

Energy Assessment / SAP Details Applied

For the proposed development at:

108 Elm Park Road, Reading, Berkshire

Energy Calculations Ltd

SAP ♦ PART O ♦ SBEM ♦ DESIGN

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108 Elm Park Road, Reading, Berkshire

13th August 2025

Property reference: SAP 10 – 01592



Contents

1. Introduction
2. Services, Thermal , SAP details Applied
3. Results 2012 & 2013 Building regulations
4. Information
5. U – Value Calculations
6. PSI Value Calculations
7. SAP 2013 Calculations
8. SAP 2021 Calculations

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1. Introduction

The calculations provided, draw upon the detailed SAP 10 assessment. This gives as accurate a guide as possible to the energy usage of the final development in operation, to comply with part L 2021 for 108 Elm Park Road, Reading, Berkshire and 19% Reduction in Co2 over 2013 Building regulations.

The Results show the dwelling achieves a reduction in Co2 of 36.77% over the 2013 building regulations and 57.02 % over the 2021 building regulations. This has been achieved though the installation of the Air to water heat pump.

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2: Thermals

The total CO₂ emissions has been calculated taking full account of energy demands for space heating and hot water, and electricity for pumps, fans, lights, using the orientation and the use of building elements (walls, windows etc.) with U-values and other reference values and in most cases consistent with achieving compliance with Approved Document Part L: 2021.

Element	U – Value Element	Element	U – Value Element
Walls	0.18	Floor	0.11
Windows	1.40 (g- value 0.50)	Slope	0.15
Doors	1.00	Flat	0.14
Dormer Wall	0.16	Roof windows (g values 0.63)	1.20

2.1: Services

Thermal Bridging – PSI values taken RCD and Default – see sign off sheets to be confirm suitable for the wall construction

Air pressure test – 5.00 or less

Lighting Efficacy – 84 lm/w

Ventilation – intermittent extract fans

Space and water heating – Samsung AE050RXYDEG flow rate 4° C

Water Cylinder – minimum heat loss

Emitters – Underfloor & Radiators

Controls – Time and temperature zone control

Electricity tariff – Standard

Water storage – from Mains

Shower – 8 ltr per person per day

Internal water use – 125 ltr per person per day

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3: Results - shows the summary for the calculations - 2021 Building Regulations

TER = Target Emission Rate kgCO₂/yr/m²
 DER = Dwelling Emission Rate kgCO₂/yr/m²
 TFEE = Target Fabric Energy Efficiency kWh/m²/yr
 DFEE = Dwelling Fabric Energy Efficiency kWh/m²/yr
 TPER = Target Primary Energy Rate kWh/m²/yr
 DPER = Dwelling Primary Energy Rate kWh/m²/yr

Table 1

TER	DER	% Reduction	TFEE	DFEE	% Reduction	TPER	DPER	% Reduction	SAP Rating
12.66	5.44	57.03	40.29	40.17	0.30	66.30	56.96	14.08	78 C

3.1 Results 2013 Building regulations

Table 2

TER kgCO ₂ /yr/m ²	DER kgCO ₂ /yr/m ²	% reduction	TFEE kWh/m ² /yr	DFEE kWh/m ² /yr	% reduction	SAP rating
25.10	15.87	36.77	47.56	47.10	0.97	87 B

108 Elm Park Road, Reading, Berkshire
 13th August 2025
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4: Information

With reference to the heat pump this have been applied for the efficiency only and needs to be clarified that its suitable for use, if an alternative is used please inform us and we will check the efficiencies as an alternative could make the calculations fail L1A building regulations.

With reference to the construction details a full specification / u – value calculations will be required before the As built SAP and EPC can be issued, including photograph evidence date and location stamped - of construction, services, thermal bridging, and insulation levels and type manufactures details of the windows, installation certificate on the services and full lighting details.

The U-value for a window should be that for the whole window opening, including the window frame. Measurements of thermal transmittance in the case of doors and windows should be made according to BS EN ISO 12567-1. Alternatively, U-values of windows and doors may be calculated using BS EN ISO 10077-1 or BS EN ISO 10077-2.

108 Elm Park Road, Reading, Berkshire

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U-VALUE CALCULATOR REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Property Reference	000690		Issued on Date	13/08/2025	
Assessment Reference		Prop Type Ref			
Project	108, Elm Road , Reading				
Calculation Type	New Build (As Built)				
SAP Rating		DER		TER	
Environmental		% DER<TER			
CO ₂ Emissions (t/year)		DFEE		TFEE	
General Requirements Compliance		% DFEE<TFEE			
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761 035, mcarter@energycalculations.co.uk			Assessor ID	7869-0001
Client					

Building Elements

Wall 000001

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Brick, outer leaf				
	Main construction	102	0.7700	0.1325	82.81
	Main construction	102	0.9407	0.1084	17.19
Layer 2	Earthwool Dritherm 32 Ultimate				
	Main construction	75	0.0320	2.3438	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Earthwool Dritherm 32 Ultimate				
	Main construction	75	0.0320	2.3438	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 4	Celcon Standard - Normal - Trad joint 10mm				
	Main construction	100	0.1500	0.6667	93.18
	Main construction	100	0.8803	0.1136	6.82
Layer 5	airspace/plaster dabs				
	Main construction	15	0.0882	0.1700	80.00
	Main construction	15	0.0882	0.1700	20.00
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 6	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1300	

Total resistance: Upper limit = 5.841 m² K/W Lower limit = 5.715 m² K/W Average = 5.778 m² K/W
Total correction = 0.0033 m² K/W U-value (unrounded) = 0.17 W/m² K

Unheated space: None

Total thickness: 380 mm

U-value: 0.17 W/m² K

Kappa: n/a

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Environmental		% DER<TER			
CO ₂ Emissions (t/year)		DFEE		TFEE	
General Requirements Compliance		% DFEE<TFEE			
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761 035, mcarter@energycalculations.co.uk			Assessor ID	7869-0001
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Building Elements

Floor 000002 - Floor - suspended beam-and-block floor

Floor Type: Suspended Floor

Area = 33.60 m², Perimeter = 17.30 m, Wall thickness = 350.00 mm, Soil: Clay

Depth of underfloor space below ground: 0.200 m Floor wind shielding: Average (suburban)

Floor height above ground: h = 0.000 m

U-value of walls above ground: U_w = 1.500 m

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.1700	
Layer 1	AAC (600 kg/m ³)/ concrete				
	Main construction	100	0.1800	0.5556	86.30
	Main construction	100	1.3500	0.0741	13.70
Layer 2	Thermafloor TF70 zero ODP				
	Main construction	150	0.0220	6.8182	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Screed				
	Main construction	75	1.1500	0.0652	100.00
Int surface				0.1700	

Total resistance: Upper limit = 7.709 m² K/W Lower limit = 7.517 m² K/W Average = 7.613 m² K/W
Total correction = 0.0080 m² K/W U-value (unrounded) = 0.11 W/m² K

Unheated space: None

Total thickness: 325 mm

U-value: 0.11 W/m² K

Kappa: n/a

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SAP Rating		DER		TER	
Environmental		% DER<TER			
CO ₂ Emissions (t/year)		DFEE		TFEE	
General Requirements Compliance		% DFEE<TFEE			
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Building Elements

Roof 000003 - pitched roof - insulated slope, sloping

Roof Type: Pitched Roof, insulated sloping ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Tiles, clay						
	Main construction	15	1.0000	0.0150	100.00		
Layer 2	Air layer ventilated						
	Main construction	25	0.2500	0.1000	100.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 3	Sarking Felt						
	Main construction	1	0.2300	0.0043	100.00		
Layer 4	Air layer ventilated						
	Main construction	50	0.5000	0.1000	100.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 5	K107						
	Main construction	100	0.0190	5.2632	91.67		
	Main construction	100	0.1300	0.7692	8.33		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 6	K118						
	Main construction	52.5	0.0233	2.2500	100.00		
Int surface				0.1000			

Total resistance: Upper limit = 7.087 m² K/W Lower limit = 6.149 m² K/W Average = 6.618 m² K/W
Total correction = 0.0029 m² K/W U-value (unrounded) = 0.15 W/m² K

Unheated space: None

Total thickness: 244 mm

U-value: 0.15 W/m² K

Kappa: 0.00 kJ/m² K

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SAP Rating		DER		TER	
Environmental		% DER<TER			
CO ₂ Emissions (t/year)		DFEE		TFEE	
General Requirements Compliance		% DFEE<TFEE			

Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761 035, mcarter@energycalculations.co.uk	Assessor ID	7869-0001
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Client	
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Building Elements

Wall 000004 - Timber framed insulation between studs

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Tiling, concrete						
	Main construction	10	1.5000	0.0067	100.00		
Layer 2	airspace/timber battens						
	Main construction	22	0.1222	0.1800	89.63		
	Main construction	22	0.1243	0.1770	10.37		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 3	Plywood						
	Main construction	18	0.1300	0.1385	100.00		
Layer 4	Breather membrane						
	Main construction	1	0.0000	0.0000	100.00		
Layer 5	K108						
	Main construction	100	0.0190	5.2632	91.67		
	Main construction	100	0.1300	0.7692	8.33		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 6	Standard cavity						
	Main construction	30	0.1667	0.1800	87.50		
	Main construction	30	0.1300	0.2308	12.50		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 7	K118						
	Main construction	42.5	0.0250	1.7000	100.00		
Int surface				0.1300			

Total resistance: Upper limit = 6.832 m² K/W Lower limit = 5.920 m² K/W Average = 6.376 m² K/W
Total correction = 0.0031 m² K/W U-value (unrounded) = 0.16 W/m² K

Unheated space: None

Total thickness: 224 mm

U-value: 0.16 W/m² K

Kappa: 0.00 kJ/m² K

U-VALUE CALCULATOR REPORT

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SAP Rating		DER		TER	
Environmental		% DER<TER			
CO ₂ Emissions (t/year)		DFEE		TTEE	
General Requirements Compliance		% DFEE<TFEE			
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761 035, mcarter@energycalculations.co.uk			Assessor ID	7869-0001
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Building Elements

Roof 000005 - Flat

Roof Type: Flat Roof standard (no precipitation)

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Membrane						
	Main construction	2	0.0000	0.0000	100.00		
Layer 2	Ply						
	Main construction	18	0.1300	0.1385	100.00		
Layer 3	Standard cavity						
	Main construction	150	0.9375	0.1600	87.50		
	Main construction	150	0.1300	1.1538	12.50		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 4	Kingspan						
	Main construction	120	0.0220	5.4545	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 5	K118						
	Main construction	42.5	0.0250	1.7000	100.00		
Int surface				0.1000			

Total resistance: Upper limit = 7.704 m² K/W Lower limit = 7.612 m² K/W Average = 7.658 m² K/W
Total correction = 0.0051 m² K/W U-value (unrounded) = 0.14 W/m² K

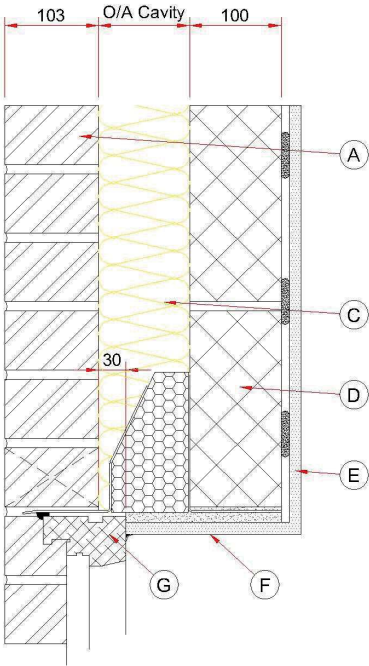
Unheated space: None

Total thickness: 333 mm

U-value: 0.14 W/m² K

Kappa: 0.00 kJ/m² K

Catnic Thermally Broken Lintel psi Value Data Sheet



Materials	Thickness (mm)	λ Value (W/m.K)
(A) Brick	103	0.77
(C) Insulation	See below	
(D) Blockwork	100	See below
(E) Plasterboard on Dabs + Air Space	12.5	0.19
(F) Plasterboard + Adhesive	10.0	0.09
(G) Window frame	~	~
Lintel	~	52
Insulation	~	0.034

Comment: Continuous band of adhesive to soffit area

Cavity Width	150 mm
Cavity Type	Full Fill
Insulation Conductivity	0.032 W/mK
Blockwork Conductivity	0.15 W/mK

Lintel Type	psi Value (W/mK)	Temperature Factor
TS150/100 (Standard Duty)	0.029	0.939
TX150/100 (Extra Heavy Duty)	0.029	0.945

To limit the risk of surface condensation or mould growth the temperature factor for a detail used in the external wall of a dwelling must be greater than 0.75.
All calculations have been carried out following the conventions set out in BR 497.

Catnic

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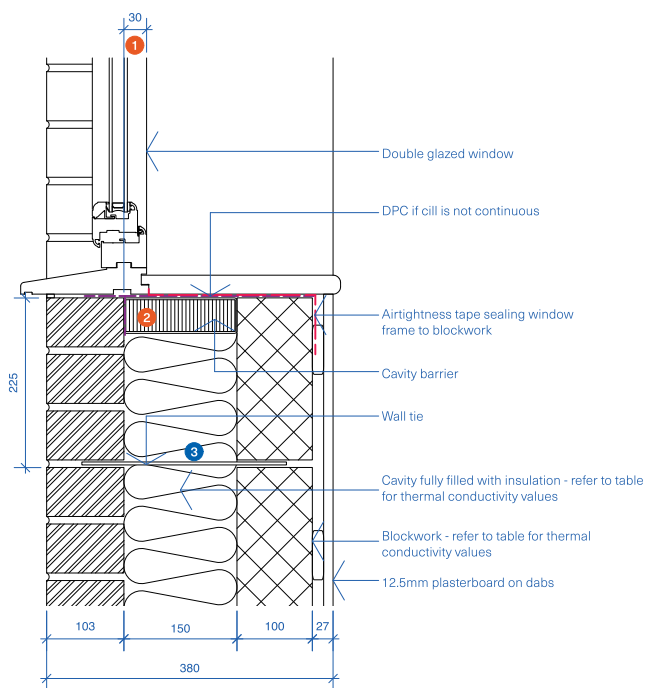
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Construction Detail



Calculated Ψ (Psi) value for use in SAP Calculation

Insulation thermal conductivity (W/mK)	Internal leaf block thermal conductivity (W/mK)					
	0.11	0.15	0.19	0.28	0.6	1.33
0.032	0.024	0.023	0.022	0.022	0.021	0.021
0.034	0.023	0.022	0.022	0.021	0.021	0.021
0.037	0.023	0.022	0.022	0.021	0.020	0.020

f-values: 0.881 - 0.893 (values above 0.75 indicate low risk of condensation and mould)

Ψ (Psi) value Thermal Compliance Notes

- 1 Minimum 30mm overlap of window frame and insulated wall cavity.
- 2 Insulated cavity barrier with $\lambda \leq 0.026 \text{ W/mK}$ fixed in accordance with manufacturers guidelines. If fixing spikes are used, they should be installed at the required centres. For compression fit cavity barriers, use the correct size for a compressive fit in the cavity.

Construction Notes

- 3 Wall tie: 225mm maximum distance from opening. No greater than 450mm vertical spacing. 450mm horizontal centres for first row of wall ties above and below opening.

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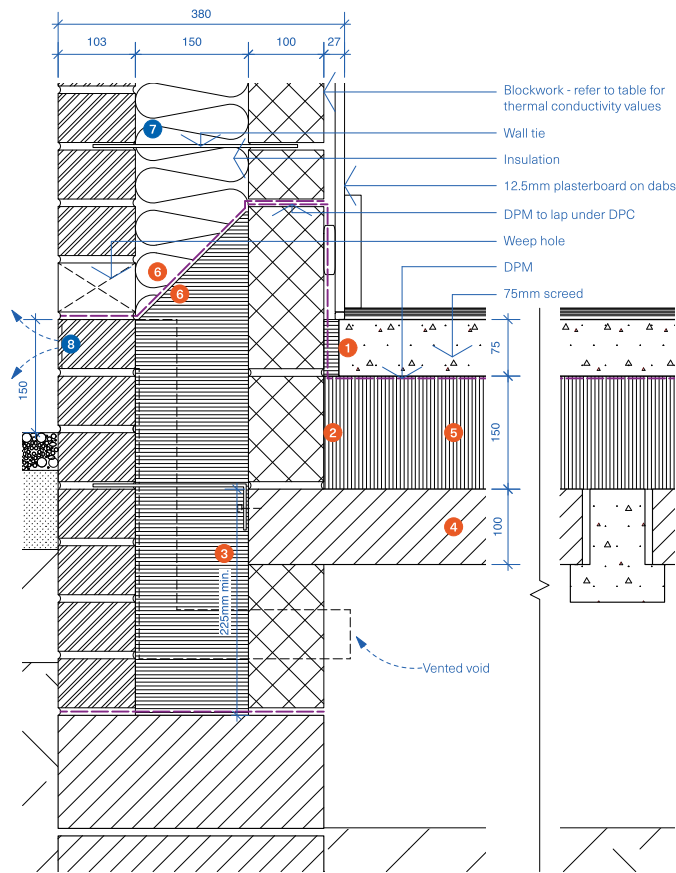
	Internal leaf block thermal conductivity (W/mK)					
Insulation thermal conductivity (W/mK)	0.11	0.15	0.19	0.28	0.6	1.33
0.032	0.019	0.018	0.017	0.017	0.016	0.016
0.034	0.019	0.017	0.017	0.016	0.016	0.016
0.037	0.018	0.017	0.017	0.016	0.015	0.015

Ψ (Psi) value Thermal Compliance Notes

- ## Construction Notes

- 4 Wall tie: 225mm maximum distance from opening. No greater than 450mm vertical spacing. 450mm horizontal centres for first row of wall ties above and below opening.

Construction Detail



Calculated Ψ (Psi) value for use in SAP Calculation

Insulation thermal conductivity (W/mK)	Internal leaf block thermal conductivity (W/mK)					
	0.11	0.15	0.19	0.28	0.6	1.33
0.032	0.060	0.068	0.067	0.084	0.111	0.144
0.034	0.061	0.068	0.067	0.085	0.111	0.144
0.037	0.062	0.069	0.068	0.085	0.112	0.145

f-values: 0.922 - 0.953 (values above 0.75 indicate low risk of condensation and mould)

Ψ (Psi) value Thermal Compliance Notes

- 1 Minimum 20mm perimeter insulation with $\lambda \leq 0.022\text{W/mK}$.
- 2 Ensure the floor insulation is tightly butted against the external wall.
- 3 Continue full fill rigid cavity insulation at least 225mm below the top of the beams. Insulation below DPC to provide thermal resistance equal to or better than main wall insulation.
- 4 150mm Beam and Aircrete block infill.
- 5 150mm insulation (0.022W/mK) above slab.
- 6 Ensure insulation is cut and fitted around the angle of the cavity tray.

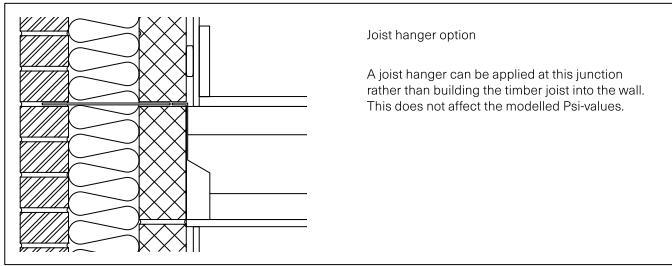
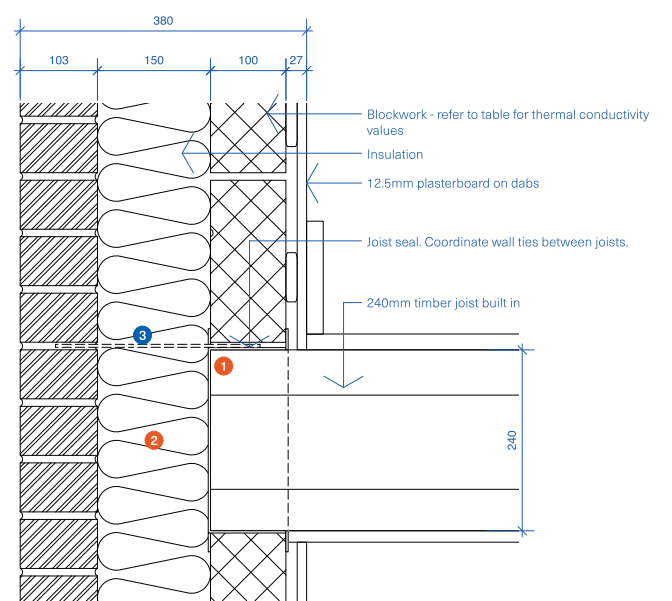
Construction Notes

- 7 Wall tie: No greater than 450mm vertical spacing.
- 8 Telescopic void vent. Ensure voids around vents are fitted with cut insulation.

General Notes

Rigid insulation below DPC to provide structural stability and stop water ingress.

Construction Detail



Calculated Ψ (Psi) value for use in SAP Calculation

Insulation thermal conductivity (W/mK)	Internal leaf block thermal conductivity (W/mK)					
	0.11	0.15	0.19	0.28	0.6	1.33
0.032	0.000	0.001	0.001	0.001	0.002	0.002
0.034	0.001	0.001	0.001	0.001	0.002	0.003
0.037	0.001	0.001	0.001	0.002	0.002	0.002

f-values: 0.972 - 0.985 (values above 0.75 indicate low risk of condensation and mould)

Ψ (Psi) value Thermal Compliance Notes

- 1 Joist seal to the end of the timber joist, built into the internal leaf blockwork. Airtightness seal.
- 2 Insulation to be continuous across floor abutment zone.

Construction Notes

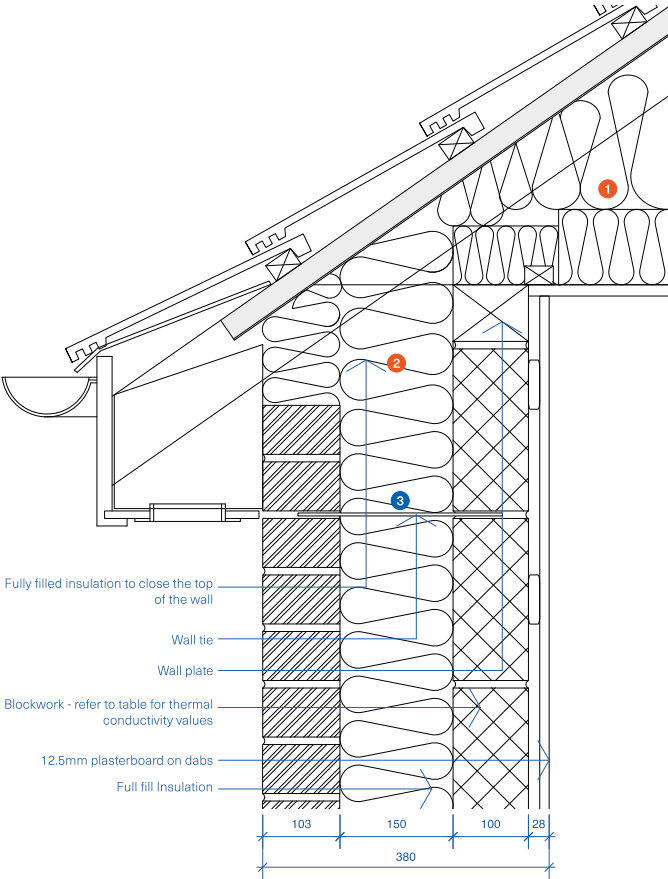
- 3 Wall tie: No greater than 450mm vertical spacing.

General Notes

You can alternatively build this detail with a joist hanger rather than building the timber joist into the blockwork.

Maintain clear separation of components to prevent congestion within the cavity and mortar joints.

Construction Detail



Calculated Ψ (Psi) value for use in SAP Calculation

Insulation thermal conductivity (W/mK)	Internal leaf block thermal conductivity (W/mK)					
	0.11	0.15	0.19	0.28	0.6	1.33
0.032	0.051	0.055	0.057	0.060	0.065	0.068
0.034	0.050	0.053	0.055	0.058	0.063	0.066
0.037	0.047	0.050	0.052	0.055	0.059	0.062

f-values: 0.924 - 0.939 (values above 0.75 indicate low risk of condensation and mould)

Ψ (Psi) value Thermal Compliance Notes

- 1 400mm insulation quilt (0.044 W/mK), minimum roof pitch 40 degrees.
- 2 Ensure continuity of insulation between the loft and external wall.

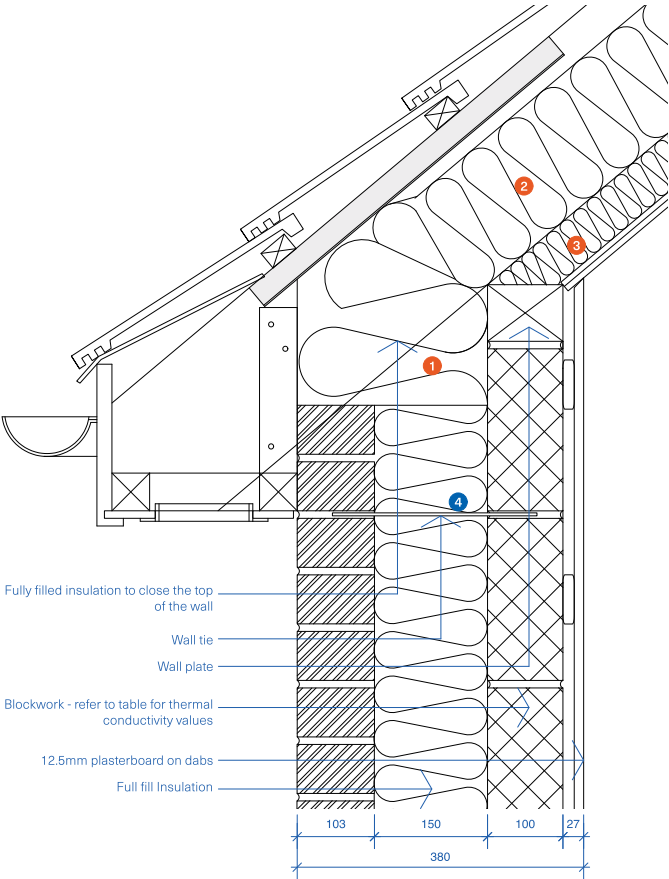
Construction Notes

- 3 Wall tie: 225mm maximum distance from opening. No greater than 450mm spacing.

General Notes

When the cavity is fully filled with insulation additional cavity closing is not required at the head of the wall. This meets the provisions of Diagram 5.3 ADBv1.

Construction Detail



Calculated Ψ (Psi) value for use in SAP Calculation

Insulation thermal conductivity (W/mK)	Internal leaf block thermal conductivity (W/mK)					
	0.11	0.15	0.19	0.28	0.6	1.33
0.032	0.018	0.018	0.018	0.018	0.018	0.019
0.034	0.017	0.017	0.017	0.016	0.017	0.018
0.037	0.015	0.015	0.015	0.015	0.015	0.015

f-values: 0.950 - 0.962 (values above 0.75 indicate low risk of condensation and mould)

Ψ (Psi) value Thermal Compliance Notes

- 1 Fully fill the void with insulation and ensure continuity of insulation between the roof and external wall.
- 2 150mm insulation (0.022 W/mK) between rafters.
- 3 60mm (0.022 W/mK) beneath rafters.

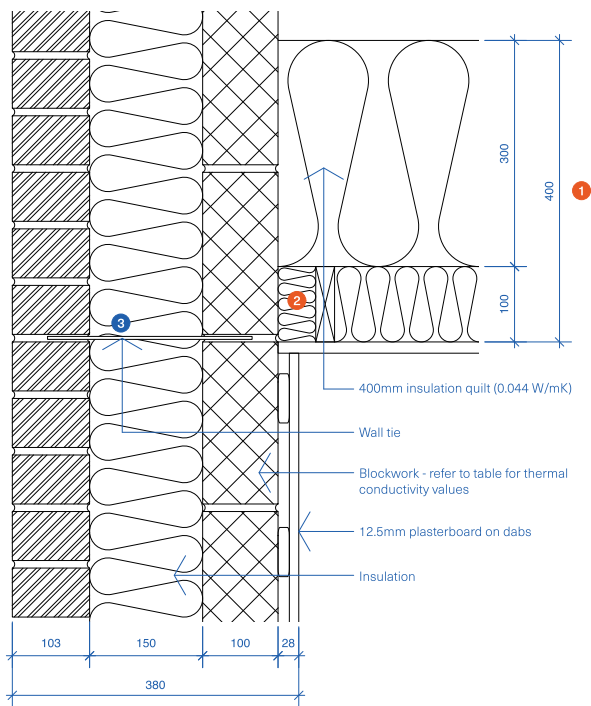
Construction Notes

- 4 Wall tie: 225mm maximum distance from opening. No greater than 450mm spacing.

General Notes

When the cavity is fully filled with insulation additional cavity closing is not required at the head of the wall. This meets the provisions of Diagram 5.3 ADBv1.

Construction Detail



Calculated Ψ (Psi) value for use in SAP Calculation

Insulation thermal conductivity (W/mK)	Internal leaf block thermal conductivity (W/mK)					
	0.11	0.15	0.19	0.28	0.6	1.33
0.032	0.029	0.037	0.043	0.056	0.097	0.175
0.034	0.030	0.037	0.044	0.057	0.098	0.174
0.037	0.031	0.038	0.044	0.057	0.099	0.174

f-values: 0.878 - 0.949 (values above 0.75 indicate low risk of condensation and mould)

Ψ (Psi) value Thermal Compliance Notes

- 1 400mm insulation quilt (0.044 W/mK).
- 2 Fill the space between the wall and joist with insulation.

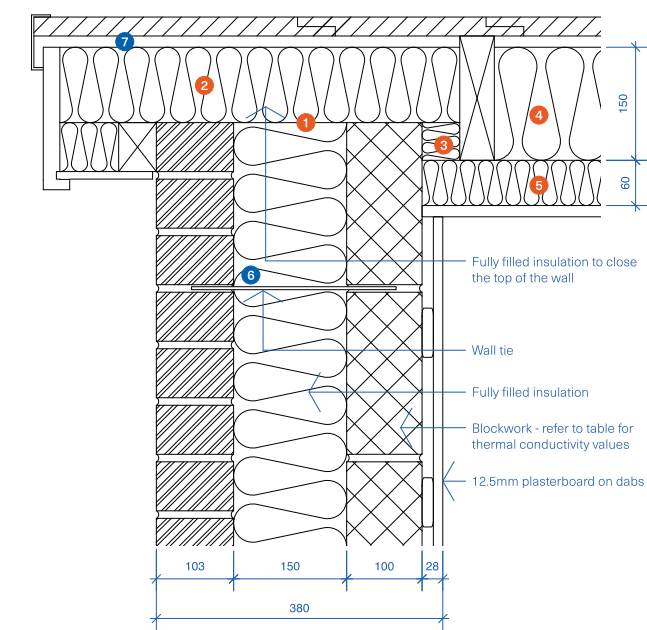
Construction Notes

- 3 Wall tie: 225mm maximum distance from opening. No greater than 450mm spacing.

General Notes

When the cavity is fully filled with insulation additional cavity closing is not required at the head of the wall. This meets the provisions of Diagram 5.3 ADBv1.

Construction Detail



Calculated Ψ (Psi) value for use in SAP Calculation

Insulation thermal conductivity (W/mK)	Internal leaf block thermal conductivity (W/mK)					
	0.11	0.15	0.19	0.28	0.6	1.33
0.032	0.034	0.039	0.043	0.050	0.061	0.070
0.034	0.034	0.039	0.044	0.050	0.062	0.071
0.037	0.034	0.040	0.044	0.051	0.062	0.072

f-values: 0.921 - 0.941 (values above 0.75 indicate low risk of condensation and mould)

Ψ (Psi) value Thermal Compliance Notes

- 1 Continue cavity insulation up to the wall head.
- 2 Minimum 100mm insulation $\lambda \leq 0.044$ W/mK to void above the wall.
- 3 Pack insulation between the final rafter and the wall.
- 4 150mm insulation (0.022 W/mK) between rafters.
- 5 60mm (0.022 W/mK) beneath rafters.

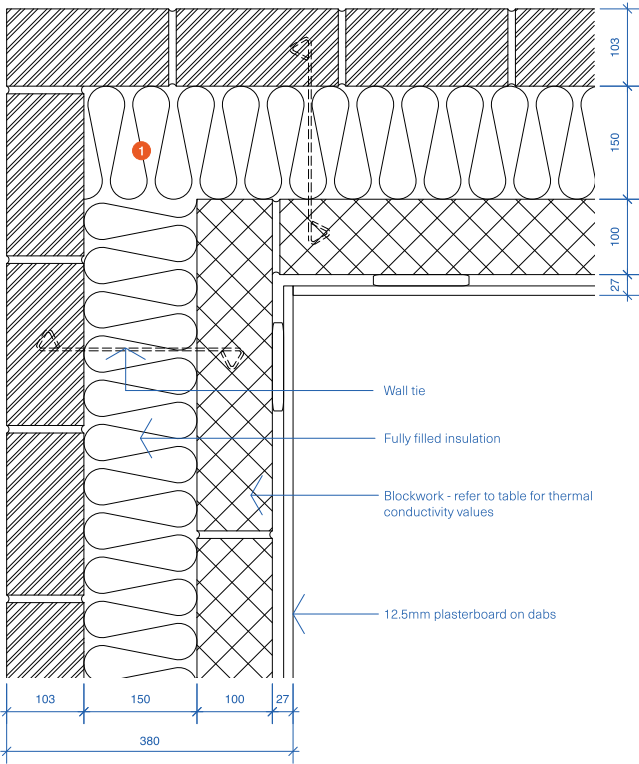
Construction Notes

- 6 Wall tie: 225mm maximum distance from opening. No greater than 450mm spacing.
- 7 Maintain air gap for ventilation.

General Notes

When the cavity is fully filled with insulation additional cavity closing is not required at the head of the wall. This meets the provisions of Diagram 5.3 ADBv1.

Construction Detail



Calculated Ψ (Psi) value for use in SAP Calculation

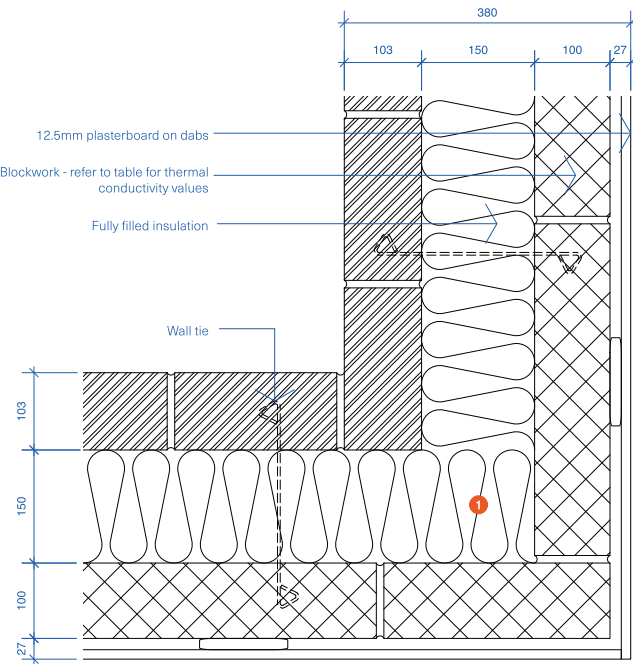
Insulation thermal conductivity (W/mK)	Internal leaf block thermal conductivity (W/mK)					
	0.11	0.15	0.19	0.28	0.6	1.33
0.032	0.037	0.040	0.042	0.046	0.051	0.054
0.034	0.037	0.041	0.044	0.047	0.054	0.057
0.037	0.039	0.043	0.046	0.051	0.057	0.061

f-values: 0.924 - 0.966 (values above 0.75 indicate low risk of condensation and mould)

Ψ (Psi) value Thermal Compliance Notes

- 1 Ensure continuity of insulation at the corner.

Construction Detail



Calculated Ψ (Psi) value for use in SAP Calculation

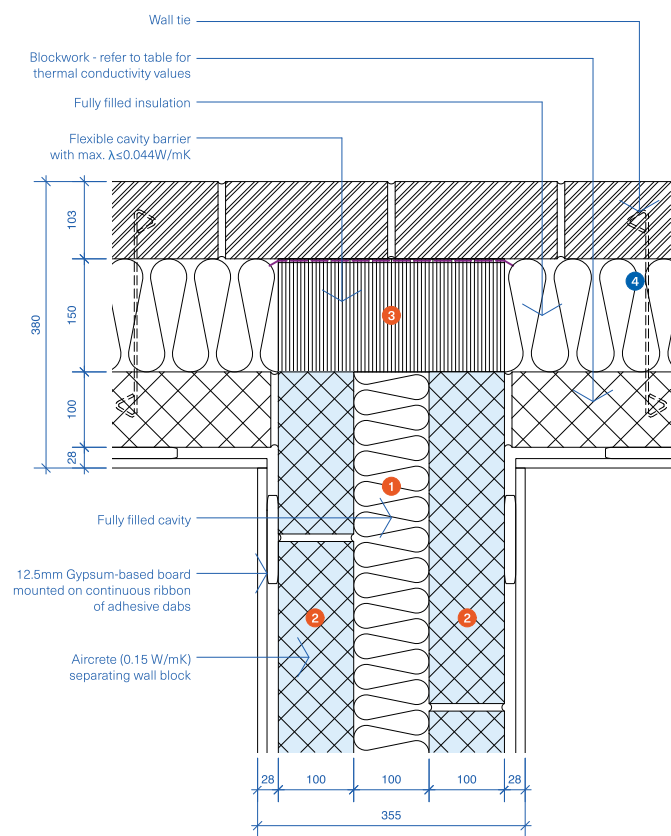
Insulation thermal conductivity (W/mK)	Internal leaf block thermal conductivity (W/mK)					
	0.11	0.15	0.19	0.28	0.6	1.33
0.032	-0.079	-0.082	-0.085	-0.088	-0.091	-0.093
0.034	-0.083	-0.086	-0.089	-0.094	-0.097	-0.098
0.037	-0.087	-0.092	-0.096	-0.099	-0.105	-0.107

f-values: 0.972 - 0.986 (values above 0.75 indicate low risk of condensation and mould)

Ψ (Psi) value Thermal Compliance Notes

- 1 Ensure continuity of insulation at the corner.

Construction Detail



Calculated Ψ (Psi) value for use in SAP Calculation

Insulation thermal conductivity (W/mK)	Internal leaf block thermal conductivity (W/mK)					
	0.11	0.15	0.19	0.28	0.6	1.33
0.032	0.031	0.032	0.032	0.033	0.034	0.035
0.034	0.031	0.032	0.032	0.032	0.034	0.034
0.037	0.031	0.032	0.032	0.033	0.034	0.035

f-values: 0.954 - 0.970 (values above 0.75 indicate low risk of condensation and mould)
The above Psi values are applicable per dwelling on either side of the party wall.

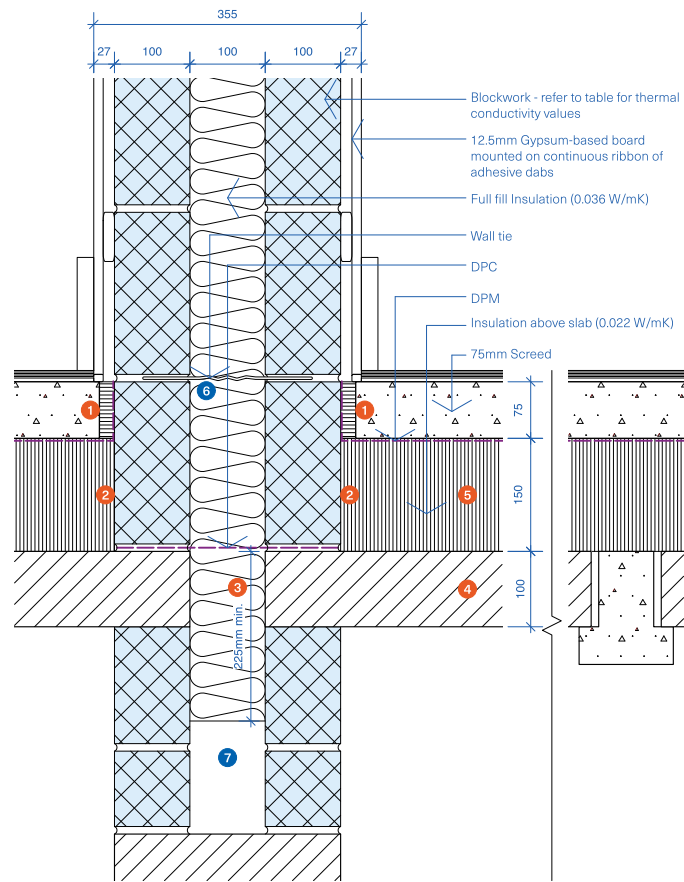
Ψ (Psi) value Thermal Compliance Notes

- 1 Fully fill the separating wall 100mm cavity with insulation (0.036 W/mK).
- 2 2 x 100mm Aircrete (0.15 W/mK) block separating wall.
- 3 Close the external wall cavity with flexible cavity barrier with max. $\lambda \leq 0.044 \text{ W/mK}$.
Dependent on the type of cavity barrier used, a DPC should be provided to prevent the barrier absorbing moisture.
Horizontal/vertical cavity barriers need to be fixed in accordance with manufacturers guidelines.
If fixing spikes are used, they should be installed at the required centres.
For compression fit cavity barriers, use the correct size for a compressive fit in the cavity.

Construction Notes

- 4 Type A (part E) wall ties at no more than 2.5 ties/m² (900 x 450mm spacing).
Wall ties: no greater than 900mm horizontal spacing.

Construction Detail



Calculated Ψ (Psi) value for use in SAP Calculation

Separating Wall Block Conductivity: W/mK				
Floor Insulation Thermal Conductivity (W/mK)	0.15	0.19	0.6	1.33
0.022	0.058	0.065	0.103	0.138

f-values: 0.912 - 0.953 (values above 0.75 indicate low risk of condensation and mould)
The above Psi-values are applicable per dwelling on either side of the party wall.

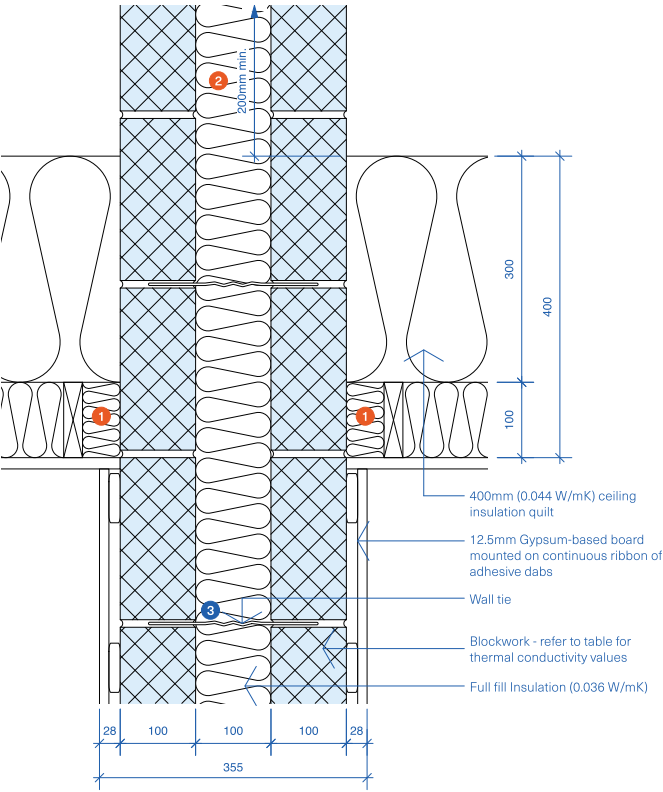
Ψ (Psi) value Thermal Compliance Notes

- 1 Minimum 20mm perimeter insulation with $\lambda \leq 0.022$ W/mK.
- 2 Ensure the floor insulation is tightly butted against the separating wall.
- 3 Continue full fill cavity insulation at least 225mm below the top of the beams. Insulation below DPC to provide thermal resistance equal to or better than main wall insulation.
- 4 150mm Beam and Aircrete block infill.
- 5 150mm insulation (0.022 W/mK) above slab.

Construction Notes

- 6 Type A (part E) wall ties at no more than 2.5 ties/m² (900 x 450mm spacing).
Wall ties: no greater than 900mm horizontal spacing.
- 7 Continue the cavity at least 225mm below the underside of the beams.

Construction Detail



Calculated Ψ (Psi) value for use in SAP Calculation

Separating Wall Block Conductivity: W/mK				
Roof Insulation Thermal Conductivity (W/mK)	0.15	0.19	0.6	1.33
0.044	0.033	0.040	0.101	0.190

f-values: 0.890 - 0.957 (values above 0.75 indicate low risk of condensation and mould)
The above Psi-values are applicable per dwelling on either side of the party wall.

Ψ (Psi) value Thermal Compliance Notes

- 1 Fill the space between the separating wall and last joist with insulation.
- 2 Ensure that the cavity insulation extends at least 200mm above the top of the loft insulation.

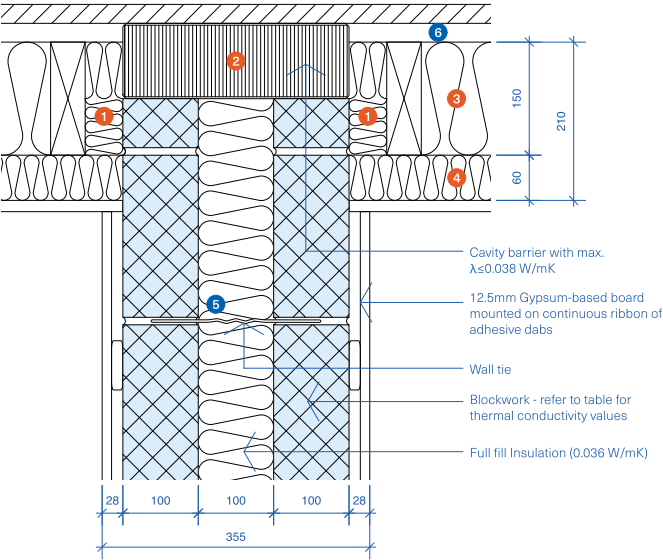
Construction Notes

- 3 Type A (part E) wall ties at no more than 2.5 ties/m2 (900 x 450mm spacing).
Wall ties: no greater than 900mm horizontal spacing.

General Notes

The cavity must be fire-stopped (same resistance as the compartment wall) at the top of the wall to the underside of the roof for the provisions of Diagram 8.1 ADBv1 to apply.

Construction Detail



Calculated Ψ (Psi) value for use in SAP Calculation

Separating Wall Block Conductivity: W/mK				
Roof Insulation between rafters Thermal Conductivity (W/mK)	0.15	0.19	0.6	1.33
0.022	0.036	0.038	0.046	0.050

f-values: 0.955 - 0.972 (values above 0.75 indicate low risk of condensation and mould)
The above Psi-values are applicable per dwelling on either side of the party wall.

Ψ (Psi) value Thermal Compliance Notes

- 1 Fill the space between the separating wall and last rafter with insulation.
- 2 Cavity barrier with maximum $\lambda \leq 0.038 \text{ W/mK}$.
The cavity must be fire-stopped (same resistance as the compartment wall) at the top of the wall to the underside of the roof for the provisions of Diagram 8.1 ADBv1 to apply.
- 3 150mm insulation (0.022 W/mK) between rafters.
- 4 60mm insulation (0.022 W/mK) beneath rafters.

Construction Notes

- 5 Type A (part E) wall ties at no more than 2.5 ties/m² (900 x 450mm spacing).
Wall ties: no greater than 900mm horizontal spacing.
- 6 Maintain air gap for ventilation.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Wed 13 Aug 2025 15:31:13

Project Information			
Assessed By	Matthew Carter	Building Type	House, End-terrace
OCDEA Registration	EES/003584	Assessment Date	2025-08-13

Dwelling Details			
Assessment Type	As designed	Total Floor Area	78 m ²
Site Reference	01592	Plot Reference	00001
Address	108 Adj: Elm Park Road, Reading		

Client Details	
Name	Colony Architects Ltd
Company	Colony Architects Ltd
Address	The Wine Store, Brewery Court, Theale, R7 5AJ

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	12.66 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	5.44 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	66.3 kWh _{PE} /m ²		
Dwelling primary energy	56.96 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	40.3 kWh/m ²		
Dwelling fabric energy efficiency	40.2 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.11	Floor (0.11)	OK
Roofs	0.16	0.15	Roof (1) (0.15)	OK
Windows, doors, and roof windows	1.6	1.34	Front (1.4)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	84.487385	0.18
Exposed wall: Walls (2)	11.87	0.16
Party wall: Party Wall (1)	51.36	0 (!)
Ground floor: Floor, Floor	33.6	0.11
Exposed roof: Roof (1)	20.05	0.15
Exposed roof: Roof (2)	5.1	0.14
Exposed roof: Roof (3)	11.91	0.14

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, Door	1.953	East	N/A	1 (!)
Front, Windows	1.17436	East	0.7	1.4
Front, Windows	0.66725	East	0.7	1.4
Front, Windows	0.66725	East	0.7	1.4
Front, Windows	1.092	East	0.7	1.4
Front, Windows	1.092	East	0.7	1.4
Opening, Roof windows	0.49	East	0.7	1.2
Opening, Roof windows	0.49	East	0.7	1.2
Rear, Windows	5.4537	West	0.7	1.4
Rear, Windows	0.578655	West	0.7	1.4

Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Rear, Windows	1.5092	West	0.7	1.4
Rear, Windows	0.8576	West	0.7	1.4
Rear, Windows	0.8576	West	0.7	1.4

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))

Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.029 (!)	Catnic
External wall	E3: Sill	Calculated by person with suitable expertise	0.023 (!)	RCD
External wall	E4: Jamb	Calculated by person with suitable expertise	0.018 (!)	RCD
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.068	RCD
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	RCD
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.018 (!)	RCD
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.039 (!)	RCD
External wall	E14: Flat roof	SAP table default	0.16	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.04	RCD
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.082	RCD
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.032 (!)	RCD
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.048	RCD
Party wall	P2: Intermediate floor within a dwelling	SAP table default	0 (!)	
Party wall	P5: Roof (insulation at rafter level)	Calculated by person with suitable expertise	0 (!)	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity

Efficiency	239.7%
Emitter type	Both radiators and underfloor
Flow temperature	45°C
System type	Heat Pump
Manufacturer	Samsung Electronics Air Conditioner Europe B.V.
Model	AE050RXYDEG
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

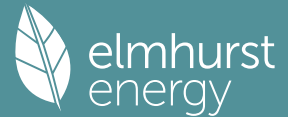
5 Hot water

Cylinder/store - type: Cylinder

Capacity	180 litres
Declared heat loss	1.4 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	

Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		
6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	84 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Full SAP Calculation Printout



Property Reference	01592				Issued on Date	13/08/2025	
Assessment Reference	00001			Prop Type Ref			
Property	Adj., 108, Elm Park Road , Reading , Berkshire						
SAP Rating	78 C		DER	5.44		TER	12.66
Environmental	96 A		% DER < TER				57.03
CO ₂ Emissions (t/year)	0.38		DFEE	40.17		TFEE	40.29
Compliance Check	See BREL		% DFEE < TFEE				0.30
% DPER < TPER	14.08		DPER	56.96		TPER	66.30
Assessor Details	Mr. Matthew Carter					Assessor ID	7869-0001
Client	COLONY ARCHITECTS LTD, Colony Architects Ltd						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	33.6000 (1b)	x 2.3000 (2b)	= 77.2800 (1b) - (3b)
First floor	28.1600 (1c)	x 2.4800 (2c)	= 69.8368 (1c) - (3c)
Second floor	16.3400 (1d)	x 2.4000 (2d)	= 39.2160 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.3328 (5)

2. Ventilation rate

	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	5 * 10 =	50.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	50.0000 / (5) =	0.2683 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.5183	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4795 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.6113	0.5993	0.5873	0.5274	0.5154	0.4555	0.4555	0.4435	0.4795	0.5154	0.5394	0.5634 (22b)
Effective ac	0.6869	0.6796	0.6725	0.6391	0.6328	0.6037	0.6037	0.5983	0.6149	0.6328	0.6455	0.6587 (25)

3. Heat losses and heat loss parameter

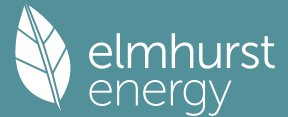
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			1.9500	1.0000	1.9500		(26)
Windows			13.9500	1.3258	18.4943		(27)
Roof windows			0.9800	1.1450	1.1221		(27a)
Floor			33.6000	0.1100	3.6960	75.0000	2520.0000 (28a)
Main	100.3900	15.9000	84.4900	0.1800	15.2082	70.0000	5914.3000 (29a)
Dormer	11.8700		11.8700	0.1600	1.8992	9.0000	106.8300 (29a)
Slope	21.0300	0.9800	20.0500	0.1500	3.0075	9.0000	180.4500 (30)
Flat roof	5.1000		5.1000	0.1400	0.7140	9.0000	45.9000 (30)
Dormer	11.9100		11.9100	0.1400	1.6674	9.0000	107.1900 (30)
Total net area of external elements A _{um} (A, m ²)			183.9000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.7588		(33)
Main dwelling							
Party Wall 1			51.3600	0.0000	0.0000	140.0000	7190.4000 (32)
Internal Wall 1			10.3500			9.0000	93.1500 (32c)
Internal Wall 2			10.4200			100.0000	1042.0000 (32c)
Internal Wall 3			30.5500			9.0000	274.9500 (32c)
Internal Wall 4			24.0000			9.0000	216.0000 (32c)
Internal Floor 1			16.3400			18.0000	294.1200 (32d)

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.4258 (42)
Hot water usage for mixer showers												
	64.8927	63.9175	62.4965	59.7775	57.7710	55.5333	54.2614	55.6717	57.2177	59.6203	62.3976	64.6441 (42a)
Hot water usage for baths												
	28.0292	27.6130	27.0268	25.9459	25.1366	24.2392	23.7544	24.3365	24.9703	25.9306	27.0337	27.9345 (42b)
Hot water usage for other uses												
	39.4728	38.0375	36.6021	35.1667	33.7313	32.2960	32.2960	33.7313	35.1667	36.6021	38.0375	39.4728 (42c)
Average daily hot water use (litres/day)												121.7008 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	132.3948	129.5679	126.1253	120.8901	116.6389	112.0684	110.3118	113.7396	117.3547	122.1529	127.4688	132.0514 (44)
Energy content (annual)												
	209.6810	184.5030	193.8499	165.4925	157.0183	137.8012	133.4125	140.8334	144.7101	165.7604	181.6027	206.7606 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2021.4257
	31.4522	27.6755	29.0775	24.8239	23.5528	20.6702	20.0119	21.1250	21.7065	24.8641	27.2404	31.0141 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7560 (55)
Total storage loss												
	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (56)
If cylinder contains dedicated solar storage												
	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (57)
Primary loss												
	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	256.3794	226.6822	240.5483	210.6845	203.7167	182.9932	180.1109	187.5318	189.9021	212.4588	226.7947	253.4590 (62)
WWHRS												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	256.3794	226.6822	240.5483	210.6845	203.7167	182.9932	180.1109	187.5318	189.9021	212.4588	226.7947	253.4590 (64)
Total per year (kWh/year) = Sum(64)m =												2571.2617 (64a)
12Total per year (kWh/year)												2571 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	107.0777	95.0906	101.8138	91.1799	89.5673	81.9725	81.7184	84.1858	84.2697	92.4741	96.5365	106.1066 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.8201	121.5865	109.8201	113.4808	109.8201	113.4808	109.8201	109.8201	113.4808	109.8201	113.4808	109.8201 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.4238	217.6592	212.0260	200.0336	184.8953	170.6675	161.1624	158.9270	164.5602	176.5526	191.6909	205.9187 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329 (71)
Water heating gains (Table 5)	143.9216	141.5039	136.8465	126.6387	120.3862	113.8507	109.8365	113.1530	117.0413	124.2931	134.0785	142.6164 (72)
Total internal gains	528.5527	540.1369	518.0799	499.5403	474.4889	457.3862	440.2064	441.2874	454.4695	470.0531	498.6374	517.7425 (73)

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6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
East					4.6900	19.6403		0.5000	0.7000	0.7700		22.3420 (76)
West					9.2600	19.6403		0.5000	0.7000	0.7700		44.1123 (80)
East					0.9800	25.9287		0.6300	0.7000	1.0000		10.0853 (82)
Solar gains	76.5395	150.1765	248.4663	364.2217	448.0412	459.3987	437.0581	374.2999	289.5737	178.4959	95.5156	62.8918 (83)
Total gains	605.0923	690.3135	766.5462	863.7620	922.5301	916.7849	877.2644	815.5872	744.0432	648.5489	594.1530	580.6343 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.2164	55.4747	55.7302	56.9626	57.1992	58.3273	58.3273	58.5411	57.8875	57.1992	56.7225	56.2325
alpha	4.6811	4.6983	4.7153	4.7975	4.8133	4.8885	4.8885	4.9027	4.8592	4.8133	4.7815	4.7488
util living area	0.9934	0.9870	0.9710	0.9164	0.7978	0.6066	0.4497	0.5004	0.7544	0.9457	0.9869	0.9945 (86)
Living	19.8998	20.0491	20.2786	20.5891	20.8061	20.9110	20.9318	20.9288	20.8637	20.5720	20.1958	19.8923
Non living	18.6253	18.8182	19.1101	19.5037	19.7448	19.8556	19.8681	19.8706	19.8149	19.4953	19.0227	18.6294
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4372	20.0491	20.2786	20.5891	20.8061	20.9110	20.9318	20.9288	20.8637	20.5720	20.1958	20.0472 (87)
Th 2	19.8985	19.9030	19.9075	19.9285	19.9325	19.9509	19.9509	19.9543	19.9438	19.9325	19.9245	19.9162 (88)
util rest of house	0.9913	0.9829	0.9615	0.8898	0.7403	0.5181	0.3452	0.3914	0.6707	0.9225	0.9820	0.9928 (89)
MIT 2	19.3909	18.8182	19.1101	19.5037	19.7448	19.8556	19.8681	19.8706	19.8149	19.4953	19.0227	18.8613 (90)
Living area fraction									fLA = Living area / (4) =			0.2501 (91)
MIT	19.6525	19.1260	19.4023	19.7751	20.0102	20.1195	20.1341	20.1352	20.0772	19.7645	19.3161	19.1578 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6525	19.1260	19.4023	19.7751	20.0102	20.1195	20.1341	20.1352	20.0772	19.7645	19.3161	19.1578 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9907	0.9790	0.9559	0.8854	0.7449	0.5329	0.3638	0.4107	0.6823	0.9180	0.9782	0.9912 (94)
Useful gains	599.4899	675.8333	732.7730	764.7514	687.2198	488.5407	319.1057	334.9633	507.6319	595.3565	581.2194	575.5115 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1471.1593	1356.8617	1224.9664	1010.1608	768.7193	500.6980	320.5931	337.5975	546.3318	847.7482	1139.5219	1407.4335 (97)
Space heating kWh	648.5220	457.6511	366.1918	176.6948	60.6356	0.0000	0.0000	0.0000	0.0000	187.7795	401.9778	618.9500 (98a)
Space heating requirement - total per year (kWh/year)												2918.4026
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	648.5220	457.6511	366.1918	176.6948	60.6356	0.0000	0.0000	0.0000	0.0000	187.7795	401.9778	618.9500 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2918.4026
Space heating per m2										(98c) / (4) =		37.3675 (99)

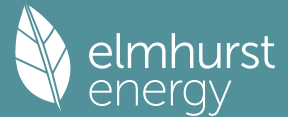
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												239.6963 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	648.5220	457.6511	366.1918	176.6948	60.6356	0.0000	0.0000	0.0000	0.0000	187.7795	401.9778	618.9500 (98)
Space heating efficiency (main heating system 1)	239.6963	239.6963	239.6963	239.6963	239.6963	0.0000	0.0000	0.0000	0.0000	239.6963	239.6963	239.6963 (210)
Space heating fuel (main heating system)	270.5599	190.9296	152.7733	73.7161	25.2969	0.0000	0.0000	0.0000	0.0000	78.3406	167.7030	258.2226 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	256.3794	226.6822	240.5483	210.6845	203.7167	182.9932	180.1109	187.5318	189.9021	212.4588	226.7947	253.4590 (64)
Efficiency of water heater	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222 (216)
Fuel for water heating, kWh/month	147.4952	130.4104	138.3876	121.2069	117.1984	105.2761	103.6179	107.8871	109.2508	122.2277	130.4751	145.8151 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	22.4409	18.0029	16.2096	11.8759	9.1733	7.4946	8.3682	10.8772	14.1285	18.5373	20.9378	23.0646 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

2. Ventilation rate		

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000
Pressure test	/ (5) =	0.1610 (8)
Pressure Test Method		Yes
Measured/design AP50		Blower Door
Infiltration rate		5.0000 (17)
Number of sides sheltered		0.4110 (18)
		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)

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Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.3802 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.4847	0.4752	0.4657	0.4182	0.4087	0.3612	0.3612	0.3517	0.3802	0.4087	0.4277	0.4467	(22b)
	0.6175	0.6129	0.6084	0.5874	0.5835	0.5652	0.5652	0.5618	0.5723	0.5835	0.5915	0.5998	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9500	1.0000	1.9500			(26)
TER Opening Type			13.9500	1.1450	15.9733			(27)
TER Roof Window			0.9800	1.1450	1.3868			(27a)
Floor			33.6000	0.1300	4.3680			(28a)
Main	100.3900	15.9000	84.4900	0.1800	15.2082			(29a)
Dormer	11.8700		11.8700	0.1800	2.1366			(29a)
Slope	21.0300	0.9800	20.0500	0.1100	2.2055			(30)
Flat roof	5.1000		5.1000	0.1100	0.5610			(30)
Dormer	11.9100		11.9100	0.1100	1.3101			(30)
Total net area of external elements Aum(A, m2)			183.9000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.0995		(33)
Main dwelling								
Party Wall 1			51.3600	0.0000	0.0000			(32)

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

243.8926 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	10.0000	0.0500	0.5000	
E2 Other lintels (including other steel lintels)	5.7100	0.0500	0.2855	
E3 Sill	32.4900	0.0500	1.6245	
E4 Jamb	17.3000	0.1600	2.7680	
E5 Ground floor (normal)	36.6800	0.0000	0.0000	
E6 Intermediate floor within a dwelling	10.6800	0.0400	0.4272	
E11 Eaves (insulation at rafter level)	9.5200	0.0800	0.7616	
E13 Gable (insulation at rafter level)	10.7000	0.0800	0.8560	
E14 Flat roof	19.1400	0.0900	1.7226	
E16 Corner (normal)	4.7800	-0.0900	-0.4302	
E17 Corner (inverted - internal area greater than external area)	14.3600	0.0600	0.8616	
E18 Party wall between dwellings	10.5000	0.0800	0.8400	
P1 Party wall - Ground floor	22.6000	0.0000	0.0000	
P2 Party wall - Intermediate floor within a dwelling	5.2000	0.0800	0.4160	
P5 Party wall - Roof (insulation at rafter level)				

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

Point Thermal bridges

(36a) = 10.6328 (36)

Total fabric heat loss

(33) + (36) + (36a) = 55.7323 (37)

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

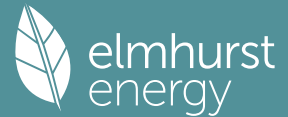
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	37.9687	37.6882	37.4132	36.1218	35.8802	34.7554	34.7554	34.5471	35.1886	35.8802	36.3690	36.8800	(38)
Average = Sum(39)m / 12 =	93.7010	93.4205	93.1455	91.8541	91.6124	90.4876	90.4876	90.2793	90.9209	91.6124	92.1012	92.6123	(39)
												91.8529	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1998	1.1962	1.1926	1.1761	1.1730	1.1586	1.1586	1.1559	1.1642	1.1730	1.1793	1.1858	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4258 (42)
Hot water usage for mixer showers													
Hot water usage for baths	64.8927	63.9175	62.4965	59.7775	57.7710	55.5333	54.2614	55.6717	57.2177	59.6203	62.3976	64.6441	(42a)
Hot water usage for other uses	28.0292	27.6130	27.0268	25.9459	25.1366	24.2392	23.7544	24.3365	24.9703	25.9306	27.0337	27.9345	(42b)
Average daily hot water use (litres/day)	39.4728	38.0375	36.6021	35.1667	33.7313	32.2960	32.2960	33.7313	35.1667	36.6021	38.0375	39.4728	(42c)
												121.7008	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	132.3948	129.5679	126.1253	120.8901	116.6389	112.0684	110.3118	113.7396	117.3547	122.1529	127.4688	132.0514	(44)
Energy content (annual)	209.6810	184.5030	193.8499	165.4925	157.0183	137.8012	133.4125	140.8334	144.7101	165.7604	181.6027	206.7606	(45)
Distribution loss (46)m = 0.15 x (45)m	31.4522	27.6755	29.0775	24.8239	23.5528	20.6702	20.0119	21.1250	21.7065	24.8641	27.2404	31.0141	(46)
Water storage loss:													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5520 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.9237	228.9803	243.0926	213.1467	206.2610	185.4554	182.6552	190.0760	192.3643	215.0031	229.2569	256.0033	(62)
WWHRS	-29.6663	-26.2371	-27.4740	-22.7495	-21.2017	-18.1425	-17.0057	-18.0838	-18.7709	-22.1288	-25.0693	-29.1169	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	229.2574	202.7432	215.6186	190.3972	185.0593	167.3129	165.6495	171.9922	173.5934	192.8742	204.1876	226.8864	(64)
Total per year (kWh/year)													2325.5720 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													

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109.1131 96.9291 103.8492 93.1496 91.6027 83.9423 83.7538 86.2212 86.2395 94.5095 98.5062 108.1420 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.8201	121.5865	109.8201	113.4808	109.8201	113.4808	109.8201	109.8201	113.4808	109.8201	113.4808	109.8201	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.4238	217.6592	212.0260	200.0336	184.8953	170.6675	161.1624	158.9270	164.5602	176.5526	191.6909	205.9187	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	(71)
Water heating gains (Table 5)	146.6574	144.2397	139.5823	129.3745	123.1220	116.5865	112.5723	115.8887	119.7770	127.0289	136.8142	145.3522	(72)
Total internal gains	534.2885	545.8727	523.8157	505.2761	480.2247	460.1220	442.9421	444.0231	457.2053	475.7888	504.3732	523.4783	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
East				4.6900	19.6403	0.6300	0.7000	0.7700			28.1509 (76)	
West				9.2600	19.6403	0.6300	0.7000	0.7700			55.5815 (80)	
East				0.9800	25.9287	0.6300	0.7000	1.0000			10.0853 (82)	
Solar gains	93.8177	183.9762	304.1295	445.4031	547.5321	561.2453	534.0203	457.5890	354.3123	218.6020	117.0594	77.1005 (83)
Total gains	628.1062	729.8489	827.9452	950.6792	1027.7568	1021.3673	976.9624	901.6121	811.5176	694.3908	621.4326	600.5788 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.4681	56.6376	56.8048	57.6035	57.7554	58.4733	58.4733	58.6083	58.1947	57.7554	57.4489	57.1319	
alpha	4.7645	4.7758	4.7870	4.8402	4.8504	4.8982	4.8982	4.9072	4.8796	4.8504	4.8299	4.8088	
util living area	0.9922	0.9835	0.9605	0.8865	0.7433	0.5512	0.4045	0.4550	0.7090	0.9306	0.9841	0.9937	(86)
MIT	19.6942	19.9089	20.2288	20.6259	20.8773	20.9775	20.9959	20.9930	20.9274	20.5728	20.0692	19.6665	(87)
Th 2	19.9202	19.9231	19.9259	19.9392	19.9416	19.9533	19.9533	19.9554	19.9488	19.9416	19.9366	19.9314	(88)
util rest of house	0.9898	0.9784	0.9483	0.8543	0.6824	0.4677	0.3099	0.3546	0.6240	0.9030	0.9783	0.9917	(89)
MIT 2	18.4220	18.6955	19.0966	19.5785	19.8455	19.9413	19.9520	19.9531	19.9032	19.5325	18.9107	18.3947	(90)
Living area fraction	18.7401	18.9989	19.3797	19.8404	20.1035	20.2004	20.2131	20.2131	20.1594	19.7927	19.2004	18.7127	(91)
MIT	18.7401	18.9989	19.3797	19.8404	20.1035	20.2004	20.2131	20.2131	20.1594	19.7927	19.2004	18.7127	(92)
Temperature adjustment	18.7401	18.9989	19.3797	19.8404	20.1035	20.2004	20.2131	20.2131	20.1594	19.7927	19.2004	18.7127	(93)
adjusted MIT	18.7401	18.9989	19.3797	19.8404	20.1035	20.2004	20.2131	20.2131	20.1594	19.7927	19.2004	18.7127	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9860	0.9725	0.9406	0.8509	0.6923	0.4880	0.3336	0.3797	0.6422	0.8983	0.9728	0.9884	(94)
Ext temp.	619.3093	709.7790	778.7240	808.9564	711.5339	498.3867	325.9159	342.3500	521.1393	623.7480	604.5028	593.6104	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	1353.0533	1317.1260	1199.6896	1004.9224	769.8685	506.7662	326.9381	344.2445	550.9218	842.1628	1114.4620	1344.0547	(97)
Space heating requirement - total per year (kWh/year)	545.9055	408.1371	313.1984	141.0955	43.4010	0.0000	0.0000	0.0000	0.0000	162.5006	367.1706	558.3305	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	545.9055	408.1371	313.1984	141.0955	43.4010	0.0000	0.0000	0.0000	0.0000	162.5006	367.1706	558.3305	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(99)
Space heating per m ²													

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating efficiency (main heating system 1)	545.9055	408.1371	313.1984	141.0955	43.4010	0.0000	0.0000	0.0000	0.0000	162.5006	367.1706	558.3305	(98)
Space heating fuel (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating efficiency (main heating system 2)	591.4469	442.1854	339.3265	152.8662	47.0216	0.0000	0.0000	0.0000	0.0000	176.0570	397.8013	604.9085	(211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

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Water heating													
Water heating requirement	229.2574	202.7432	215.6186	190.3972	185.0593	167.3129	165.6495	171.9922	173.5934	192.8742	204.1876	226.8864	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9336	85.5961	84.8960	83.3977	81.3666	79.8000	79.8000	79.8000	79.8000	83.6780	85.3596	85.9975	(217)
Fuel for water heating, kWh/month	266.7843	236.8604	253.9796	228.3003	227.4388	209.6653	207.5809	215.5291	217.5356	230.4957	239.2088	263.8290	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.8184	18.3058	16.4823	12.0757	9.3276	7.6207	8.5089	11.0603	14.3662	18.8492	21.2901	23.4526	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.4141	-46.2139	-67.1739	-76.4072	-83.1401	-77.8703	-76.9039	-72.2283	-64.1045	-53.2342	-35.8158	-27.9633	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-16.7829	-35.4692	-70.8009	-106.7810	-141.6219	-142.4560	-140.7868	-119.0155	-86.9807	-50.8813	-22.4586	-13.2599	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2751.6135	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2797.2079	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												184.1579	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1660.7642	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4158.2152	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2751.6135	0.2100	577.8388	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2797.2079	0.2100	587.4137	(264)
Space and water heating			1165.2525	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	184.1579	0.1443	26.5797	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-713.4695	0.1343	-95.8532	
PV Unit electricity exported	-947.2947	0.1258	-119.1438	
Total			-214.9970	(269)
Total CO2, kg/year			988.7644	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.6600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2751.6135	1.1300	3109.3233	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2797.2079	1.1300	3160.8449	(278)
Space and water heating			6270.1682	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	184.1579	1.5338	282.4676	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-713.4695	1.4965	-1067.7171	
PV Unit electricity exported	-947.2947	0.4617	-437.3343	
Total			-1505.0514	(283)
Total Primary energy kWh/year			5177.6852	(286)
Target Primary Energy Rate (TPER)			66.3000	(287)

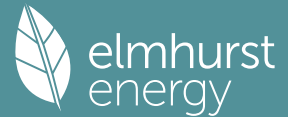
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	33.6000 (1b)	x	2.3000 (2b)	=
Ground floor			77.2800 (1b) - (3b)	

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First floor	28.1600 (1c)	x	2.4800 (2c)	=	69.8368 (1c) - (3c)
Second floor	16.3400 (1d)	x	2.4000 (2d)	=	39.2160 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000				(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	186.3328 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
	Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1610 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4110 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3802 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4847	0.4752	0.4657	0.4182	0.4087	0.3612	0.3612	0.3517	0.3802	0.4087	0.4277	0.4467 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6175	0.6129	0.6084	0.5874	0.5835	0.5652	0.5652	0.5618	0.5723	0.5835	0.5915	0.5998 (25)

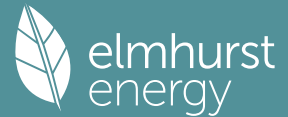
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Door			1.9500	1.0000	1.9500		(26)
Windows			13.9500	1.3258	18.4943		(27)
Roof windows			0.9800	1.1450	1.1221		(27a)
Floor			33.6000	0.1100	3.6960	75.0000	2520.0000 (28a)
Main	100.3900	15.9000	84.4900	0.1800	15.2082	70.0000	5914.3000 (29a)
Dormer	11.8700		11.8700	0.1600	1.8992	9.0000	106.8300 (29a)
Slope	21.0300	0.9800	20.0500	0.1500	3.0075	9.0000	180.4500 (30)
Flat roof	5.1000		5.1000	0.1400	0.7140	9.0000	45.9000 (30)
Dormer	11.9100		11.9100	0.1400	1.6674	9.0000	107.1900 (30)
Total net area of external elements Aum(A, m2)			183.9000				(31)
Fabric heat loss, W/K = Sum (A x U)					47.7588		(33)
Main dwelling							
Party Wall 1			51.3600	0.0000	0.0000	140.0000	7190.4000 (32)
Internal Wall 1			10.3500			9.0000	93.1500 (32c)
Internal Wall 2			10.4200			100.0000	1042.0000 (32c)
Internal Wall 3			30.5500			9.0000	274.9500 (32c)
Internal Wall 4			24.0000			9.0000	216.0000 (32c)
Internal Floor 1			16.3400			18.0000	294.1200 (32d)
Internal Floor 2			28.1600			18.0000	506.8800 (32d)
Internal Ceiling 1			33.6000			9.0000	302.4000 (32e)
Internal Ceiling 2			28.1600			9.0000	253.4400 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 19048.0100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							243.8926 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.0000	0.0290	0.2900	
E3 Sill				5.7100	0.0230	0.1313	
E4 Jamb				32.4900	0.0180	0.5848	
E5 Ground floor (normal)				17.3000	0.0680	1.1764	
E6 Intermediate floor within a dwelling				36.6800	0.0010	0.0367	
E11 Eaves (insulation at rafter level)				10.6800	0.0180	0.1922	
E13 Gable (insulation at rafter level)				9.5200	0.0390	0.3713	
E14 Flat roof				10.7000	0.1600	1.7120	
E16 Corner (normal)				19.1400	0.0400	0.7656	
E17 Corner (inverted - internal area greater than external area)				4.7800	-0.0820	-0.3920	
E18 Party wall between dwellings				14.3600	0.0320	0.4595	
P1 Party wall - Ground floor				10.5000	0.0480	0.5040	
P2 Party wall - Intermediate floor within a dwelling				22.6000	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)				5.2000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8319 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	53.5907 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	Jan 37.9687 Feb 37.6882 Mar 37.4132 Apr 36.1218 May 35.8802 Jun 34.7554 Jul 34.7554 Aug 34.5471 Sep 35.1886 Oct 35.8802 Nov 36.3690 Dec 36.8800 (38)
Heat transfer coeff	91.5594 91.2789 91.0039 89.7125 89.4708 88.3460 88.3460 88.1377 88.7793 89.4708 89.9596 90.4707 (39)
Average = Sum(39)m / 12 =	89.7113
HLP	Jan 1.1723 Feb 1.1687 Mar 1.1652 Apr 1.1487 May 1.1456 Jun 1.1312 Jul 1.1312 Aug 1.1285 Sep 1.1367 Oct 1.1456 Nov 1.1519 Dec 1.1584 (40)
HLP (average)	1.1487
Days in mont	31 28 31 30 31 30 31 31 30 31 30 31

HLP	Jan 1.1723 Feb 1.1687 Mar 1.1652 Apr 1.1487 May 1.1456 Jun 1.1312 Jul 1.1312 Aug 1.1285 Sep 1.1367 Oct 1.1456 Nov 1.1519 Dec 1.1584 (40)
HLP (average)	1.1487
Days in mont	31 28 31 30 31 30 31 31 30 31 30 31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4258 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	28.0292	27.6130	27.0268	25.9459	25.1366	24.2392	23.7544	24.3365	24.9703	25.9306	27.0337	27.9345 (42c)
Average daily hot water use (litres/day)	39.4728	38.0375	36.6021	35.1667	33.7313	32.2960	32.2960	33.7313	35.1667	36.6021	38.0375	39.4728 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	67.5021	65.6504	63.6288	61.1126	58.8679	56.5351	56.0504	58.0679	60.1370	62.5327	65.0712	67.4073 (44)
Distribution loss (46)m = 0.15 x (45)m	106.9068	93.4853	97.7952	83.6601	79.2475	69.5165	67.7881	71.9001	74.1550	84.8563	92.7058	105.5436 (45)
Water storage loss:												Total = Sum(45)m = 1027.5602
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	90.8708	79.4625	83.1259	71.1111	67.3604	59.0891	57.6199	61.1151	63.0317	72.1278	78.7999	89.7120 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	90.8708	79.4625	83.1259	71.1111	67.3604	59.0891	57.6199	61.1151	63.0317	72.1278	78.7999	89.7120 (64)
12Total per year (kWh/year)												873.4262 (64)
Electric shower(s)	51.9683	46.3042	50.5624	48.2510	49.1565	46.8905	48.4535	49.1565	48.2510	50.5624	49.6116	51.9683 (64a)
Heat gains from water heating, kWh/month	35.7098	31.4417	33.4221	29.8405	29.1292	26.4949	26.5183	27.5679	27.8207	30.6725	32.1029	35.4201 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 591.1361 (64a)												873 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.8201	121.5865	109.8201	113.4808	109.8201	113.4808	109.8201	109.8201	113.4808	109.8201	113.4808	109.8201 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.4238	217.6592	212.0260	200.0336	184.8953	170.6675	161.1624	158.9270	164.5602	176.5526	191.6909	205.9187 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329 (71)
Water heating gains (Table 5)	47.9970	46.7882	44.9221	41.4452	39.1522	36.7985	35.6429	37.0536	38.6399	41.2265	44.5873	47.6076 (72)
Total internal gains	432.6281	445.4212	426.1555	414.3468	393.2549	380.3340	366.0128	365.1880	376.0681	386.9865	409.1463	422.7337 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East			4.6900		19.6403		0.5000		0.7000		0.7700		22.3420 (76)
West			9.2600		19.6403		0.5000		0.7000		0.7700		44.1123 (80)
East			0.9800		25.9287		0.6300		0.7000		1.0000		10.0853 (82)
Solar gains	76.5395	150.1765	248.4663	364.2217	448.0412	459.3987	437.0581	374.2999	289.5737	178.4959	95.5156		62.8918 (83)
Total gains	509.1677	595.5978	674.6219	778.5685	841.2961	839.7327	803.0708	739.4879	665.6418	565.4824	504.6619		485.6255 (84)

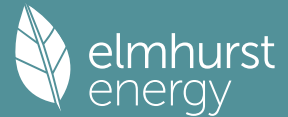
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	57.7889	57.9665	58.1416	58.9786	59.1379	59.8908	59.8908	60.0323	59.5985	59.1379	58.8165	58.4843
alpha	4.8526	4.8644	4.8761	4.9319	4.9425	4.9927	4.9927	5.0022	4.9732	4.9425	4.9211	4.8990
util living area	0.9968	0.9926	0.9811	0.9362	0.8271	0.6397	0.4773	0.5357	0.7962	0.9647	0.9931	0.9975 (86)
MIT	19.5762	19.7749	20.0821	20.5008	20.8092	20.9603	20.9924	20.9869	20.8841	20.4608	19.9517	19.5530 (87)
Th 2	19.9422	19.9451	19.9479	19.9613	19.9638	19.9754	19.9754	19.9776	19.9709	19.9638	19.9587	19.9534 (88)
util rest of house	0.9957	0.9902	0.9746	0.9146	0.7739	0.5508	0.3697	0.4229	0.7175	0.9484	0.9904	0.9966 (89)
MIT 2	18.6526	18.8523	19.1576	19.5690	19.8401	19.9580	19.9736	19.9740	19.9097	19.5415	19.0396	18.6381 (90)
Living area fraction	18.8836	19.0830	19.3888	19.8020	20.0824	20.2087	20.2283	20.2273	20.1534	19.7714	19.2677	18.8669 (92)
MIT	18.8836	19.0830	19.3888	19.8020	20.0824	20.2087	20.2283	20.2273	20.1534	19.7714	19.2677	18.8669 (92)
Temperature adjustment	18.8836	19.0830	19.3888	19.8020	20.0824	20.2087	20.2283	20.2273	20.1534	19.7714	19.2677	18.8669 (93)
adjusted MIT	18.8836	19.0830	19.3888	19.8020	20.0824	20.2087	20.2283	20.2273	20.1534	19.7714	19.2677	18.8669 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9942	0.9875	0.9702	0.9107	0.7806	0.5719	0.3967	0.4512	0.7330	0.9446	0.9879	0.9954 (94)

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Useful gains	506.2297	588.1558	654.5233	709.0461	656.7414	480.2711	318.5762	333.6792	487.9073	534.1401	498.5769	483.3819 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1335.2649	1294.6053	1172.9275	978.0445	749.9818	495.5029	320.5487	337.3295	537.4154	820.5707	1094.5994	1326.9236 (97)
Space heating kWh	616.8022	474.7341	385.6927	193.6788	69.3709	0.0000	0.0000	0.0000	0.0000	213.1044	429.1362	627.5950 (98a)
Space heating requirement - total per year (kWh/year)												3010.1143
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	616.8022	474.7341	385.6927	193.6788	69.3709	0.0000	0.0000	0.0000	0.0000	213.1044	429.1362	627.5950 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3010.1143
Space heating per m2										(98c) / (4) =		38.5418 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	830.4526	653.7606	669.8467	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8755	0.9317	0.9041	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	727.0286	609.1264	605.5994	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	927.1649	887.0842	816.6347	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	144.0981	206.8006	157.0103	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	36.0245	51.7001	39.2526	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												126.9773 (107)
Energy for space heating												38.5418 (99)
Energy for space cooling												1.6258 (108)
Total												40.1676 (109)
Fabric Energy Efficiency (DFEE)												40.2 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	33.6000 (1b)	x 2.3000 (2b) =	77.2800 (1b) - (3b)
First floor	28.1600 (1c)	x 2.4800 (2c) =	69.8368 (1c) - (3c)
Second floor	16.3400 (1d)	x 2.4000 (2d) =	39.2160 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	186.3328 (5)

2. Ventilation rate

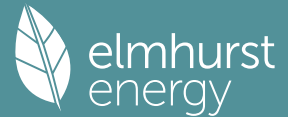
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1610 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4110 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3802 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4847	0.4752	0.4657	0.4182	0.4087	0.3612	0.3612	0.3517	0.3802	0.4087	0.4277	0.4467 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6175	0.6129	0.6084	0.5874	0.5835	0.5652	0.5652	0.5618	0.5723	0.5835	0.5915	0.5998 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K
TER Opaque door			1.9500	1.0000	1.9500		(26)
TER Opening Type			13.9500	1.1450	15.9733		(27)
TER Roof Window			0.9800	1.1450	1.3868		(27a)
Floor			33.6000	0.1300	4.3680		(28a)
Main	100.3900	15.9000	84.4900	0.1800	15.2082		(29a)
Dormer	11.8700		11.8700	0.1800	2.1366		(29a)
Slope	21.0300	0.9800	20.0500	0.1100	2.2055		(30)
Flat roof	5.1000		5.1000	0.1100	0.5610		(30)
Dormer	11.9100		11.9100	0.1100	1.3101		(30)
Total net area of external elements Aum(A, m2)			183.9000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.0995		(33)
Main dwelling							
Party Wall 1			51.3600	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 243.8926 (35)

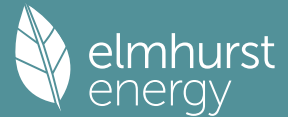
List of Thermal Bridges	Length	Psi-value	Total
K1 Element	10.0000	0.0500	0.5000
E2 Other lintels (including other steel lintels)	5.7100	0.0500	0.2855
E3 Sill	32.4900	0.0500	1.6245
E4 Jamb	17.3000	0.1600	2.7680
E5 Ground floor (normal)	36.6800	0.0000	0.0000
E6 Intermediate floor within a dwelling	10.6800	0.0400	0.4272
E11 Eaves (insulation at rafter level)	9.5200	0.0800	0.7616
E13 Gable (insulation at rafter level)	10.7000	0.0800	0.8560
E14 Flat roof	19.1400	0.0900	1.7226
E16 Corner (normal)	4.7800	-0.0900	-0.4302
E17 Corner (inverted - internal area greater than external area)	14.3600	0.0600	0.8616
E18 Party wall between dwellings	10.5000	0.0800	0.8400
P1 Party wall - Ground floor	22.6000	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	5.2000	0.0800	0.4160
P5 Party wall - Roof (insulation at rafter level)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.6328 (36)
Point Thermal bridges			0.0000 (36a)
Total fabric heat loss			55.7323 (33) + (36) + (36a) = (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	37.9687	37.6882	37.4132	36.1218	35.8802	34.7554	34.7554	34.5471	35.1886	35.8802	36.3690	36.8800 (38)
Heat transfer coeff	93.7010	93.4205	93.1455	91.8541	91.6124	90.4876	90.4876	90.2793	90.9209	91.6124	92.1012	92.6123 (39)
Average = Sum(39)m / 12 =												91.8529
HLP	1.1998	1.1962	1.1926	1.1761	1.1730	1.1586	1.1586	1.1559	1.1642	1.1730	1.1793	Dec 1.1858 (40)
HLP (average)												1.1761
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												
Hot water usage for mixer showers												2.4258 (42)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
28.0292	27.6130	27.0268	25.9459	25.1366	24.2392	23.7544	24.3365	24.9703	25.9306	27.0337	27.9345	(42b)
Hot water usage for other uses												
39.4728	38.0375	36.6021	35.1667	33.7313	32.2960	32.2960	33.7313	35.1667	36.6021	38.0375	39.4728	(42c)
Average daily hot water use (litres/day)												61.8719 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	67.5021	65.6504	63.6288	61.1126	58.8679	56.5351	56.0504	58.0679	60.1370	62.5327	65.0712	67.4073 (44)
Energy content (annual)	106.9068	93.4853	97.7952	83.6601	79.2475	69.5165	67.7881	71.9001	74.1550	84.8563	92.7058	105.5436 (45)
Energy content (annual)										Total = Sum(45)m =		1027.5602
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
90.8708	79.4625	83.1259	71.1111	67.3604	59.0891	57.6199	61.1151	63.0317	72.1278	78.7999	89.7120 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	90.8708	79.4625	83.1259	71.1111	67.3604	59.0891	57.6199	61.1151	63.0317	72.1278	78.7999	89.7120 (64)
12Total per year (kWh/year)												873.4262 (64)
Electric shower(s)	51.9683	46.3042	50.5624	48.2510	49.1565	46.8905	48.4535	49.1565	48.2510	50.5624	49.6116	51.9683 (64a)
												873.4262 (64)
												873 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												591.1361 (64a)
Heat gains from water heating, kWh/month												
35.7098	31.4417	33.4221	29.8405	29.1292	26.4949	26.5183	27.5679	27.8207	30.6725	32.1029	35.4201 (65)	

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.8201	121.5865	109.8201	113.4808	109.8201	113.4808	109.8201	109.8201	113.4808	109.8201	113.4808	109.8201 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.4238	217.6592	212.0260	200.0336	184.8953	170.6675	161.1624	158.9270	164.5602	176.5526	191.6909	205.9187 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329 (71)
Water heating gains (Table 5)	47.9970	46.7882	44.9221	41.4452	39.1522	36.7985	35.6429	37.0536	38.6399	41.2265	44.5873	47.6076 (72)

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Total internal gains
432.6281 445.4212 426.1555 414.3468 393.2549 380.3340 366.0128 365.1880 376.0681 386.9865 409.1463 422.7337 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	FF Access factor Table 6d	Gains W
East	4.6900	19.6403	0.6300	0.7000	0.7700	28.1509 (76)
West	9.2600	19.6403	0.6300	0.7000	0.7700	55.5815 (80)
East	0.9800	25.9287	0.6300	0.7000	1.0000	10.0853 (82)
Solar gains	93.8177	183.9762	304.1295	445.4031	547.5321	561.2453
Total gains	526.4458	629.3974	730.2851	859.7499	940.7870	941.5793

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.4681	56.6376	56.8048	57.6035	57.7554	58.4733	58.4733	58.6083	58.1947	57.7554	57.4489	57.1319
alpha	4.7645	4.7758	4.7870	4.8402	4.8504	4.8982	4.8982	4.9072	4.8796	4.8504	4.8299	4.8088
util living area	0.9963	0.9909	0.9751	0.9159	0.7855	0.5918	0.4378	0.4959	0.7613	0.9565	0.9919	0.9971 (86)
MIT	19.5573	19.7782	20.1134	20.5487	20.8426	20.9695	20.9942	20.9898	20.9005	20.4794	19.9445	19.5297 (87)
Th 2	19.9202	19.9231	19.9259	19.9392	19.9416	19.9533	19.9533	19.9554	19.9488	19.9416	19.9366	19.9314 (88)
util rest of house	0.9951	0.9879	0.9668	0.8893	0.7272	0.5046	0.3360	0.3878	0.6783	0.9370	0.9888	0.9962 (89)
MIT 2	18.6169	18.8383	19.1698	19.5918	19.8429	19.9403	19.9519	19.9527	19.8980	19.5398	19.0151	18.5980 (90)
Living area fraction	18.8521	19.0734	19.4058	19.8311	20.0929	20.1977	20.2125	20.2120	20.1487	19.7748	19.2475	18.8310 (92)
Temperature adjustment	18.8521	19.0734	19.4058	19.8311	20.0929	20.1977	20.2125	20.2120	20.1487	19.7748	19.2475	18.8310 (93)
adjusted MIT	18.8521	19.0734	19.4058	19.8311	20.0929	20.1977	20.2125	20.2120	20.1487	19.7748	19.2475	18.8310 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9934	0.9847	0.9617	0.8862	0.7363	0.5257	0.3616	0.4149	0.6956	0.9332	0.9860	0.9948 (94)
Useful gains	522.9624	619.7988	702.3498	761.9082	692.6867	494.9922	325.4280	341.3526	508.0209	565.1283	518.8221	497.2190 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1363.5459	1324.0838	1202.1138	1004.0664	768.8914	506.5201	326.8902	344.1479	549.9527	840.5227	1118.8035	1355.0107 (97)
Space heating kWh	625.3941	473.2795	371.8244	174.3540	56.6963	0.0000	0.0000	0.0000	0.0000	204.8935	431.9866	638.1970 (98a)
Space heating requirement - total per year (kWh/year)												2976.6254
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	625.3941	473.2795	371.8244	174.3540	56.6963	0.0000	0.0000	0.0000	0.0000	204.8935	431.9866	638.1970 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2976.6254
Space heating per m ²												38.1130 (99)

8c. Space cooling requirement

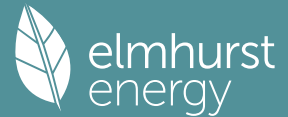
Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	850.5837	669.6085	686.1229	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9038	0.9489	0.9252	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	768.7472	635.4204	634.8127	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1046.2064	1000.4166	913.9856	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	199.7706	271.5572	207.7046	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	49.9427	67.8893	51.9262	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												169.7581 (107)
Energy for space heating												38.1130 (99)
Energy for space cooling												2.1736 (108)
Total												40.2866 (109)
Fabric Energy Efficiency (TFEE)												40.3 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
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Ground floor	33.6000 (1b)	x	2.3000 (2b)	=	77.2800 (1b) - (3b)
First floor	28.1600 (1c)	x	2.4800 (2c)	=	69.8368 (1c) - (3c)
Second floor	16.3400 (1d)	x	2.4000 (2d)	=	39.2160 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000				(4)
Dwelling volume			(3a) + (3b) + (3c) + (3d) + (3e) ... (3n)	=	186.3328 (5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)	
Number of open flues	0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)	
Number of blocked chimneys	0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans	5 * 10 =	50.0000 (7a)	
Number of passive vents	0 * 10 =	0.0000 (7b)	
Number of flueless gas fires	0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.2683 (8)	
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	5.0000	(17)	
Infiltration rate	0.5183	(18)	
Number of sides sheltered	1	(19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4795 (21)	

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.6113	0.5993	0.5873	0.5274	0.5154	0.4555	0.4555	0.4435	0.4795	0.5154	0.5394	0.5634	(22b)
Effective ac	0.6869	0.6796	0.6725	0.6391	0.6328	0.6037	0.6037	0.5983	0.6149	0.6328	0.6455	0.6587	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			1.9500	1.0000	1.9500			(26)
Windows			13.9500	1.3258	18.4943			(27)
Roof windows			0.9800	1.1450	1.1221			(27a)
Floor			33.6000	0.1100	3.6960	75.0000	2520.0000	(28a)
Main	100.3900	15.9000	84.4900	0.1800	15.2082	70.0000	5914.3000	(29a)
Dormer	11.8700		11.8700	0.1600	1.8992	9.0000	106.8300	(29a)
Slope	21.0300	0.9800	20.0500	0.1500	3.0075	9.0000	180.4500	(30)
Flat roof	5.1000		5.1000	0.1400	0.7140	9.0000	45.9000	(30)
Dormer	11.9100		11.9100	0.1400	1.6674	9.0000	107.1900	(30)
Total net area of external elements Aum(A, m2)			183.9000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.7588			(33)
Main dwelling								
Party Wall 1			51.3600	0.0000	0.0000	140.0000	7190.4000	(32)
Internal Wall 1			10.3500			9.0000	93.1500	(32c)
Internal Wall 2			10.4200			100.0000	1042.0000	(32c)
Internal Wall 3			30.5500			9.0000	274.9500	(32c)
Internal Wall 4			24.0000			9.0000	216.0000	(32c)
Internal Floor 1			16.3400			18.0000	294.1200	(32d)
Internal Floor 2			28.1600			18.0000	506.8800	(32d)
Internal Ceiling 1			33.6000			9.0000	302.4000	(32e)
Internal Ceiling 2			28.1600			9.0000	253.4400	(32e)

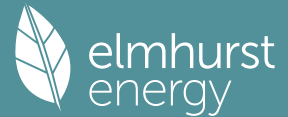
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19048.0100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		243.8926 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.0000	0.0290	0.2900
E3 Sill	5.7100	0.0230	0.1313
E4 Jamb	32.4900	0.0180	0.5848
E5 Ground floor (normal)	17.3000	0.0680	1.1764
E6 Intermediate floor within a dwelling	36.6800	0.0010	0.0367
E11 Eaves (insulation at rafter level)	10.6800	0.0180	0.1922
E13 Gable (insulation at rafter level)	9.5200	0.0390	0.3713
E14 Flat roof	10.7000	0.1600	1.7120
E16 Corner (normal)	19.1400	0.0400	0.7656
E17 Corner (inverted - internal area greater than external area)	4.7800	-0.0820	-0.3920
E18 Party wall between dwellings	14.3600	0.0320	0.4595
P1 Party wall - Ground floor	10.5000	0.0480	0.5040
P2 Party wall - Intermediate floor within a dwelling	22.6000	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	5.2000	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.8319 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =		53.5907 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	42.2344	41.7883	41.3510	39.2969	38.9126	37.1236	37.1236	36.7923	37.8127	38.9126	39.6900	40.5028	(38)
Average = Sum(39)m / 12 =	95.8251	95.3789	94.9416	92.8876	92.5032	90.7142	90.7142	90.3829	91.4033	92.5032	93.2807	94.0935	(39)
												92.8857	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2270	1.2212	1.2156	1.1893	1.1844	1.1615	1.1615	1.1573	1.1703	1.1844	1.1944	1.2048	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

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Assumed occupancy												2.4258 (42)
Hot water usage for mixer showers	64.8927	63.9175	62.4965	59.7775	57.7710	55.5333	54.2614	55.6717	57.2177	59.6203	62.3976	64.6441 (42a)
Hot water usage for baths	28.0292	27.6130	27.0268	25.9459	25.1366	24.2392	23.7544	24.3365	24.9703	25.9306	27.0337	27.9345 (42b)
Hot water usage for other uses	39.4728	38.0375	36.6021	35.1667	33.7313	32.2960	32.2960	33.7313	35.1667	36.6021	38.0375	39.4728 (42c)
Average daily hot water use (litres/day)												121.7008 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	132.3948	129.5679	126.1253	120.8901	116.6389	112.0684	110.3118	113.7396	117.3547	122.1529	127.4688	132.0514 (44)
Energy content (annual)	209.6810	184.5030	193.8499	165.4925	157.0183	137.8012	133.4125	140.8334	144.7101	165.7604	181.6027	206.7606 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2021.4257
	31.4522	27.6755	29.0775	24.8239	23.5528	20.6702	20.0119	21.1250	21.7065	24.8641	27.2404	31.0141 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7560 (55)
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	256.3794	226.6822	240.5483	210.6845	203.7167	182.9932	180.1109	187.5318	189.9021	212.4588	226.7947	253.4590 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	256.3794	226.6822	240.5483	210.6845	203.7167	182.9932	180.1109	187.5318	189.9021	212.4588	226.7947	253.4590 (64)
												Total per year (kWh/year) = Sum(64)m = 2571.2617 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	107.0777	95.0906	101.8138	91.1799	89.5673	81.9725	81.7184	84.1858	84.2697	92.4741	96.5365	106.1066 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.6381	22.7715	18.5191	14.0201	10.4802	8.8478	9.5604	12.4270	16.6794	21.1784	24.7183	26.3507 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	321.5280	324.8645	316.4567	298.5576	275.9632	254.7276	240.5409	237.2045	245.6122	263.5113	286.1058	307.3413 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329 (71)
Water heating gains (Table 5)	143.9216	141.5039	136.8465	126.6387	120.3862	113.8507	109.8365	113.1530	117.0413	124.2931	134.0785	142.6164 (72)
Total internal gains	591.5849	589.6371	572.3195	539.7136	507.3267	477.9233	460.4350	463.2816	479.8301	509.4800	545.3997	576.8056 (73)

6. Solar gains												

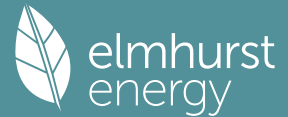
[Jan]			Area		Solar flux		g		FF		Access	Gains
			m2		Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
East			4.6900		19.6403		0.5000		0.7000		0.7700	22.3420 (76)
West			9.2600		19.6403		0.5000		0.7000		0.7700	44.1123 (80)
East			0.9800		25.9287		0.6300		0.7000		1.0000	10.0853 (82)

Solar gains	76.5395	150.1765	248.4663	364.2217	448.0412	459.3987	437.0581	374.2999	289.5737	178.4959	95.5156	62.8918 (83)
Total gains	668.1244	739.8136	820.7858	903.9352	955.3679	937.3219	897.4931	837.5814	769.4038	687.9758	640.9153	639.6974 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.2164	55.4747	55.7302	56.9626	57.1992	58.3273	58.3273	58.5411	57.8875	57.1992	56.7225	56.2325
alpha	4.6811	4.6983	4.7153	4.7975	4.8133	4.8885	4.8885	4.9027	4.8592	4.8133	4.7815	4.7488
util living area	0.9902	0.9830	0.9628	0.9040	0.7819	0.5953	0.4400	0.4882	0.7380	0.9339	0.9823	0.9918 (86)
Living	19.9624	20.0966	20.3262	20.6158	20.8175	20.9130	20.9322	20.9296	20.8705	20.6024	20.2408	19.9515
Non living	18.7045	18.8778	19.1683	19.5334	19.7552	19.8568	19.8683	19.8708	19.8199	19.5297	19.0788	18.7046
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4692	20.0966	20.3262	20.6158	20.8175	20.9130	20.9322	20.9296	20.8705	20.6024	20.2408	20.0982 (87)
Th 2	19.8985	19.9030	19.9075	19.9285	19.9325	19.9509	19.9509	19.9543	19.9438	19.9325	19.9245	19.9162 (88)
util rest of house	0.9871	0.9777	0.9512	0.8749	0.7230	0.5076	0.3376	0.3814	0.6534	0.9071	0.9759	0.9893 (89)
MIT 2	19.4225	18.8778	19.1683	19.5334	19.7552	19.8568	19.8683	19.8708	19.8199	19.5297	19.0788	18.9229 (90)
Living area fraction	19.6842	19.1826	19.4578	19.8041	20.0208	20.1209	20.1343	20.1356	fLA = Living area / (4) = 20.0826	19.7980	19.3694	19.2168 (91)
MIT	19.6842	19.1826	19.4578	19.8041	20.0208	20.1209	20.1343	20.1356	20.0826	19.7980	19.3694	19.2168 (92)
Temperature adjustment	19.6842	19.1826	19.4578	19.8041	20.0208	20.1209	20.1343	20.1356	20.0826	19.7980	19.3694	19.2168 (93)
adjusted MIT	19.6842	19.1826	19.4578	19.8041	20.0208	20.1209	20.1343	20.1356	20.0826	19.7980	19.3694	19.2168 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9864	0.9732	0.9452	0.8710	0.7283	0.5224	0.3557	0.4003	0.6655	0.9029	0.9715	0.9872	(94)
Useful gains	659.0323	720.0041	775.8144	787.3175	695.7933	489.6515	319.2649	335.2813	512.0234	621.1983	622.6477	631.4864	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	16.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1474.1965	1362.2577	1230.2374	1012.8544	769.7026	500.8222	320.6128	337.6357	546.8284	850.8415	1144.4973	1412.9831	(97)
Space heating kWh	606.4822	431.5945	338.0907	162.3866	54.9885	0.0000	0.0000	0.0000	0.0000	170.8545	375.7317	581.4335	(98a)
Space heating requirement - total per year (kWh/year)												2721.5621	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	606.4822	431.5945	338.0907	162.3866	54.9885	0.0000	0.0000	0.0000	0.0000	170.8545	375.7317	581.4335	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2721.5621	
Space heating per m2											(98c) / (4) =	34.8471	(99)

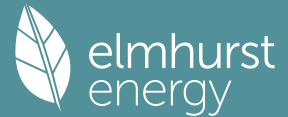
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													239.6963	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	606.4822	431.5945	338.0907	162.3866	54.9885	0.0000	0.0000	0.0000	0.0000	170.8545	375.7317	581.4335	(98)	
Space heating efficiency (main heating system 1)	239.6963	239.6963	239.6963	239.6963	239.6963	0.0000	0.0000	0.0000	0.0000	239.6963	239.6963	239.6963	(210)	
Space heating fuel (main heating system)	253.0211	180.0589	141.0496	67.7468	22.9409	0.0000	0.0000	0.0000	0.0000	71.2796	156.7532	242.5709	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	256.3794	226.6822	240.5483	210.6845	203.7167	182.9932	180.1109	187.5318	189.9021	212.4588	226.7947	253.4590	(64)	
Efficiency of water heater	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	(216)	
Fuel for water heating, kWh/month	147.4952	130.4104	138.3876	121.2069	117.1984	105.2761	103.6179	107.8871	109.2508	122.2277	130.4751	145.8151	(219)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)	
Lighting	22.4409	18.0029	16.2096	11.8759	9.1733	7.4946	8.3682	10.8772	14.1285	18.5373	20.9378	23.0646	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1												1135.4210	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												173.8222		
Water heating fuel used												1479.2484	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
Total electricity for the above, kWh/year												0.0000	(231)	
Electricity for lighting (calculated in Appendix L)												181.1108	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												0.0000	(233)	
Wind generation												0.0000	(234)	
Hydro-electric generation (Appendix N)												0.0000	(235a)	
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)	
Appendix Q - special features														
Energy saved or generated												-0.0000	(236)	
Energy used												0.0000	(237)	
Total delivered energy for all uses												2795.7802	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1135.4210	16.4900	187.2309	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1479.2484	16.4900	243.9281	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	181.1108	16.4900	29.8652	(250)
Additional standing charges			0.0000	(251)
Total energy cost			461.0242	(255)

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11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.3482 (257)
SAP value		78.1450
SAP rating (Section 12)		78 (258)
SAP band		C

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	1135.4210	0.1561	177.2513 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1479.2484	0.1410	208.5227 (264)
Space and water heating			385.7740 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	181.1108	0.1443	26.1399 (268)
Total CO ₂ , kg/year			411.9139 (272)
CO ₂ emissions per m ²			5.2700 (273)
EI value			95.5161
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	33.6000 (1b)	x 2.3000 (2b)	= 77.2800 (1b) - (3b)
First floor	28.1600 (1c)	x 2.4800 (2c)	= 69.8368 (1c) - (3c)
Second floor	16.3400 (1d)	x 2.4000 (2d)	= 39.2160 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	186.3328 (5)

2. Ventilation rate

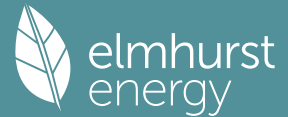
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 50.0000 / (5) = 0.2683 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.5183 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4795 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.5034	0.4795	0.4795	0.4435	0.4435	0.3956	0.4075	0.3836	0.3956	0.4195	0.4195	0.4555 (22b)
Effective ac	0.6267	0.6149	0.6149	0.5983	0.5983	0.5782	0.5830	0.5736	0.5782	0.5880	0.5880	0.6037 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			1.9500	1.0000	1.9500		(26)
Windows			13.9500	1.3258	18.4943		(27)
Roof windows			0.9800	1.1450	1.1221		(27a)
Floor			33.6000	0.1100	3.6960	75.0000	(28a)
Main	100.3900	15.9000	84.4900	0.1800	15.2082	70.0000	5914.3000 (29a)
Dormer	11.8700		11.8700	0.1600	1.8992	9.0000	106.8300 (29a)
Slope	21.0300	0.9800	20.0500	0.1500	3.0075	9.0000	180.4500 (30)
Flat roof	5.1000		5.1000	0.1400	0.7140	9.0000	45.9000 (30)
Dormer	11.9100		11.9100	0.1400	1.6674	9.0000	107.1900 (30)
Total net area of external elements Aum(A, m ²)			183.9000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.7588		(33)

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Main dwelling													
Party Wall 1	51.3600	0.0000	0.0000	140.0000	7190.4000	(32)							
Internal Wall 1	10.3500			9.0000	93.1500	(32c)							
Internal Wall 2	10.4200			100.0000	1042.0000	(32c)							
Internal Wall 3	30.5500			9.0000	274.9500	(32c)							
Internal Wall 4	24.0000			9.0000	216.0000	(32c)							
Internal Floor 1	16.3400			18.0000	294.1200	(32d)							
Internal Floor 2	28.1600			18.0000	506.8800	(32d)							
Internal Ceiling 1	33.6000			9.0000	302.4000	(32e)							
Internal Ceiling 2	28.1600			9.0000	253.4400	(32e)							

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 19048.0100 (34)
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$ 243.8926 (35)

List of Thermal Bridges													
K1 Element	Length	Psi-value	Total										
E2 Other lintels (including other steel lintels)	10.0000	0.0290	0.2900										
E3 Sill	5.7100	0.0230	0.1313										
E4 Jamb	32.4900	0.0180	0.5848										
E5 Ground floor (normal)	17.3000	0.0680	1.1764										
E6 Intermediate floor within a dwelling	36.6800	0.0010	0.0367										
E11 Eaves (insulation at rafter level)	10.6800	0.0180	0.1922										
E13 Gable (insulation at rafter level)	9.5200	0.0390	0.3713										
E14 Flat roof	10.7000	0.1600	1.7120										
E16 Corner (normal)	19.1400	0.0400	0.7656										
E17 Corner (inverted - internal area greater than external area)	4.7800	-0.0820	-0.3920										
E18 Party wall between dwellings	14.3600	0.0320	0.4595										
P1 Party wall - Ground floor	10.5000	0.0480	0.5040										
P2 Party wall - Intermediate floor within a dwelling	22.6000	0.0000	0.0000										
P5 Party wall - Roof (insulation at rafter level)	5.2000	0.0000	0.0000										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												5.8319	(36)
Point Thermal bridges												0.0000	
Total fabric heat loss												(33) + (36) + (36a) =	53.5907 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	38.5371	37.8127	37.8127	36.7923	36.7923	35.5554	35.8514	35.2683	35.5554	36.1562	36.1562	37.1236	(38)
Average = Sum(39)m / 12 =	92.1278	91.4033	91.4033	90.3829	90.3829	89.1461	89.4420	88.8589	89.1461	89.7468	89.7468	90.7142	(39)
												90.2084	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1796	1.1703	1.1703	1.1573	1.1573	1.1414	1.1452	1.1378	1.1414	1.1491	1.1491	1.1615	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

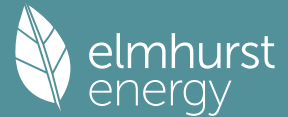
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4258	(42)
Hot water usage for mixer showers	64.8927	63.9175	62.4965	59.7775	57.7710	55.5333	54.2614	55.6717	57.2177	59.6203	62.3976	64.6441	(42a)	
Hot water usage for baths	28.0292	27.6130	27.0268	25.9459	25.1366	24.2392	23.7544	24.3365	24.9703	25.9306	27.0337	27.9345	(42b)	
Hot water usage for other uses	39.4728	38.0375	36.6021	35.1667	33.7313	32.2960	32.2960	33.7313	35.1667	36.6021	38.0375	39.4728	(42c)	
Average daily hot water use (litres/day)												121.7008	(43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	132.3948	129.5679	126.1253	120.8901	116.6389	112.0684	110.3118	113.7396	117.3547	122.1529	127.4688	132.0514	(44)	
Energy content (annual)	209.6810	184.5030	193.8499	165.4925	157.0183	137.8012	133.4125	140.8334	144.7101	165.7604	181.6027	206.7606	(45)	
Distribution loss (46)m = $0.15 \times (45)\text{m}$	31.4522	27.6755	29.0775	24.8239	23.5528	20.6702	20.0119	21.1250	21.7065	24.8641	27.2404	31.0141	(46)	
Water storage loss:														
Store volume													180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4000	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.7560	(55)
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(56)	
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month	256.3794	226.6822	240.5483	210.6845	203.7167	182.9932	180.1109	187.5318	189.9021	212.4588	226.7947	253.4590	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h	256.3794	226.6822	240.5483	210.6845	203.7167	182.9932	180.1109	187.5318	189.9021	212.4588	226.7947	253.4590	(64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)	
Heat gains from water heating, kWh/month	107.0777	95.0906	101.8138	91.1799	89.5673	81.9725	81.7184	84.1858	84.2697	92.4741	96.5365	106.1066	(65)	

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

Metabolic gains (Table 5), Watts														
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	(66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	25.6381	22.7715	18.5191	14.0201	10.4802	8.8478	9.5604	12.4270	16.6794	21.1784	24.7183	26.3507	(67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	321.5280	324.8645	316.4567	298.5576	275.9632	254.7276	240.5409	237.2045	245.6122	263.5113	286.1058	307.3413	(68)	
Pumps, fans	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	(69)	
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	(71)	
Water heating gains (Table 5)	143.9216	141.5039	136.8465	126.6387	120.3862	113.8507	109.8365	113.1530	117.0413	124.2931	134.0785	142.6164	(72)	

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Total internal gains
591.5849 589.6371 572.3195 539.7136 507.3267 477.9233 460.4350 463.2816 479.8301 509.4800 545.3997 576.8056 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
East	4.6900		22.3313		0.5000		0.7000		0.7700		25.4032 (76)	
West	9.2600		22.3313		0.5000		0.7000		0.7700		50.1564 (80)	
East	0.9800		29.6355		0.6300		0.7000		1.0000		11.5271 (82)	
Solar gains	87.0867	153.7133	250.7769	377.7542	451.7616	495.3135	466.2896	409.0281	316.4506	194.9744	111.3384	70.8621 (83)
Total gains	678.6716	743.3504	823.0964	917.4677	959.0883	973.2367	926.7247	872.3096	796.2807	704.4543	656.7381	647.6677 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.4323	57.8875	57.8875	58.5411	58.5411	59.3533	59.1569	59.5451	59.3533	58.9560	58.9560	58.3273	
alpha	4.8288	4.8592	4.8592	4.9027	4.9027	4.9569	4.9438	4.9697	4.9569	4.9304	4.9304	4.8885	
util living area	0.9868	0.9783	0.9500	0.8654	0.6967	0.4528	0.2987	0.3251	0.6203	0.8967	0.9734	0.9889 (86)	
Living	20.1058	20.2247	20.4540	20.7175	20.8793	20.9322	20.9368	20.9369	20.9132	20.7147	20.3835	20.0967	
Non living	18.9164	19.0718	19.3553	19.6710	19.8333	19.8849	19.8836	19.8900	19.8748	19.6823	19.2867	18.9166	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5426	20.2247	20.4540	20.7175	20.8793	20.9322	20.9368	20.9369	20.9132	20.7147	20.3835	20.2231 (87)	
Th 2	19.9363	19.9438	19.9438	19.9543	19.9543	19.9671	19.9641	19.9701	19.9671	19.9609	19.9609	19.9509 (88)	
util rest of house	0.9826	0.9715	0.9342	0.8266	0.6244	0.3618	0.1992	0.2210	0.5224	0.8565	0.9636	0.9853 (89)	
MIT 2	19.5297	19.0718	19.3553	19.6710	19.8333	19.8849	19.8836	19.8900	19.8748	19.6823	19.2867	19.1030 (90)	
Living area fraction									fLA = Living area / (4) =				0.2501 (91)
MIT	19.7830	19.3601	19.6301	19.9327	20.0948	20.1468	20.1470	20.1518	20.1345	19.9404	19.5610	19.3831 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.7830	19.3601	19.6301	19.9327	20.0948	20.1468	20.1470	20.1518	20.1345	19.9404	19.5610	19.3831 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9818	0.9667	0.9285	0.8257	0.6347	0.3779	0.2168	0.2394	0.5390	0.8556	0.9588	0.9828 (94)
Useful gains	666.3532	718.6043	764.2668	757.5407	608.7007	367.7767	200.8927	208.8489	429.1838	602.7071	629.6578	636.5588 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1352.7114	1257.7187	1117.8690	906.7853	641.2526	369.6726	200.9750	208.9799	439.8878	748.5286	1037.5602	1295.6811 (97)
Space heating kWh	510.6505	362.2849	263.0800	107.4561	24.2186	0.0000	0.0000	0.0000	0.0000	108.4912	293.6897	490.3870 (98a)
Space heating requirement - total per year (kWh/year)												2160.2580
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	510.6505	362.2849	263.0800	107.4561	24.2186	0.0000	0.0000	0.0000	0.0000	108.4912	293.6897	490.3870 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2160.2580
Space heating per m2										(98c) / (4) =		27.6602 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												239.5386 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	510.6505	362.2849	263.0800	107.4561	24.2186	0.0000	0.0000	0.0000	0.0000	108.4912	293.6897	490.3870 (98)
Space heating efficiency (main heating system 1)	239.5386	239.5386	239.5386	239.5386	239.5386	0.0000	0.0000	0.0000	0.0000	239.5386	239.5386	239.5386 (210)
Space heating fuel (main heating system)	213.1809	151.2428	109.8278	44.8596	10.1105	0.0000	0.0000	0.0000	0.0000	45.2917	122.6065	204.7215 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	256.3794	226.6822	240.5483	210.6845	203.7167	182.9932	180.1109	187.5318	189.9021	212.4588	226.7947	253.4590 (64)
Efficiency of water heater (217)m	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521 (216)
Fuel for water heating, kWh/month	147.3851	130.3131	138.2842	121.1164	117.1109	105.1975	103.5406	107.8066	109.1692	122.1364	130.3777	145.7062 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	22.4409	18.0029	16.2096	11.8759	9.1733	7.4946	8.3682	10.8772	14.1285	18.5373	20.9378	23.0646 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

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Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													901.8415	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													173.9521	
Water heating fuel used													1478.1439	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													0.0000	(231)
Electricity for lighting (calculated in Appendix L)													181.1108	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													0.0000	(233)
Wind generation													0.0000	(234)
Hydro-electric generation (Appendix N)													0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)													0.0000	(235)
Appendix Q - special features														
Energy saved or generated													-0.0000	(236)
Energy used													0.0000	(237)
Total delivered energy for all uses													2561.0962	(238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	901.8415	28.4300	256.3935 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1478.1439	28.4300	420.2363 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	181.1108	28.4300	51.4898 (250)
Additional standing charges			0.0000 (251)
Total energy cost			728.1196 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	901.8415	0.1569	141.5434 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1478.1439	0.1410	208.3670 (264)
Space and water heating			349.9104 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	181.1108	0.1443	26.1399 (268)
Total CO2, kg/year			376.0503 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	901.8415	1.5810	1425.8383 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1478.1439	1.5212	2248.6144 (278)
Space and water heating			3674.4527 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	181.1108	1.5338	277.7938 (282)
Total Primary energy kWh/year			3952.2465 (286)

SAP 10 EPC IMPROVEMENTS

00001

Current energy efficiency rating: C 78
Current environmental impact rating: A 96

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 2.4	-£ 97	-42 kg (11.2%)
U Solar photovoltaic panels	+ 6.6	-£ 244	-116 kg (34.6%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£97	0.54 kg/m²	B 81 A 96
Solar photovoltaic panels	£244	1.48 kg/m²	B 87 A 97
Total Savings	£340	2.02 kg/m²	

Potential energy efficiency rating: B 87

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Potential environmental impact rating:

A 97

Fuel prices for cost data on this page from database revision number 577 TEST (01 Aug 2025)

Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £728	Potential £631	Saving £97
Electricity			
Space heating	£256	£280	-£23
Water heating	£420	£300	£120
Lighting	£51	£51	£0
Generated (PV)	-£0	-£244	£244
Total cost of fuels	£728	£387	£341
Total cost of uses	£727	£387	£341
Delivered energy	33 kWh/m ²	17 kWh/m ²	15 kWh/m ²
Carbon dioxide emissions	0.4 tonnes	0.2 tonnes	0.2 tonnes
CO2 emissions per m ²	5 kg/m ²	3 kg/m ²	2 kg/m ²
Primary energy	51 kWh/m ²	28 kWh/m ²	23 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	33.6000 (1b)	x 2.3000 (2b)	= 77.2800 (1b) - (3b)
First floor	28.1600 (1c)	x 2.4800 (2c)	= 69.8368 (1c) - (3c)
Second floor	16.3400 (1d)	x 2.4000 (2d)	= 39.2160 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.3328 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.2683 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.5183 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4795 (21)

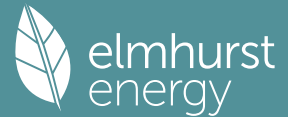
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.6113	0.5993	0.5873	0.5274	0.5154	0.4555	0.4555	0.4435	0.4795	0.5154	0.5394	0.5634 (22b)
	0.6869	0.6796	0.6725	0.6391	0.6328	0.6037	0.6037	0.5983	0.6149	0.6328	0.6455	0.6587 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Door			1.9500	1.0000	1.9500		(26)
Windows			13.9500	1.3258	18.4943		(27)
Roof windows			0.9800	1.1450	1.1221		(27a)
Floor			33.6000	0.1100	3.6960	75.0000	2520.0000 (28a)
Main	100.3900	15.9000	84.4900	0.1800	15.2082	70.0000	5914.3000 (29a)
Dormer	11.8700		11.8700	0.1600	1.8992	9.0000	106.8300 (29a)
Slope	21.0300	0.9800	20.0500	0.1500	3.0075	9.0000	180.4500 (30)
Flat roof	5.1000		5.1000	0.1400	0.7140	9.0000	45.9000 (30)
Dormer	11.9100		11.9100	0.1400	1.6674	9.0000	107.1900 (30)
Total net area of external elements Aum(A, m ²)			183.9000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.7588		(33)
Main dwelling							
Party Wall 1			51.3600	0.0000	0.0000	140.0000	7190.4000 (32)
Internal Wall 1			10.3500			9.0000	93.1500 (32c)
Internal Wall 2			10.4200			100.0000	1042.0000 (32c)
Internal Wall 3			30.5500			9.0000	274.9500 (32c)
Internal Wall 4			24.0000			9.0000	216.0000 (32c)
Internal Floor 1			16.3400			18.0000	294.1200 (32d)
Internal Floor 2			28.1600			18.0000	506.8800 (32d)
Internal Ceiling 1			33.6000			9.0000	302.4000 (32e)

Page 21 of 27

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329 (71)
Water heating gains (Table 5)	143.9216	141.5039	135.3457	119.1347	106.6288	99.8432	95.8291	100.1460	111.0381	122.7923	134.0785	142.6164 (72)
Total internal gains	591.5849	589.6371	570.8187	532.2096	493.5694	463.9158	446.4276	450.2746	473.8269	507.9792	545.3997	576.8056 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				4.6900	19.6403	0.5000	0.7000	0.7700	22.3420 (76)			
West				9.2600	19.6403	0.5000	0.7000	0.7700	44.1123 (80)			
East				0.9800	25.9287	0.6300	0.7000	1.0000	10.0853 (82)			
Solar gains	76.5395	150.1765	248.4663	364.2217	448.0412	459.3987	437.0581	374.2999	289.5737	178.4959	95.5156	62.8918 (83)
Total gains	668.1244	739.8136	819.2850	896.4312	941.6106	923.3145	883.4856	824.5745	763.4006	686.4750	640.9153	639.6974 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.2164	55.4747	55.7302	56.9626	57.1992	58.3273	58.3273	58.5411	57.8875	57.1992	56.7225	56.2325
alpha	4.6811	4.6983	4.7153	4.7975	4.8133	4.8885	4.8885	4.9027	4.8592	4.8133	4.7815	4.7488
util living area	0.9902	0.9830	0.9631	0.9064	0.7886	0.6029	0.4466	0.4953	0.7418	0.9343	0.9823	0.9918 (86)
Living	19.9624	20.0966	20.3250	20.6109	20.8129	20.9117	20.9319	20.9292	20.8690	20.6012	20.2408	19.9515
Non living	18.7045	18.8778	19.1667	19.5280	19.7510	19.8560	19.8682	19.8707	19.8187	19.5285	19.0788	18.7046
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4692	20.0966	20.3250	20.6109	20.8129	20.9117	20.9319	20.9292	20.8690	20.6012	20.2408	20.0982 (87)
Th 2	19.8985	19.9030	19.9075	19.9285	19.9325	19.9509	19.9509	19.9543	19.9438	19.9325	19.9245	19.9162 (88)
util rest of house	0.9871	0.9777	0.9515	0.8777	0.7302	0.5147	0.3428	0.3872	0.6574	0.9077	0.9759	0.9893 (89)
MIT 2	19.4225	18.8778	19.1667	19.5280	19.7510	19.8560	19.8682	19.8707	19.8187	19.5285	19.0788	18.9229 (90)
Living area fraction									fLA = Living area / (4) =			0.2501 (91)
MIT	19.6842	19.1826	19.4563	19.7988	20.0165	20.1200	20.1342	20.1354	20.0814	19.7967	19.3694	19.2168 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6842	19.1826	19.4563	19.7988	20.0165	20.1200	20.1342	20.1354	20.0814	19.7967	19.3694	19.2168 (93)

8. Space heating requirement

Utilisation	0.9864	0.9732	0.9455	0.8737	0.7352	0.5295	0.3612	0.4064	0.6694	0.9035	0.9715	0.9872 (94)
Useful gains	659.0323	720.0041	774.6521	783.2225	692.3055	488.9056	319.1566	335.0984	511.0285	620.2484	622.6477	631.4864 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1474.1965	1362.2577	1230.0950	1012.3663	769.3031	500.7388	320.5994	337.6137	546.7160	850.7279	1144.4973	1412.9831 (97)
Space heating kWh	606.4822	431.5945	338.8495	164.9835	57.2862	0.0000	0.0000	0.0000	0.0000	171.4767	375.7317	581.4335 (98a)
Space heating requirement - total per year (kWh/year)												2727.8377
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	606.4822	431.5945	338.8495	164.9835	57.2862	0.0000	0.0000	0.0000	0.0000	171.4767	375.7317	581.4335 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2727.8377
Space heating per m2										(98c) / (4) =		34.9275 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												239.6963 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	606.4822	431.5945	338.8495	164.9835	57.2862	0.0000	0.0000	0.0000	0.0000	171.4767	375.7317	581.4335 (98)
Space heating efficiency (main heating system 1)	239.6963	239.6963	239.6963	239.6963	239.6963	0.0000	0.0000	0.0000	0.0000	239.6963	239.6963	239.6963 (210)
Space heating fuel (main heating system)	253.0211	180.0589	141.3662	68.8302	23.8995	0.0000	0.0000	0.0000	0.0000	71.5392	156.7532	242.5709 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	256.3794	210.4604	181.2199	124.7135	88.1197	75.8195	73.3287	93.0856	127.3000	182.4504	226.7947	253.4590 (64)
Efficiency of water heater (217)m	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222	173.8222 (216)
Fuel for water heating, kWh/month	147.4952	121.0780	104.2559	71.7478	50.6953	43.6190	42.1860	53.5522	73.2358	104.9638	130.4751	145.8151 (219)
Space cooling fuel requirement												

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(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	22.4409	18.0029	16.2096	11.8759	9.1733	7.4946	8.3682	10.8772	14.1285	18.5373	20.9378	23.0646	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.2509	-56.6545	-83.8685	-93.6112	-96.9761	-87.6398	-86.3451	-82.1403	-73.7280	-63.9530	-42.5716	-32.6337	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1138.0392	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												173.8222	
Water heating fuel used												1089.1193	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												80.0000	(231)
Electricity for lighting (calculated in Appendix L)												181.1108	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-838.3726	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1649.8967	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1138.0392	16.4900	187.6627	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1089.1193	16.4900	179.5958	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	181.1108	16.4900	29.8652	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-838.3726	16.4900	-138.2476	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-138.2476	(252)
Total energy cost			272.0680	(255)

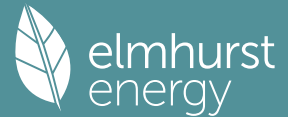
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.7956	(257)
SAP value		87.1025	
SAP rating (Section 12)		87	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1138.0392	0.1561	177.6165	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1089.1193	0.1459	158.9113	(264)
Space and water heating			336.5278	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	181.1108	0.1443	26.1399	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-838.3726	0.1349	-113.0595	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-113.0595	(269)
Total CO2, kg/year			260.7051	(272)
CO2 emissions per m2			3.3400	(273)
EI value			97.1621	
EI rating			97	(274)
EI band			A	

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1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Main dwelling						
Ground floor	33.6000 (1b)	x	2.3000 (2b)	=	77.2800 (1b)	- (3b)
First floor	28.1600 (1c)	x	2.4800 (2c)	=	69.8368 (1c)	- (3c)
Second floor	16.3400 (1d)	x	2.4000 (2d)	=	39.2160 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	186.3328	(5)

2. Ventilation rate

	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	5 * 10 =	50.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.2683 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.5183	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4795 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate	0.5034	0.4795	0.4795	0.4435	0.4435	0.3956	0.4075	0.3836	0.3956	0.4195	0.4195	0.4555	(22b)
Effective ac	0.6267	0.6149	0.6149	0.5983	0.5983	0.5782	0.5830	0.5736	0.5782	0.5880	0.5880	0.6037	(25)

3. Heat losses and heat loss parameter

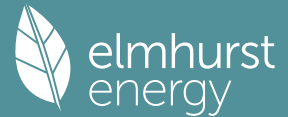
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Main dwelling								
Door			1.9500	1.0000	1.9500			(26)
Windows			13.9500	1.3258	18.4943			(27)
Roof windows			0.9800	1.1450	1.1221			(27a)
Floor			33.6000	0.1100	3.6960	75.0000	2520.0000	(28a)
Main	100.3900	15.9000	84.4900	0.1800	15.2082	70.0000	5914.3000	(29a)
Dormer	11.8700		11.8700	0.1600	1.8992	9.0000	106.8300	(29a)
Slope	21.0300	0.9800	20.0500	0.1500	3.0075	9.0000	180.4500	(30)
Flat roof	5.1000		5.1000	0.1400	0.7140	9.0000	45.9000	(30)
Dormer	11.9100		11.9100	0.1400	1.6674	9.0000	107.1900	(30)
Total net area of external elements Aum(A, m ²)			183.9000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.7588			(33)
Main dwelling								
Party Wall 1			51.3600	0.0000	0.0000	140.0000	7190.4000	(32)
Internal Wall 1			10.3500			9.0000	93.1500	(32c)
Internal Wall 2			10.4200			100.0000	1042.0000	(32c)
Internal Wall 3			30.5500			9.0000	274.9500	(32c)
Internal Wall 4			24.0000			9.0000	216.0000	(32c)
Internal Floor 1			16.3400			18.0000	294.1200	(32d)
Internal Floor 2			28.1600			18.0000	506.8800	(32d)
Internal Ceiling 1			33.6000			9.0000	302.4000	(32e)
Internal Ceiling 2			28.1600			9.0000	253.4400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19048.0100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		243.8926 (35)

List of Thermal Bridges	Length	Psi-value	Total	
K1 Element	10.0000	0.0290	0.2900	
E2 Other lintels (including other steel lintels)	5.7100	0.0230	0.1313	
E3 Sill	32.4900	0.0180	0.5848	
E4 Jamb	17.3000	0.0680	1.1764	
E5 Ground floor (normal)	36.6800	0.0010	0.0367	
E6 Intermediate floor within a dwelling	10.6800	0.0180	0.1922	
E11 Eaves (insulation at rafter level)	9.5200	0.0390	0.3713	
E13 Gable (insulation at rafter level)	10.7000	0.1600	1.7120	
E14 Flat roof	19.1400	0.0400	0.7656	
E16 Corner (normal)	4.7800	-0.0820	-0.3920	
E17 Corner (inverted - internal area greater than external area)	14.3600	0.0320	0.4595	
E18 Party wall between dwellings	10.5000	0.0480	0.5040	
P1 Party wall - Ground floor	22.6000	0.0000	0.0000	
P2 Party wall - Intermediate floor within a dwelling	5.2000	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.8319	(36)
Point Thermal bridges			0.0000	(36a)
Total fabric heat loss	(33) + (36) + (36a) =		53.5907	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.5371	37.8127	37.8127	36.7923	36.7923	35.5554	35.8514	35.2683	35.5554	36.1562	36.1562	37.1236	(38)
Heat transfer coeff	92.1278	91.4033	91.4033	90.3829	90.3829	89.1461	89.4420	88.8589	89.1461	89.7468	89.7468	90.7142	(39)
Average = Sum(39)m / 12 =												90.2084	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1796	1.1703	1.1703	1.1573	1.1573	1.1414	1.1452	1.1378	1.1414	1.1491	1.1491	1.1615	(40)
												1.1550	

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Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.4258 (42)
Hot water usage for mixer showers												
64.8927	63.9175	62.4965	59.7775	57.7710	55.5333	54.2614	55.6717	57.2177	59.6203	62.3976	64.6441	(42a)
Hot water usage for baths												
28.0292	27.6130	27.0268	25.9459	25.1366	24.2392	23.7544	24.3365	24.9703	25.9306	27.0337	27.9345	(42b)
Hot water usage for other uses												
39.4728	38.0375	36.6021	35.1667	33.7313	32.2960	32.2960	33.7313	35.1667	36.6021	38.0375	39.4728	(42c)
Average daily hot water use (litres/day)												121.7008 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	132.3948	129.5679	126.1253	120.8901	116.6389	112.0684	110.3118	113.7396	117.3547	122.1529	127.4688	132.0514 (44)
Energy conte	209.6810	184.5030	193.8499	165.4925	157.0183	137.8012	133.4125	140.8334	144.7101	165.7604	181.6027	206.7606 (45)
Energy content (annual)										Total = Sum(45)m =		2021.4257
Distribution loss (46)m = 0.15 x (45)m												
31.4522	27.6755	29.0775	24.8239	23.5528	20.6702	20.0119	21.1250	21.7065	24.8641	27.2404	31.0141	(46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7560 (55)
Total storage loss												
23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(56)
If cylinder contains dedicated solar storage												
23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
256.3794	226.6822	239.1525	203.9309	190.9224	170.3865	167.0840	175.4353	184.4992	211.0630	226.7947	253.4590	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												668.3845 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												668.3845
Solar input	-0.0000	-17.5785	-58.9508	-83.5047	-104.7864	-103.7700	-101.6227	-92.5495	-65.7134	-35.4428	-4.4658	-0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	256.3794	209.1037	180.2018	120.4262	86.1361	66.6165	65.4613	82.8858	118.7859	175.6202	222.3289	253.4590 (64)
								Total per year (kWh/year) = Sum(64)m =				1837.4047 (64)
Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000 (64a)
Heat gains from water heating, kWh/month	107.0777	95.0906	100.6972	85.7770	79.3319	71.8871	71.2968	74.5087	79.9474	91.3575	96.5365	106.1066 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	145.5493	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
25.6381	22.7715	18.5191	14.0201	10.4802	8.8478	9.5604	12.4270	16.6794	21.1784	24.7183	26.3507	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
321.5280	324.8645	316.4567	298.5576	275.9632	254.7276	240.5409	237.2045	245.6122	263.5113	286.1058	307.3413	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	51.9807	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	(71)
Water heating gains (Table 5)												
143.9216	141.5039	135.3457	119.1347	106.6288	99.8432	95.8291	100.1460	111.0381	122.7923	134.0785	142.6164	(72)
Total internal gains	591.5849	589.6371	570.8187	532.2096	493.5694	463.9158	446.4276	450.2746	473.8269	507.9792	545.3997	576.8056 (73)

6. Solar gains												

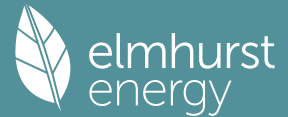
[Jan]			Area	Solar flux	g	FF			Access		Gains	
			m2	Table 6a	Specific data	Specific data			factor		W	
				W/m2	or Table 6b	or Table 6c			Table 6d			
East			4.6900	22.3313	0.5000	0.7000			0.7700		25.4032 (76)	
West			9.2600	22.3313	0.5000	0.7000			0.7700		50.1564 (80)	
East			0.9800	29.6355	0.6300	0.7000			1.0000		11.5271 (82)	

Solar gains	87.0867	153.7133	250.7769	377.7542	451.7616	495.3135	466.2896	409.0281	316.4506	194.9744	111.3384	70.8621 (83)
Total gains	678.6716	743.3504	821.5956	909.9637	945.3310	959.2293	912.7172	859.3027	790.2775	702.9535	656.7381	647.6677 (84)

7. Mean internal temperature (heating season)												

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	57.4323	57.8875	57.8875	58.5411	58.5411	59.3533	59.1569	59.5451	59.3533	58.9560	58.9560	58.3273
alpha	4.8288	4.8592	4.8592	4.9027	4.9027	4.9569	4.9438	4.9697	4.9569	4.9304	4.9304	4.8885
util living area	0.9868	0.9783	0.9503	0.8684	0.7041	0.4590	0.3032	0.3300	0.6242	0.8974	0.9734	0.9889 (86)
Living	20.1058	20.2247	20.4528	20.7135	20.8766	20.9318	20.9368	20.9369	20.9126	20.7138	20.3835	20.0967
Non living	18.9164	19.0718	19.3539	19.6669	19.8312	19.8848	19.8836	19.8900	19.8744	19.6813	19.2867	18.9166
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5426	20.2247	20.4528	20.7135	20.8766	20.9318	20.9368	20.9369	20.9126	20.7138	20.3835	20.2231 (87)
Th 2	19.9363	19.9438	19.9438	19.9543	19.9543	19.9671	19.9641	19.9701	19.9671	19.9609	19.9609	19.9509 (88)
util rest of house	0.9826	0.9715	0.9346	0.8300	0.6318	0.3670	0.2022	0.2243	0.5260	0.8573	0.9636	0.9853 (89)
MIT 2	19.5297	19.0718	19.3539	19.6669	19.8312	19.8848	19.8836	19.8900	19.8744	19.6813	19.2867	19.1030 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.7830	19.3601	19.6287	19.9286	20.0926	20.1466	20.1470	20.1518	20.1340	19.9395	19.5610	0.2501 (91)
Temperature adjustment												0.0000
adjusted MIT	19.7830	19.3601	19.6287	19.9286	20.0926	20.1466	20.1470	20.1518	20.1340	19.9395	19.5610	19.3831 (92)
												0.0000
												19.3831 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9818	0.9667	0.9289	0.8290	0.6420	0.3833	0.2201	0.2430	0.5426	0.8563	0.9588	0.9828 (94)
Useful gains	666.3532	718.6043	763.1978	754.3237	606.8705	367.6373	200.8854	208.8377	428.8288	601.9626	629.6578	636.5588 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1352.7114	1257.7187	1117.7420	906.4148	641.0498	369.6563	200.9738	208.9781	439.8482	748.4427	1037.5602	1295.6811 (97)
Space heating kWh	510.6505	362.2849	263.7809	109.5056	25.4293	0.0000	0.0000	0.0000	0.0000	108.9811	293.6897	490.3870 (98a)
Space heating requirement - total per year (kWh/year)												2164.7091
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	510.6505	362.2849	263.7809	109.5056	25.4293	0.0000	0.0000	0.0000	0.0000	108.9811	293.6897	490.3870 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2164.7091
Space heating per m2										(98c) / (4) =		27.7171 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												239.5386 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	510.6505	362.2849	263.7809	109.5056	25.4293	0.0000	0.0000	0.0000	0.0000	108.9811	293.6897	490.3870 (98)
Space heating efficiency (main heating system 1)	239.5386	239.5386	239.5386	239.5386	239.5386	0.0000	0.0000	0.0000	0.0000	239.5386	239.5386	239.5386 (210)
Space heating fuel (main heating system)	213.1809	151.2428	110.1204	45.7152	10.6160	0.0000	0.0000	0.0000	0.0000	45.4963	122.6065	204.7215 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	256.3794	209.1037	180.2018	120.4262	86.1361	66.6165	65.4613	82.8858	118.7859	175.6202	222.3289	253.4590 (64)
Efficiency of water heater	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521	173.9521 (216)
Fuel for water heating, kWh/month	147.3851	120.2077	103.5928	69.2296	49.5171	38.2959	37.6318	47.6487	68.2866	100.9590	127.8104	145.7062 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945 (231)
Lighting	22.4409	18.0029	16.2096	11.8759	9.1733	7.4946	8.3682	10.8772	14.1285	18.5373	20.9378	23.0646 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-41.8164	-56.4660	-82.3322	-92.9682	-95.0910	-89.8361	-88.1615	-84.9538	-76.8332	-66.1975	-47.0963	-35.4392 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												903.6997 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												173.9521
Water heating fuel used												1056.2708 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
pump for solar water heating												80.0000 (230g)
Total electricity for the above, kWh/year												80.0000 (231)
Electricity for lighting (calculated in Appendix L)												181.1108 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-857.1914 (233)

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Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1363.8898 (238)

10a. Fuel costs - using BEDF prices (577)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	903.6997	28.4300	256.9218 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1056.2708	28.4300	300.2978 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	28.4300	22.7440 (249)
Energy for lighting	181.1108	28.4300	51.4898 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-857.1914	28.4300	-243.6995
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-243.6995 (252)
Total energy cost			387.7539 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	903.6997	0.1569	141.8050 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1056.2708	0.1465	154.7629 (264)
Space and water heating			296.5680 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	181.1108	0.1443	26.1399 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-857.1914	0.1349	-115.6397
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-115.6397 (269)
Total CO2, kg/year			218.1652 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	903.6997	1.5809	1428.6654 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1056.2708	1.5420	1628.7922 (278)
Space and water heating			3057.4576 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)
Energy for lighting	181.1108	1.5338	277.7938 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-857.1914	1.4986	-1284.5929
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1284.5929 (283)
Total Primary energy kWh/year			2171.6824 (286)

Predicted Energy Assessment



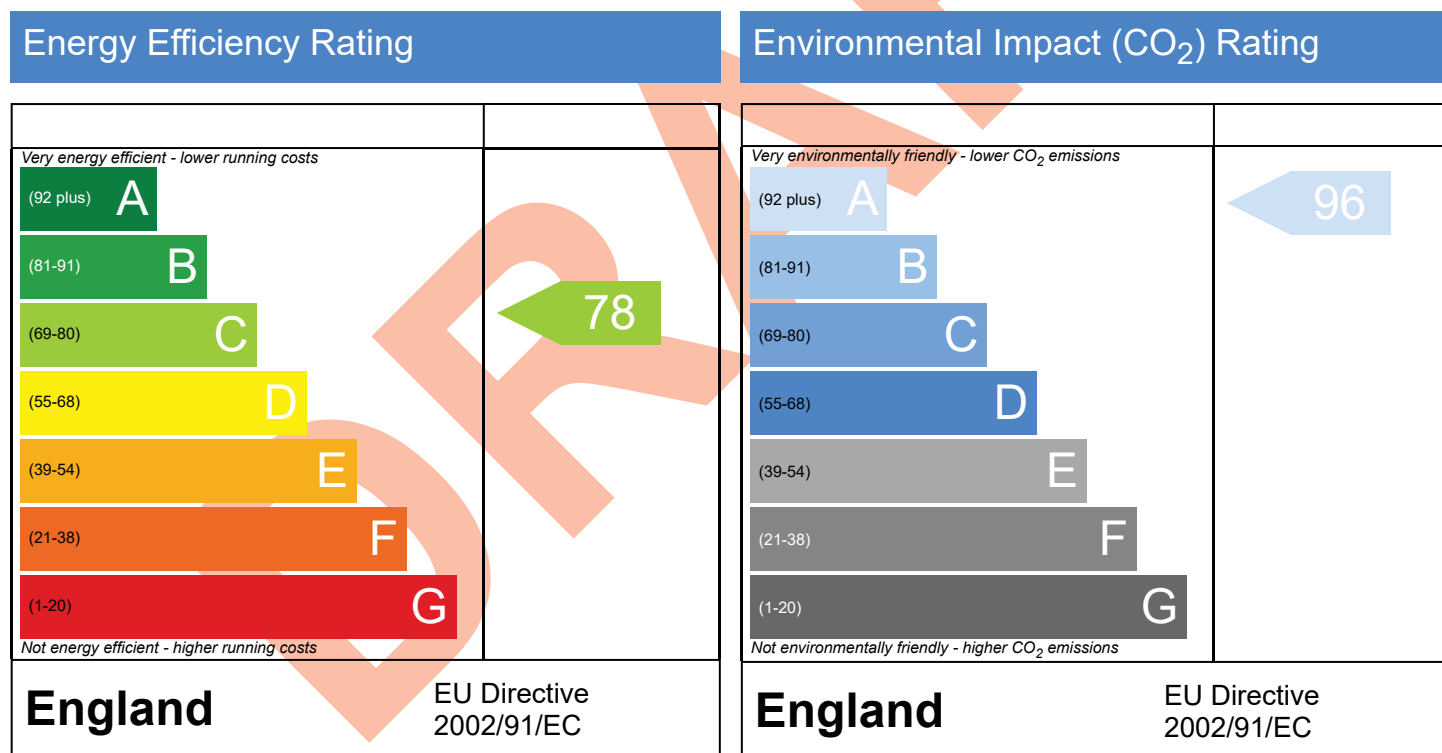
Adj., 108, Elm Park Road , Reading , Berkshire

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, End-Terrace
13/08/2025
Matthew Carter
78.1 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Summary for Input Data



Property Reference	01592	Issued on Date	13/08/2025
Assessment Reference	00001	Prop Type Ref	
Property	Adj., 108, Elm Park Road , Reading , Berkshire		

SAP Rating	78 C	DER	5.44	TER	12.66
Environmental	96 A	% DER < TER			57.03
CO ₂ Emissions (t/year)	0.38	DFEE	40.17	TFEE	40.29
Compliance Check	See BREL	% DFEE < TFEE			0.30
% DPER < TPER	14.08	DPER	56.96	TPER	66.30

Assessor Details	Mr. Matthew Carter	Assessor ID	7869-0001
Client	COLONY ARCHITECTS LTD, Colony Architects Ltd		

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

Orientation	East	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	House, End-Terrace	
2.0 Number of Storeys	3	
3.0 Date Built	2025	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	243.89	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	17.30 m	33.60 m²	2.30 m
	2nd Storey:	20.28 m	28.16 m²	2.48 m
		11.50 m	16.34 m²	2.40 m

8.0 Living Area	19.53	m²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
	Main	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.18	70.00	100.39	84.49	0.00	None	15.90	Enter Gross Area
	Dormer	Timber Frame	Timber framed wall (one layer of plasterboard)	0.16	9.00	11.87	11.87	0.00	None	0.00	Enter Gross Area

9.1 Party Walls	Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
	Party Wall 1	Solid Wall	Dense plaster both sides. lightweight aggregate blocks, cavity or cavity fill	0.00	140.00	51.36		None

9.2 Internal Walls	Description	Construction	Kappa (kJ/m²K)	Area (m²)
	Internal Wall 1	Plasterboard on timber frame	9.00	10.35
	Internal Wall 2	Dense block, dense plaster	100.00	10.42
	Internal Wall 3	Plasterboard on timber frame	9.00	30.55
	Internal Wall 4	Plasterboard on timber frame	9.00	24.00

10.0 External Roofs	Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	Slope	External Slope Roof	Plasterboard, insulated slope	0.15	9.00	21.03	20.05	None	0.00	Enter Gross Area	0.98
	Flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.14	9.00	5.10	5.10	None	0.00	Enter Gross Area	0.00

Summary for Input Data

Dormer	External Flat Roof	Plasterboard, insulated flat roof	0.14	9.00	11.91	11.91	None	0.00	Enter Gross Area	0.00
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10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	33.60
Internal Ceiling 2	+1	Plasterboard ceiling, carpeted chipboard floor	28.16

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	75.00	33.60

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1		Plasterboard ceiling, carpeted chipboard floor	18.00	16.34
Internal Floor 2		Plasterboard ceiling, carpeted chipboard floor	18.00	28.16

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacturer	Solid Door				0.00			1.00
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.50		0.70	1.40
Roof windows	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening	Door	Main	East	1.95	
Front	Windows	Main	East	4.69	
Opening	Roof windows	Slope	East	0.98	45
Rear	Windows	Main	West	9.26	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	10.00	0.03	0.03 Catnic	No
E3 Sill	Independently assessed	5.71	0.02	0.02 RCD	No
E4 Jamb	Independently assessed	32.49	0.02	0.02 RCD	No
E5 Ground floor (normal)	Independently assessed	17.30	0.07	0.07 RCD	No
E6 Intermediate floor within a dwelling	Independently assessed	36.68	0.00	0.00 RCD	No
E11 Eaves (insulation at rafter level)	Independently assessed	10.68	0.02	0.02 RCD	No
E13 Gable (insulation at rafter level)	Independently assessed	9.52	0.04	0.04 RCD	No
E14 Flat roof	Table K1 - Default	10.70	0.16	0.16	No
E16 Corner (normal)	Independently assessed	19.14	0.04	0.04 RCD	No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	4.78	-0.08	-0.08 RCD	No
E18 Party wall between dwellings	Independently assessed	14.36	0.03	0.03 RCD	No
P1 Party wall - Ground floor	Independently assessed	10.50	0.05	0.05 RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	22.60	0.00	0.00	No
P5 Party wall - Roof (insulation at rafter level)	Independently assessed	5.20	0.00	0.00	No

Y-value	0.03	W/m²K
---------	-----------------------------------	-------

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	No
---------------------------------------	---------------------------------

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	5
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System

Summary for Input Data

22.0 Pressure Testing

	Yes	
Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting	No				
	Name Lighting 1	Efficacy 84.00	Power 7.00	Capacity 588.00	Count 28

24.0 Main Heating 1

	Database	
Percentage of Heat	100.00	%
Database Ref. No.	104360	
Fuel Type	Electricity	
In Winter	239.70	
In Summer	173.82	
Model Name	AE050RXYDEG	
Manufacturer	Samsung Electronics Air Conditioner Europe B.V.	
System Type	Heat Pump	
Controls SAP Code	2207	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	

25.0 Main Heating 2

None

26.0 Heat Networks

None

27.0 Secondary Heating

None

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	Yes

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Unknown	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

	Hot Water Cylinder
Cylinder Stat	Yes
Cylinder In Heated Space	Yes
Independent Time Control	Yes
Insulation Type	Measured Loss

Summary for Input Data



Cylinder Volume	180.00	L
Loss	1.40	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

Typical Cost	Typical savings per year	Ratings after improvement	
		SAP rating	Environmental Impact
£4,000 - £7,000	£97	B 81	A 96
£8,000 - £10,000	£244	B 87	A 97
		0	0

Thermal Bridging

Property Reference	01592	Issued on Date	13/08/2025
Assessment Reference	00001	Prop Type Ref	End-Terrace House
Property	Adj., 108, Elm Park Road , Reading , Berkshire		

SAP Rating	78 C	DER	5.44	TER	12.66
Environmental	96 A	% DER < TER			57.03
CO ₂ Emissions (t/year)	0.38	DFEE	40.17	TFEE	40.29
Compliance Check	See BREL	% DFEE < TFEE			0.30
% DPER < TPER	14.08	DPER	56.96	TPER	66.30

Assessor Details	Mr. Matthew Carter	Assessor ID	7869-0001
Client	COLONY ARCHITECTS LTD, Colony Architects Ltd		

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.029	10.00	0.29	Catnic
External wall	E3 Sill	Independently assessed	0.023	5.71	0.13	RCD
External wall	E4 Jamb	Independently assessed	0.018	32.49	0.58	RCD
External wall	E5 Ground floor (normal)	Independently assessed	0.068	17.30	1.18	RCD
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.001	36.68	0.04	RCD
External wall	E11 Eaves (insulation at rafter level)	Independently assessed	0.018	10.68	0.19	RCD
External wall	E13 Gable (insulation at rafter level)	Independently assessed	0.039	9.52	0.37	RCD
External wall	E14 Flat roof	Table K1 - Default	0.160	10.70	1.71	
External wall	E16 Corner (normal)	Independently assessed	0.040	19.14	0.77	RCD
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.082	4.78	-0.39	RCD
External wall	E18 Party wall between dwellings	Independently assessed	0.032	14.36	0.46	RCD
Party wall	P1 Party wall - Ground floor	Independently assessed	0.048	10.50	0.50	RCD
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	22.60	0.00	
Party wall	P5 Party wall - Roof (insulation at rafter level)	Independently assessed	0.000	5.20	0.00	

Total: 209.66 W/mK:
Y-Value: 0.03 W/m²K:

Energy Calculations Ltd

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01754-761035



SAP Report Submission for Building Regulations Compliance

Client:

Project: Adj, 108, Elm Park Road
Reading , Berkshire

Contact: Matthew Carter
Energy Calculations Limited
mcarter@energycalculations.co.uk

Report Issue Date: 13/08/2025

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

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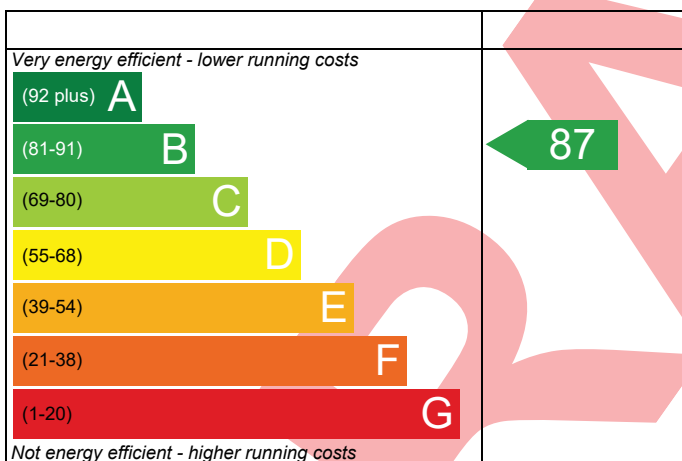
Adj, 108, Elm Park Road,
Reading ,
Berkshire

Dwelling type: House, End-Terrace
Date of assessment: 13/08/2025
Produced by: Energy Calculations Limited
Total floor area: 78.1 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating

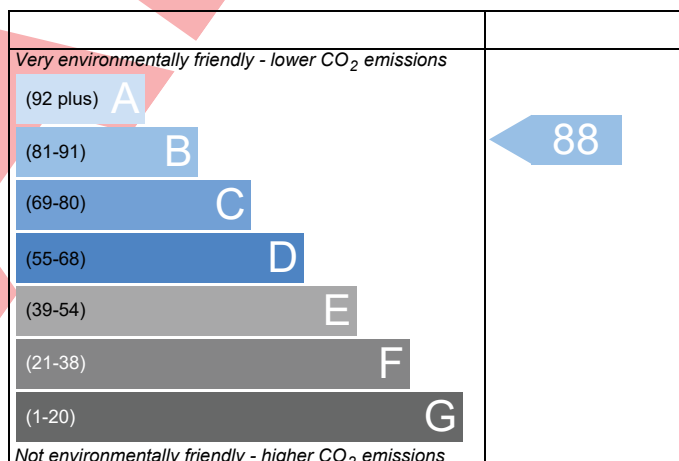


England

EU Directive
2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



England

EU Directive
2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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Property Reference	024680			Issued on Date	13/08/2025
Assessment Reference	001	Prop Type Ref			
Property	Adj, 108, Elm Park Road, Reading , Berkshire				
SAP Rating	87 B	DER	15.87	TER	25.10
Environmental	88 B	% DER<TER	36.77		
CO ₂ Emissions (t/year)	0.99	DFEE	47.10	TFEE	47.56
General Requirements Compliance	Pass	% DFEE<TFEE	0.97		
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761 035, mcarter@energycalculations.co.uk			Assessor ID	7869-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

End-Terrace House, total floor area 78 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 25.10 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.87 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)47.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)47.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.032

3 Air permeability

Air permeability at 50 pascals:	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Samsung Electronics AE050RXYDEG

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 1.40 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
-------------------------	-----------------------------------	----

Hot water controls:

Cylinderstat	OK
Independent timer for DHW	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing East:	4.69 m ² , No overhang
Windows facing West:	9.26 m ² , No overhang
Air change rate:	8.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.11 W/m ² K
Door U-value	1.00 W/m ² K
Thermal bridging y-value	0.032 W/m ² K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.6000 (1b)	x 2.3000 (2b)	= 77.2800 (1b) - (3b)
First floor	28.1600 (1c)	x 2.4800 (2c)	= 69.8368 (1c) - (3c)
Second floor	16.3400 (1d)	x 2.4000 (2d)	= 39.2160 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.3328 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					5 * 10 = 50.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					50.0000 / (5) = 0.2683 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.5183 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.4795 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.6113	0.5993	0.5873	0.5274	0.5154	0.4555	0.4555	0.4435	0.4795	0.5154	0.5394	0.5634 (22b)
	0.6869	0.6796	0.6725	0.6391	0.6328	0.6037	0.6037	0.5983	0.6149	0.6328	0.6455	0.6587 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.9500	1.0000	1.9500		(26)
Windows (Uw = 1.40)			13.9500	1.3258	18.4943		(27)
Roof windows (Uw = 1.20)			0.9800	1.1221	1.1221		(27a)
Heat Loss Floor 1			33.6000	0.1100	3.6960	75.0000	2520.0000 (28a)
External Wall 1	100.3900	15.9000	84.4900	0.1800	15.2082	140.0000	11828.6000 (29a)
Dormer	11.8700		11.8700	0.1600	1.8992	9.0000	106.8300 (29a)
Flat roof	5.1000		5.1000	0.1400	0.7140	9.0000	45.9000 (30)
Dormer Roof	11.9100		11.9100	0.1400	1.6674	9.0000	107.1900 (30)
Slope	21.0300	0.9800	20.0500	0.1500	3.0075	9.0000	180.4500 (30)
Total net area of external elements Aum(A, m ²)			183.9000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	47.7588			(33)
Party Wall 1			51.3600	0.0000	0.0000	180.0000	9244.8000 (32)
Internal Wall 1			10.3500			100.0000	1035.0000 (32c)
Internal Wall 2			10.4200			9.0000	93.7800 (32c)
Internal Wall 3			30.5500			9.0000	274.9500 (32c)
Internal Wall 4			24.0000			9.0000	216.0000 (32c)
Internal Floor 1			16.3400			18.0000	294.1200 (32d)
Internal Floor 2			28.1600			18.0000	506.8800 (32d)
Internal Ceiling 1			33.6000			18.0000	604.8000 (32e)
Internal Ceiling 2			28.1600			18.0000	506.8800 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	27566.1800 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							352.9601 (35)
Thermal bridges (User defined value 0.032 * total exposed area)							5.8848 (36)
Total fabric heat loss						(33) + (36) =	53.6436 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	42.2344	41.7883	41.3510	39.2969	38.9126	37.1236	37.1236	36.7923	37.8127	38.9126	39.6900	40.5028 (38)
Heat transfer coeff	95.8780	95.4318	94.9945	92.9404	92.5561	90.7671	90.7671	90.4358	91.4562	92.5561	93.3336	94.1464 (39)
Average = Sum(39)m / 12 =												92.9386 (39)
HLP	1.2276	1.2219	1.2163	1.1900	1.1851	1.1622	1.1622	1.1579	1.1710	1.1851	1.1951	1.2055 (40)
HLP (average)												1.1900 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Assumed occupancy													2.4258 (42)
Average daily hot water use (litres/day)													91.8133 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.9946	97.3221	93.6495	89.9770	86.3045	82.6319	82.6319	86.3045	89.9770	93.6495	97.3221	100.9946	(44)
Energy content (annual)	149.7720	130.9916	135.1716	117.8459	113.0759	97.5759	90.4184	103.7565	104.9956	122.3623	133.5680	145.0462	(45)
Distribution loss (46)m = 0.15 x (45)m													1444.5800 (45)
	22.4658	19.6487	20.2757	17.6769	16.9614	14.6364	13.5628	15.5635	15.7493	18.3543	20.0352	21.7569	(46)
Water storage loss:													
Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7560 (55)
Total storage loss													
	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(56)
If cylinder contains dedicated solar storage													
	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	196.4704	173.1708	181.8700	163.0379	159.7743	142.7679	137.1168	150.4549	150.1876	169.0607	178.7600	191.7446	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
													Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h													
	196.4704	173.1708	181.8700	163.0379	159.7743	142.7679	137.1168	150.4549	150.1876	169.0607	178.7600	191.7446	(64)
													Total per year (kWh/year) = Sum(64)m = 1994.4160 (64)
Heat gains from water heating, kWh/month													
	87.1579	77.2981	82.3033	75.3373	74.9565	68.5976	67.4228	71.8577	71.0647	78.0442	80.5650	85.5866	(65)

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.4108	17.2405	14.0209	10.6148	7.9347	6.6988	7.2383	9.4086	12.6282	16.0343	18.7144	19.9503	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	215.4238	217.6592	212.0260	200.0336	184.8953	170.6675	161.1624	158.9270	164.5602	176.5526	191.6909	205.9187	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	(71)
Water heating gains (Table 5)													
	117.1477	115.0269	110.6227	104.6352	100.7479	95.2744	90.6221	96.5830	98.7009	104.8981	111.8958	115.0357	(72)
Total internal gains													
	411.3697	409.3139	396.0569	374.6709	352.9652	332.0280	318.4101	324.3059	335.2766	356.8724	381.6884	400.2921	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
East				4.6900	19.6403	0.5000	0.7000	0.7700	22.3420 (76)			
West				9.2600	19.6403	0.5000	0.7000	0.7700	44.1123 (80)			
East				0.9800	26.2379	0.6300	0.7000	1.0000	10.2056 (82)			
Solar gains	76.6598	150.4841	249.1512	365.4984	449.8516	461.3605	438.8813	375.7016	290.4608	178.9079	95.6786	62.9824 (83)
Total gains	488.0295	559.7981	645.2082	740.1693	802.8169	793.3885	757.2914	700.0075	625.7374	535.7802	477.3670	463.2744 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.8648	80.2381	80.6075	82.3890	82.7311	84.3617	84.3617	84.6708	83.7261	82.7311	82.0420	81.3337	
alpha	6.3243	6.3492	6.3738	6.4926	6.5154	6.6241	6.6241	6.6447	6.5817	6.5154	6.4695	6.4222	
util living area													
	0.9996	0.9990	0.9958	0.9764	0.8952	0.7048	0.5237	0.5865	0.8717	0.9901	0.9990	0.9997	(86)
Tweekday	18.8413	18.9785	19.2198	19.5574	19.7865	19.8827	19.8897	19.8928	19.8433	19.5363	19.1490	18.8483	
Tweekend	20.4877	20.5467	20.6521	20.7971	20.9108	20.9639	20.9722	20.9711	20.9357	20.7839	20.6142	20.4844	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	20.2093	20.2988	20.4630	20.6832	20.8623	20.9445	20.9571	20.9554	20.8997	20.6664	20.3975	20.2042	(87)
Th 2	19.8980	19.9025	19.9070	19.9280	19.9319	19.9504	19.9504	19.9538	19.9433	19.9319	19.9240	19.9156	(88)
util rest of house													
	0.9994	0.9984	0.9935	0.9632	0.8432	0.6027	0.4010	0.4577	0.7908	0.9826	0.9984	0.9996	(89)
Tweekday	18.8413	18.9785	19.2198	19.5574	19.7865	19.8827	19.8897	19.8928	19.8433	19.5363	19.1490	18.8483	
Tweekend	18.8413	18.9785	19.2198	19.5574	19.7865	19.8827	19.8897	19.8928	19.8433	19.5363	19.1490	18.8483	
MIT 2	18.8413	18.9785	19.2198	19.5574	19.7865	19.8827	19.8897	19.8928	19.8433	19.5363	19.1490	18.8483	(90)
Living area fraction													fLA = Living area / (4) = 0.2501 (91)
MIT	19.1834	19.3086	19.5306	19.8389	20.0555	20.1482	20.1567	20.1585	20.1075	19.8189	19.4612	19.1874	(92)
Temperature adjustment													0.0000
adjusted MIT	19.1834	19.3086	19.5306	19.8389	20.0555	20.1482	20.1567	20.1585	20.1075	19.8189	19.4612	19.1874	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9993	0.9980	0.9924	0.9618	0.8502	0.6230	0.4254	0.4835	0.8055	0.9815	0.9981	0.9995	(94)
Useful gains	487.6665	558.6925	640.3124	711.9131	682.5458	494.2474	322.1735	338.4606	504.0178	525.8665	476.4378	463.0308	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1426.9902	1375.0433	1237.8398	1016.6660	773.3536	503.5986	322.8273	339.9050	549.4226	853.2639	1153.7151	1411.0058	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	698.8568	548.5878	444.5604	219.4221	67.5610	0.0000	0.0000	0.0000	0.0000	243.5837	487.6397	705.2934	(98)
Space heating													
Space heating per m2													
										(98) / (4) =		43.7325	(99)
												3415.5048	(98)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													260.4966 (206)
Efficiency of secondary/supplementary heating system, %													100.0000 (208)
Space heating requirement													1311.1515 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	698.8568	548.5878	444.5604	219.4221	67.5610	0.0000	0.0000	0.0000	0.0000	243.5837	487.6397	705.2934	(98)
Space heating efficiency (main heating system 1)	260.4966	260.4966	260.4966	260.4966	260.4966	0.0000	0.0000	0.0000	0.0000	260.4966	260.4966	260.4966	(210)
Space heating fuel (main heating system)	268.2787	210.5931	170.6588	84.2322	25.9355	0.0000	0.0000	0.0000	0.0000	93.5074	187.1962	270.7496	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	196.4704	173.1708	181.8700	163.0379	159.7743	142.7679	137.1168	150.4549	150.1876	169.0607	178.7600	191.7446	(64)
Efficiency of water heater	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	(216)
(217)m	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	(217)
Fuel for water heating, kWh/month	72.3368	63.7583	66.9612	60.0276	58.8260	52.5645	50.4839	55.3947	55.2963	62.2451	65.8162	70.5969	(219)
Water heating fuel used													
Annual totals kWh/year													
Space heating fuel - main system													1311.1515 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													342.8015 (232)
Total delivered energy for all uses													2388.2605 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1311.1515	0.5190	680.4876	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	734.3075	0.5190	381.1056	(264)
Space and water heating			1061.5932	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	342.8015	0.5190	177.9140	(268)
Total CO2, kg/year			1239.5072	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.8700	(273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			15.8700	ZC1
Total Floor Area		TFA	78.1000	
Assumed number of occupants		N	2.4258	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.3451	ZC2
CO2 emissions from cooking, equation (L16)			2.2691	ZC3
Total CO2 emissions			34.4843	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			34.4843	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.6000 (1b)	x 2.3000 (2b)	= 77.2800 (1b) - (3b)
First floor	28.1600 (1c)	x 2.4800 (2c)	= 69.8368 (1c) - (3c)
Second floor	16.3400 (1d)	x 2.4000 (2d)	= 39.2160 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.3328 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1610 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4110 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3802 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4847	0.4752	0.4657	0.4182	0.4087	0.3612	0.3612	0.3517	0.3802	0.4087	0.4277	0.4467 (22b)
Effective ac	0.6175	0.6129	0.6084	0.5874	0.5835	0.5652	0.5652	0.5618	0.5723	0.5835	0.5915	0.5998 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.9500	1.0000	1.9500		(26)
TER Opening Type (Uw = 1.40)			13.9500	1.3258	18.4943		(27)
TER Room Window (Uw = 1.70)			0.9800	1.5918	1.5599		(27a)
Heat Loss Floor 1			33.6000	0.1300	4.3680		(28a)
External Wall 1	100.3900	15.9000	84.4900	0.1800	15.2082		(29a)
Dormer	11.8700		11.8700	0.1800	2.1366		(29a)
Flat roof	5.1000		5.1000	0.1300	0.6630		(30)
Dormer Roof	11.9100		11.9100	0.1300	1.5483		(30)
Slope	21.0300	0.9800	20.0500	0.1300	2.6065		(30)
Total net area of external elements Aum(A, m ²)			183.9000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5348		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							0.0000 (36)
Total fabric heat loss						(33) + (36) =	48.5348 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	37.9687	37.6882	37.4132	36.1218	35.8802	34.7554	34.7554	34.5471	35.1886	35.8802	36.3690	36.8800 (38)
Heat transfer coeff	86.5036	86.2230	85.9481	84.6566	84.4150	83.2902	83.2902	83.0819	83.7235	84.4150	84.9038	85.4148 (39)
Average = Sum(39)m / 12 =												84.6555 (39)
HLP	1.1076	1.1040	1.1005	1.0840	1.0809	1.0665	1.0665	1.0638	1.0720	1.0809	1.0871	1.0937 (40)
HLP (average)												1.0839 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4258 (42)
Average daily hot water use (litres/day)												91.8133 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	100.9946	97.3221	93.6495	89.9770	86.3045	82.6319	82.6319	86.3045	89.9770	93.6495	97.3221	100.9946 (44)
Energy conte	149.7720	130.9916	135.1716	117.8459	113.0759	97.5759	90.4184	103.7565	104.9956	122.3623	133.5680	145.0462 (45)
Energy content (annual)												Total = Sum(45)m = 1444.5800 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Water storage loss:	22.4658	19.6487	20.2757	17.6769	16.9614	14.6364	13.5628	15.5635	15.7493	18.3543	20.0352	21.7569 (46)
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
199.0147	175.4688	184.4143	165.5001	162.3186	145.2301	139.6611	152.9991	152.6498	171.6050	181.2222	194.2889	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
199.0147	175.4688	184.4143	165.5001	162.3186	145.2301	139.6611	152.9991	152.6498	171.6050	181.2222	194.2889	(64)
Heat gains from water heating, kWh/month												
89.1933	79.1365	84.3387	77.3071	76.9919	70.5673	69.4583	73.8932	73.0344	80.0796	82.5347	87.6220	(65)

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

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	121.2911	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
19.4108	17.2405	14.0209	10.6148	7.9347	6.6988	7.2383	9.4086	12.6282	16.0343	18.7144	19.9503	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
215.4238	217.6592	212.0260	200.0336	184.8953	170.6675	161.1624	158.9270	164.5602	176.5526	191.6909	205.9187	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	35.1291	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	-97.0329	(71)
Water heating gains (Table 5)												
119.8835	117.7627	113.3585	107.3710	103.4837	98.0102	93.3579	99.3188	101.4367	107.6339	114.6316	117.7715	(72)
Total internal gains												
417.1054	415.0497	401.7927	380.4066	358.7010	337.7638	324.1459	330.0416	341.0123	362.6081	387.4242	406.0279	(73)

6. Solar gains

[Jan]												
				Area	Solar flux		g	FF		Access		Gains
				m2	Table 6a		Specific data	Specific data		factor		W
					W/m2		or Table 6b	or Table 6c		Table 6d		
East				4.6900	19.6403		0.6300	0.7000		0.7700		28.1509 (76)
West				9.2600	19.6403		0.6300	0.7000		0.7700		55.5815 (80)
East				0.9800	26.2379		0.6300	0.7000		1.0000		10.2056 (82)
Solar gains	93.9379	184.2838	304.8144	446.6799	549.3426	563.2072	535.8435	458.9907	355.1994	219.0140	117.2224	77.1910 (83)
Total gains	511.0434	599.3335	706.6071	827.0865	908.0435	900.9710	859.9893	789.0323	696.2118	581.6221	504.6466	483.2189 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.6981	62.9021	63.1033	64.0660	64.2494	65.1170	65.1170	65.2803	64.7801	64.2494	63.8795	63.4973
alpha	5.1799	5.1935	5.2069	5.2711	5.2833	5.3411	5.3411	5.3520	5.3187	5.2833	5.2586	5.2332
util living area	0.9970	0.9927	0.9768	0.9156	0.7740	0.5765	0.4236	0.4792	0.7542	0.9585	0.9934	0.9978 (86)
MIT	19.8668	20.0381	20.3252	20.6749	20.8998	20.9833	20.9973	20.9950	20.9358	20.6098	20.1742	19.8423 (87)
Th 2	19.9946	19.9976	20.0004	20.0140	20.0165	20.0283	20.0283	20.0305	20.0238	20.0165	20.0114	20.0060 (88)
util rest of house	0.9960	0.9903	0.9690	0.8894	0.7169	0.4955	0.3314	0.3809	0.6741	0.9401	0.9908	0.9970 (89)
MIT 2	18.4884	18.7397	19.1551	19.6481	19.9255	20.0181	20.0274	20.0286	19.9762	19.5739	18.9491	18.4609 (90)
Living area fraction									fLA = Living area / (4) =			0.2501 (91)
MIT	18.8331	19.0643	19.4477	19.9048	20.1691	20.2594	20.2699	20.2702	20.2162	19.8330	19.2555	18.8063 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8331	19.0643	19.4477	19.9048	20.1691	20.2594	20.2699	20.2702	20.2162	19.8330	19.2555	18.8063 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9944	0.9872	0.9635	0.8861	0.7264	0.5152	0.3545	0.4055	0.6912	0.9357	0.9880	0.9957 (94)
Useful gains	508.1689	591.6712	680.8343	732.8567	659.6284	464.1934	304.8816	319.9801	481.2031	544.2430	498.5866	481.1447 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
1257.1611	1221.2928	1112.8325	931.6335	714.9209	471.3750	305.6681	321.5464	512.0672	779.3998	1032.0453	1247.5981	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh												
557.2502	423.1057	321.4066	143.1192	41.1377	0.0000	0.0000	0.0000	0.0000	174.9567	384.0903	570.2414	(98)
Space heating												2615.3078 (98)
Space heating per m2												(98) / (4) = 33.4867 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													93.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2797.1207	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	557.2502	423.1057	321.4066	143.1192	41.1377	0.0000	0.0000	0.0000	0.0000	174.9567	384.0903	570.2414	(98)	
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)	
Space heating fuel (main heating system)	595.9895	452.5195	343.7504	153.0687	43.9975	0.0000	0.0000	0.0000	0.0000	187.1194	410.7917	609.8838	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	199.0147	175.4688	184.4143	165.5001	162.3186	145.2301	139.6611	152.9991	152.6498	171.6050	181.2222	194.2889	(64)	
Efficiency of water heater (217)m	87.4155	87.0773	86.2821	84.4292	81.7544	79.8000	79.8000	79.8000	79.8000	84.8654	86.7703	87.5178	(216)	
Fuel for water heating, kWh/month	227.6652	201.5093	213.7342	196.0224	198.5441	181.9926	175.0139	191.7282	191.2905	202.2083	208.8528	221.9992	(219)	
Water heating fuel used												2410.5608	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2797.1207	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													75.0000	(231)
Electricity for lighting (calculated in Appendix L)													342.8015	(232)
Total delivered energy for all uses													5625.4830	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2797.1207	0.2160	604.1781 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2410.5608	0.2160	520.6811 (264)
Space and water heating			1124.8592 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	342.8015	0.5190	177.9140 (268)
Total CO2, kg/m2/year			1341.6982 (272)
Emissions per m2 for space and water heating			14.4028 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2780 (272b)
Emissions per m2 for pumps and fans			0.4984 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.4028 * 1.55) + 2.2780 + 0.4984, rounded to 2 d.p.			25.1000 (273)

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Property Reference	024680	Issued on Date	13/08/2025
Assessment Reference	001	Prop Type Ref	
Property	Adj, 108, Elm Park Road, Reading , Berkshire		
SAP Rating	87 B	DER	15.87
Environmental	88 B	TER	25.10
CO ₂ Emissions (t/year)	0.99	% DER<TER	36.77
General Requirements Compliance	Pass	DFEE	47.10
		TFEE	47.56
		% DFEE<TFEE	0.97
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761 035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	25.10	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.87	kgCO ₂ /m ²	Pass
	-9.23 (-36.8%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	47.56	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	47.10	kWh/m ² /yr	
	-0.5 (-1.1%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	Pass
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using user-specified γ -value of 0.032

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Heat pump with radiators or underfloor - Electric Samsung Electronics AE050RXYDEG	
Secondary heating system	None	

BASIC COMPLIANCE REPORT

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 1.40 kWh/day
Permitted by DBSCG 2.10

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Not significant

Pass

Based on:

Overshading

Average

Windows facing East

4.69 m², No overhang

Windows facing West

9.26 m², No overhang

Air change rate

8.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Solid Wall

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Floor U-value

0.11

W/m²K

Door U-value

1.00

W/m²K

Thermal bridging y-value

0.032

W/m²K

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Property Reference	024680	Issued on Date	13/08/2025
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Environmental	88 B	TER	25.10
CO ₂ Emissions (t/year)	0.99	% DER<TER	36.77
General Requirements Compliance	Pass	DfEE	47.10
		TFEE	47.56
		% DfEE<TFEE	0.97
Assessor Details	Mr. Matthew Carter, Energy Calculations Limited, Tel: 01754 761 035, mcarter@energycalculations.co.uk		Assessor ID
			7869-0001
Client			

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

Orientation	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Urban
1.0 Property Type	House, End-Terrace
2.0 Number of Storeys	3
3.0 Date Built	2025
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	17.30 m	33.60 m ²	2.30 m
1st Storey:	20.28 m	28.16 m ²	2.48 m
2nd Storey:	11.50 m	16.34 m ²	2.40 m

7.0 Living Area 19.53 m²

8.0 Thermal Mass Parameter
Thermal Mass 352.96 kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Wall 1	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.18	140.00	100.39	84.49
Dormer	Timber Frame	Timber framed wall (one layer of plasterboard)	0.16	9.00	11.87	11.87

9.1 Party Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	51.36

9.2 Internal Walls

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Wall 1	Dense block, dense plaster	100.00	10.35
Internal Wall 2	Plasterboard on timber frame	9.00	10.42
Internal Wall 3	Plasterboard on timber frame	9.00	30.55
Internal Wall 4	Plasterboard on timber frame	9.00	24.00

10.0 External Roofs

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.14	9.00	5.10	5.10
Dormer Roof	External Flat Roof	Plasterboard, insulated flat roof	0.14	9.00	11.91	11.91
Slope	External Slope Roof	Plasterboard, insulated slope	0.15	9.00	21.03	20.05

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	33.60
Internal Ceiling 2	Plasterboard ceiling, carpeted chipboard floor	9.00	28.16

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid	Suspended concrete floor, carpeted	0.11	75.00	33.60

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	16.34
Internal Floor 2	Plasterboard ceiling, carpeted chipboard floor	18.00	28.16

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacture	Solid Door							1.00
Windows	Manufacture	Window	Double Low-E Soft 0.05			0.50		0.70	1.40
Roof windows	Manufacture	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Opening 1	Solid Door	[1] External Wall 1	East							1.95	
Opening 2	Window	[1] External Wall 1	East	None	0.00					4.69	
Opening 3	Roof Window	[3] Slope	East	None						0.98	
Opening 4	Window	[1] External Wall 1	West	None	0.00					9.26	

14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

No

17.0 Thermal Bridging

User Input

17.1 List of Bridges

Bridge Type	Length	Imported
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Y-value	0.032	W/m²K
Description	Calculated	

18.0 Pressure Testing

Designed AP ₅₀	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP ₅₀		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather Windows fully open

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP ♦ CODE ♦ SBEM ♦ DESIGN

Calculation Type: New Build (As Designed)

Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	8.00

Mechanical Ventilation

Mechanical Ventilation System Present	No
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20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				5
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	26	
Total number of L.E.L. fittings	26	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Database		
Percentage of Heat	100	%
Database Ref. No.	104360	
Fuel Type	Electricity	
Main Heating	PET	
SAP Code	224	
In Winter	274.2	
In Summer	285.9	
Controls	CHD Time and temperature zone control	
PCDF Controls	0	
Sap Code	2207	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	36° - 45°C	

25.0 Main Heating 2

None

Community Heating	None
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28.0 Water Heating

HWP From main heating 1	
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No

SUMMARY FOR INPUT DATA

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901
Immersion Only Heating Hot Water	Yes

29.0 Hot Water Cylinder	Hot Water Cylinder
Cylinder Stat	Yes
Cylinder In Heated Space	Yes
Independent Time Control	Yes
Insulation Type	Measured Loss
Cylinder Volume	180.00
Loss	1.40
Pipes insulation	Fully insulated primary pipework

L kWh/day

31.0 Thermal Store	None
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Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£75	B 89	
	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar photovoltaic panels, 2.5 kWp	£3,500 - £5,500	£475	A 99	