Building Performance Evaluation and Carbon Emissions Assessment

In Compliance with Building Regulation Approved Document Part L

11 Imperial Drive, North Harrow, HA2 7BP
Phone: 077 14866 707
E: Info@airtightbuildingsolutions.co.uk
W: www.airtightbuildingsolutions.co.uk

Site Address:	**99 & 99A London Road, Reading, RG1 5BY**
Project Type:	**Conversion to six residential properties**
Client / Performed for:	**Ameet Ghatahora**
Report Date:	**17 February 2025**
Issued by:	**Sammit Pancholi**
Report No:	**108170225-01**
Report Issued Date:	**17 February 2025**

Disclaimer

This report presents calculation using the Standard Assessment Procedure (SAP) to determine the 'CO_2 Emissions (t/year)' for the existing and proposed development located at **99 & 99A London Road, Reading, RG1 5BY**.

It serves as a technical resource for the client and its appointed professionals to inform building design, construction, and subsequent submission to local building control authorities for development approval. The calculations are based upon information provided by the client, including architectural drawings, material specifications, and construction details. While we have exercised due diligence in reviewing this information, any inherent inaccuracies or omissions could impact the presented results.

Third-Party Data Reliance:

The calculations may utilize thermal conductivity values and other data sourced from third-party sources. While we rely on the accuracy and reliability of such data, absolute correctness cannot be guaranteed.

Responsibility and Liability:

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The client is responsible for ensuring the report's information remains accurate and reflects any design or construction adjustments throughout the project lifecycle. Changes to building fabric elements or construction details may necessitate U-value recalculations.

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Evaluation Report Summary

Airtight Building Solutions Ltd has been requested to carry out a calculation using Standard Assessment Procedure (SAP) to determine the 'CO_2 Emissions (t/year)' for the existing and proposed development located at **99 & 99A London Road, Reading, RG1 5BY**.

The proposed development achieves a lower 'CO_2 Emissions (t/year)' than the existing development, by incorporating passive strategies such as improving the building fabric and adopting high-efficiency heating and hot water systems and installing renewable technology such as solar panels.

The purpose of this design note is to provide a review of the building performance of the development after incorporating all improvement strategies.

OBJECTIVES

1.1 To evaluate the building fabric to comply with Approved Document Part L1(a), at the following property: **99 & 99A London Road, Reading, RG1 5BY**

ASSESSMENT DETAILS

2.1	Type of property:	Conversion to six dwellings
2.2	Age of property:	N/A
2.3	Evaluated by:	Airtight Building Solutions Ltd. 11 Imperial Drive North Harrow HA2 7BP
2.6	Client:	Ameet Ghatahora

2.7 Description of building elements assessed: External walls, floor, roof, glazing, heating and hot water systems, and renewable capacity.

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PLANNING CONDITION AND CALCULATION METHODOLOGY

3.1 The client was requested to submit and receive approval by the Local Planning Authority demonstrating that the dwellings hereby permitted have achieved a minimum of a 19% improvement in the dwelling emission rate over the target emission rate as defined in The Building Regulations for England Approved Document L1a: Conservation of Fuel and Power in New Dwellings (2021 edition).

As this is a conversion project, a 'design stage' SAP assessment can be performed as requested in the first condition by the council. However, if the project is a conversion/extension in an existing dwelling, the SAP calculation generates only 'Dwelling Emission Rate (DER)' as a result in the final report and does not generate the metric 'Target Emission Rate (TER)'. Hence, there is no way to show a minimum of a 19% improvement in the dwelling emission rate over the target emission rate.

For conversion/existing dwellings, a single metric called 'CO_2 Emissions (t/year)' is provided, but with no target metric to compare with. Hence, the performance of the proposed dwelling was compared to the Part L 2021 Baseline, and the 'CO_2 Emissions (t/year) values' evaluated. The CO_2 Emissions area substitute to the 'DER<TER metric' to evaluate improved construction as well as reduction in carbon emissions by the dwelling.

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IMPROVEMENTS AND RESULTS

4.1 **Table 4.1** shows the fabric related improvements incorporated on **existing elements** in dwelling to achieve reduction in CO_2 Emissions (t/year) in the dwelling.

Table 4.1 Comparison of existing fabric elements with improved fabric U-values

Table 4.1			
Element type	**Part L 2021 Baseline for existing wall U-value W/ (m2 ·K)**	**Proposed U-value W/ (m2 ·K)**	**Improvement made to fabric**
External Wall	**0.30**	**0.21**	**102.5mm Celotex insulated plasterboard is added internally**
External Roof	**0.16**	**0.16**	**150mm Celotex between joists/rafters and additional 50mm Celotex insulation under joists**
External Floor	**0.25**	**0.1**	**200mm Celotex insulation above concrete base, and 65mm screed over**

Other key features and improvements include:

- Glazing improvements include reducing the U-value from 1.7 to 1.2 W/m^{2}K, and for rooflights from 2.2 to 1.3 W/m^{2}K. The external door for flat 2 has a reduced U-value of 1.4 as compared to 3 W/m^{2}K.
- Additionally, all the proposed dwellings include high efficiency combi boilers with Programmers, room thermostats and TRVs. They also include the boiler interlock and delayed stat functionality improving the efficiency of the dwelling.
- All dwellings have 0.6kW peak solar power capacity, with panels installed at a 30 deg pitch facing West, with an export capable meter.
- Lastly, all dwellings will have a low flow shower head (Grohe Tempesta 250mm Chrome Shower Head) with flow rate of 9.5L/min as compared to average rate of 11L/min; this greatly impacts the amount of heating required and thus reducing the carbon emissions further.

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4.2 Results

Table 4.2 Resultant reduction in CO2 Emissions (t/year).

Table 4.3			
Dwelling	**Baseline dwelling CO_2 Emissions (t/Year)**	**Proposed Dwelling CO_2 Emissions (t/Year)**	**Percentage Reduction in Emissions (%)**
Flat 1	**1.11**	**0.82**	**26.12**
Flat 2	**1.31**	**0.92**	**29.77**
Flat 3	**1.15**	**0.89**	**22.60**
Flat 4	**0.89**	**0.67**	**24.71**
Flat 5	**0.88**	**0.67**	**23.86**
Flat 6	**0.83**	**0.64**	**22.89**
Total Average Reduction in **CO_2 Emissions (t/Year)** for whole dwelling			**24.99%**

Table 4.2 shows cumulative impact of incorporating fabric improvements for all flats due to highly-efficient combi boilers with efficient controls, improvements to fabric and glazing, installing solar panels and the use of low flow shower heads for all flats, in reducing CO_2 Emissions released by the whole dwelling, by 24.99 **%.**

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Appendix

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Full SAP Calculation Printout

Property Reference	Flat 1 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Ground Floor Flat	**Prop Type Ref**	Ground Floor, Flat
Property	Flat 1, 99 London Road, Reading, RG1 5BY		

SAP Rating	76 C	**DER**	35.29	**TER**	
Environmental	79 C	**% DER < TER**			N/A
CO_2 Emissions (t/year)	1.11	**DFEE**	88.25	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	193.07	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.9500	(1b)	x 2.6900	(2b) =	96.7055	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.9500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	96.7055	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.2068 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9568 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8133 (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	1.0369	1.0166	0.9963	0.8946	0.8743	0.7726	0.7726	0.7523	0.8133	0.8743	0.9150	0.9556	(22b)
Effective ac	1.0369	1.0166	0.9963	0.9002	0.8822	0.7985	0.7985	0.7830	0.8307	0.8822	0.9186	0.9566	(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								
Window			5.8000	1.5918	9.2322			(27)
Heatloss Floor 1			35.9500	0.2500	8.9875	110.0000	3954.5000	(28a)
External Wall 1	22.1200	1.0500	21.0700	0.3000	6.3210	0.0000	0.0000	(29a)
External Cavity Wall	13.2700	4.7500	8.5200	0.1800	1.5336	60.0000	511.2000	(29a)
External Roof 1	7.3400		7.3400	0.1600	1.1744	9.0000	66.0600	(30)
Total net area of external elements Aum(A, m2)			78.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2487			(33)
Main dwelling								
Party Wall 1			18.1800	0.0000	0.0000	180.0000	3272.4001	(32)
Party Wall 2			19.3000	0.0000	0.0000	20.0000	386.0000	(32)
Party Ceiling 1			28.6100			20.0000	572.2000	(32b)
Internal Wall - Timber			50.9000			9.0000	458.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9220.4601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		256.4801 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.7360 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	42.9847 (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	33.0919	32.4430	31.7944	28.7271	28.1532	25.4816	25.4816	24.9869	26.5107	28.1532	29.3141	30.5279	(38)
Heat transfer coeff													
	76.0766	75.4277	74.7791	71.7118	71.1379	68.4663	68.4663	67.9716	69.4954	71.1379	72.2988	73.5126	(39)
Average = Sum(39)m / 12 =												71.7068	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1162	2.0981	2.0801	1.9948	1.9788	1.9045	1.9045	1.8907	1.9331	1.9788	2.0111	2.0449	(40)
HLP (average)												1.9946	
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												1.3033	(42)
Hot water usage for mixer showers													
	84.2063	82.9409	81.0969	77.5687	74.9649	72.0613	70.4109	72.2409	74.2470	77.3646	80.9686	83.8837	(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													
	27.9776	26.9602	25.9428	24.9255	23.9081	22.8907	22.8907	23.9081	24.9255	25.9428	26.9602	27.9776	(42c)
Average daily hot water use (litres/day)												103.0696	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	112.1839	109.9011	107.0397	102.4941	98.8730	94.9520	93.3016	96.1490	99.1725	103.3075	107.9288	111.8613	(44)
Energy conte	177.6719	156.4977	164.5160	140.3093	133.1021	116.7546	112.8402	119.0526	122.2896	140.1873	153.7644	175.1477	(45)
Energy content (annual)										Total = Sum(45)m =		1712.1334	
Distribution loss (46)m = 0.15 x (45)m													
	26.6508	23.4747	24.6774	21.0464	19.9653	17.5132	16.9260	17.8579	18.3434	21.0281	23.0647	26.2722	(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	(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	17.8224	16.0987	17.8157	17.2111	17.7573	17.1383	17.6836	17.7093	17.1675	17.7683	17.2228	17.8180	(61)
Total heat required for water heating calculated for each month													
	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(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													
	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(64)
										Total per year (kWh/year) = Sum(64)m =		1921.3465	(64)
12Total per year (kWh/year)												1921	(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													
	63.5315	56.0601	59.1555	50.9556	48.6958	43.1055	41.9403	44.0123	44.9532	51.0543	55.4324	62.6911	(65)

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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	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	58.5768	64.8529	58.5768	60.5294	58.5768	60.5294	58.5768	58.5768	60.5294	58.5768	60.5294	58.5768	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	111.4991	112.6561	109.7404	103.5334	95.6981	88.3341	83.4145	82.2574	85.1731	91.3801	99.2154	106.5794	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	(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)													
	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	(71)
Water heating gains (Table 5)													
	85.3918	83.4228	79.5101	70.7717	65.4513	59.8687	56.3713	59.1563	62.4349	68.6214	76.9894	84.2622	(72)
Total internal gains													
	298.0179	303.4820	290.3775	277.3847	262.2765	251.2824	240.9128	242.5408	250.6876	261.1286	279.2843	291.9687	(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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	319.7564	345.3101	360.8078	387.5124	407.0292	404.5442	384.6863	358.9273	334.5700	310.8727	306.1851	310.0198	(84)

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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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.6666	33.9562	34.2507	35.7157	36.0039	37.4087	37.4087	37.6810	36.8548	36.0039	35.4257	34.8408	
alpha	3.2444	3.2637	3.2834	3.3810	3.4003	3.4939	3.4939	3.5121	3.4570	3.4003	3.3617	3.3227	
util living area													
	0.9915	0.9881	0.9818	0.9627	0.9164	0.8074	0.6747	0.7219	0.8910	0.9689	0.9871	0.9924	(86)
MIT	18.6238	18.8179	19.1705	19.7440	20.2654	20.7128	20.8926	20.8618	20.5349	19.8835	19.2202	18.6635	(87)
Th 2	19.9419	19.9509	19.9600	20.0026	20.0106	20.0478	20.0478	20.0546	20.0334	20.0106	19.9945	19.9776	(88)
util rest of house													
	0.9897	0.9856	0.9776	0.9530	0.8914	0.7449	0.5652	0.6199	0.8489	0.9591	0.9840	0.9908	(89)

MIT 2	17.7649	17.9644	18.3216	18.9187	19.4293	19.8633	19.9998	19.9877	19.7045	19.0655	18.3964	17.8292	(90)
Living area fraction									fLA = Living area / (4) =			0.5166	(91)
MIT	18.2086	18.4053	18.7601	19.3450	19.8612	20.3021	20.4610	20.4392	20.1334	19.4881	18.8219	18.2602	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2086	18.4053	18.7601	19.3450	19.8612	20.3021	20.4610	20.4392	20.1334	19.4881	18.8219	18.2602	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9855	0.9804	0.9711	0.9449	0.8870	0.7634	0.6160	0.6649	0.8540	0.9524	0.9789	0.9871	(94)
Useful gains	315.1317	338.5591	350.3755	366.1762	361.0146	308.8464	236.9814	238.6568	285.7323	296.0859	299.7276	306.0272	(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	1058.1169	1018.6713	916.8004	749.0291	580.5709	390.4004	264.3454	274.5519	419.2949	632.2780	847.4830	1033.5992	(97)
Space heating kWh	552.7810	457.0354	421.4201	275.6541	163.3499	0.0000	0.0000	0.0000	0.0000	250.1269	394.3839	541.3136	(98a)
Space heating requirement - total per year (kWh/year)												3056.0648	
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	552.7810	457.0354	421.4201	275.6541	163.3499	0.0000	0.0000	0.0000	0.0000	250.1269	394.3839	541.3136	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3056.0648	
Space heating per m2											(98c) / (4) =	85.0088	(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 %)												84.0000	(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	552.7810	457.0354	421.4201	275.6541	163.3499	0.0000	0.0000	0.0000	0.0000	250.1269	394.3839	541.3136	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	658.0726	544.0898	501.6906	328.1597	194.4641	0.0000	0.0000	0.0000	0.0000	297.7701	469.5046	644.4209	(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	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(64)
Efficiency of water heater												78.9000	(216)
(217)m	86.1198	85.9828	85.6874	85.0413	83.8467	78.9000	78.9000	78.9000	78.9000	84.7984	85.6828	86.1034	(217)
Fuel for water heating, kWh/month	227.0027	200.7335	212.7870	185.2281	179.9229	169.6995	165.4294	173.3358	176.7517	186.2720	199.5583	224.1092	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	13.0682	10.4838	9.4395	6.9158	5.3419	4.3644	4.8731	6.3342	8.2275	10.7950	12.1929	13.4314	(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)
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	3638.1724	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2300.8301	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	105.4678	(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	6089.4703	(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	3638.1724	0.2100	764.0162	(261)

Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2300.8301	0.2100	483.1743	(264)
Space and water heating			1247.1905	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	105.4678	0.1443	15.2223	(268)
Total CO2, kg/year			1268.6548	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			35.2900	(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	3638.1724	1.1300	4111.1349	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2300.8301	1.1300	2599.9380	(278)
Space and water heating			6711.0729	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	105.4678	1.5338	161.7700	(282)
Total Primary energy kWh/year			6940.9188	(286)
Dwelling Primary energy Rate (DPER)			193.0700	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.9500	(1b) x	2.6900	(2b) =	96.7055	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.9500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	96.7055	(5)

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2. Ventilation rate

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		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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2068	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9568	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8133	(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	1.0369	1.0166	0.9963	0.8946	0.8743	0.7726	0.7726	0.7523	0.8133	0.8743	0.9150	0.9556	(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	1.0369	1.0166	0.9963	0.9002	0.8822	0.7985	0.7985	0.7830	0.8307	0.8822	0.9186	0.9566	(25)

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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								
Window			5.8000	1.5918	9.2322			(27)
Heatloss Floor 1			35.9500	0.2500	8.9875	110.0000	3954.5000	(28a)
External Wall 1	22.1200	1.0500	21.0700	0.3000	6.3210	0.0000	0.0000	(29a)
External Cavity Wall	13.2700	4.7500	8.5200	0.1800	1.5336	60.0000	511.2000	(29a)
External Roof 1	7.3400		7.3400	0.1600	1.1744	9.0000	66.0600	(30)
Total net area of external elements Aum(A, m2)			78.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2487			(33)
Main dwelling								
Party Wall 1			18.1800	0.0000	0.0000	180.0000	3272.4001	(32)
Party Wall 2			19.3000	0.0000	0.0000	20.0000	386.0000	(32)
Party Ceiling 1			28.6100			30.0000	858.3000	(32b)
Internal Wall - Timber			50.9000			9.0000	458.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9506.5601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		264.4384 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.7360 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	42.9847 (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	33.0919	32.4430	31.7944	28.7271	28.1532	25.4816	25.4816	24.9869	26.5107	28.1532	29.3141	30.5279	(38)
Heat transfer coeff	76.0766	75.4277	74.7791	71.7118	71.1379	68.4663	68.4663	67.9716	69.4954	71.1379	72.2988	73.5126	(39)
Average = Sum(39)m / 12 =												71.7068	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1162	2.0981	2.0801	1.9948	1.9788	1.9045	1.9045	1.8907	1.9331	1.9788	2.0111	2.0449	(40)
HLP (average)												1.9946	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3033 (42)

Hot water usage for mixer showers

	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

	19.9358	19.6397	19.2228	18.4540	17.8784	17.2401	16.8953	17.3094	17.7601	18.4431	19.2277	19.8684	(42b)

Hot water usage for other uses

	27.9776	26.9602	25.9428	24.9255	23.9081	22.8907	22.8907	23.9081	24.9255	25.9428	26.9602	27.9776	(42c)

Average daily hot water use (litres/day) 43.9178 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	47.9134	46.5999	45.1656	43.3795	41.7865	40.1309	39.7861	41.2175	42.6856	44.3860	46.1879	47.8460	(44)
Energy conte	75.8831	66.3577	69.4179	59.3844	56.2527	49.3456	48.1178	51.0358	52.6356	60.2314	65.8032	74.9152	(45)
Energy content (annual)										Total = Sum(45)m =		729.3803	

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	(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

	64.5006	56.4040	59.0052	50.4767	47.8148	41.9437	40.9001	43.3805	44.7403	51.1966	55.9327	63.6779	(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

	64.5006	56.4040	59.0052	50.4767	47.8148	41.9437	40.9001	43.3805	44.7403	51.1966	55.9327	63.6779	(64)
									Total per year (kWh/year) = Sum(64)m =			619.9732	(64)
12Total per year (kWh/year)												620	(64)

Electric shower(s)

	36.8962	32.8748	35.8980	34.2570	34.8998	33.2911	34.4008	34.8998	34.2570	35.8980	35.2230	36.8962	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							419.6917	(64a)

Heat gains from water heating, kWh/month

	25.3492	22.3197	23.7258	21.1834	20.6787	18.8087	18.8252	19.5701	19.7493	21.7737	22.7889	25.1435	(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	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.5768	64.8529	58.5768	60.5294	58.5768	60.5294	58.5768	58.5768	60.5294	58.5768	60.5294	58.5768	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	111.4991	112.6561	109.7404	103.5334	95.6981	88.3341	83.4145	82.2574	85.1731	91.3801	99.2154	106.5794	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	(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)	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	(71)
Water heating gains (Table 5)	34.0715	33.2138	31.8895	29.4214	27.7939	26.1232	25.3027	26.3039	27.4296	29.2657	31.6513	33.7951	(72)
Total internal gains	246.6976	253.2730	242.7570	236.0344	224.6190	217.5369	209.8442	209.6883	215.6823	221.7728	233.9462	241.5015	(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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	268.4361	295.1011	313.1872	346.1622	369.3717	370.7986	353.6177	326.0749	299.5646	271.5170	260.8470	259.5526	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.7112	35.0098	35.3135	36.8240	37.1210	38.5695	38.5695	38.8502	37.9984	37.1210	36.5249	35.9219	
alpha	3.3141	3.3340	3.3542	3.4549	3.4747	3.5713	3.5713	3.5900	3.5332	3.4747	3.4350	3.3948	
util living area	0.9954	0.9932	0.9889	0.9745	0.9371	0.8413	0.7149	0.7654	0.9192	0.9803	0.9928	0.9960	(86)
MIT	18.5512	18.7452	19.0991	19.6815	20.2139	20.6819	20.8779	20.8407	20.4877	19.8197	19.1502	18.5909	(87)
Th 2	19.2570	19.2687	19.2805	19.3368	19.3475	19.3978	19.3978	19.4072	19.3783	19.3475	19.3259	19.3036	(88)

util rest of house

	0.9936	0.9905	0.9839	0.9613	0.8984	0.7317	0.5121	0.5773	0.8508	0.9676	0.9893	0.9945	(89)
MIT 2	17.1306	17.3315	17.6913	18.3035	18.8188	19.2537	19.3714	19.3664	19.0974	18.4515	17.7740	17.2012	(90)
Living area fraction										fLA = Living area / (4) =		0.5166	(91)
MIT	17.8644	18.0618	18.4185	19.0153	19.5394	19.9914	20.1496	20.1279	19.8156	19.1583	18.4849	17.9190	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.8644	18.0618	18.4185	19.0153	19.5394	19.9914	20.1496	20.1279	19.8156	19.1583	18.4849	17.9190	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9876	0.9804	0.9579	0.9041	0.7795	0.6186	0.6750	0.8743	0.9656	0.9867	0.9926	(94)
Useful gains	266.1389	291.4498	307.0370	331.5753	333.9669	289.0295	218.7391	220.0843	261.9059	262.1706	257.3859	257.6250	(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	1031.9343	992.7618	891.2571	725.3878	557.6817	369.1297	243.0251	253.3928	397.2048	608.8166	823.1115	1008.5227	(97)
Space heating kWh	569.7517	471.2817	434.6597	283.5450	166.4438	0.0000	0.0000	0.0000	0.0000	257.9046	407.3225	558.6679	(98a)
Space heating requirement - total per year (kWh/year)												3149.5770	
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	569.7517	471.2817	434.6597	283.5450	166.4438	0.0000	0.0000	0.0000	0.0000	257.9046	407.3225	558.6679	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3149.5770	
Space heating per m2											(98c) / (4) =	87.6099	(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	643.5835	506.6509	516.5842	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.5868	0.6741	0.6287	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	377.6397	341.5248	324.7602	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	412.4178	393.5772	362.5012	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	25.0403	38.7270	28.0793	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	6.2601	9.6817	7.0198	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												22.9616	(107)
Energy for space heating												87.6099	(99)
Energy for space cooling												0.6387	(108)
Total												88.2486	(109)
Fabric Energy Efficiency (DFEE)												88.2	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.9500	(1b)	x 2.6900	(2b) =	96.7055	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.9500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	96.7055	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2068	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9568	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8133	(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	1.0369	1.0166	0.9963	0.8946	0.8743	0.7726	0.7726	0.7523	0.8133	0.8743	0.9150	0.9556 (22b)
Effective ac	1.0369	1.0166	0.9963	0.9002	0.8822	0.7985	0.7985	0.7830	0.8307	0.8822	0.9186	0.9566 (25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			5.8000	1.5918	9.2322			(27)
Heatloss Floor 1			35.9500	0.2500	8.9875	110.0000	3954.5000	(28a)
External Wall 1	22.1200	1.0500	21.0700	0.3000	6.3210	0.0000	0.0000	(29a)
External Cavity Wall	13.2700	4.7500	8.5200	0.1800	1.5336	60.0000	511.2000	(29a)
External Roof 1	7.3400		7.3400	0.1600	1.1744	9.0000	66.0600	(30)
Total net area of external elements Aum(A, m2)			78.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2487			(33)
Main dwelling								
Party Wall 1			18.1800	0.0000	0.0000	180.0000	3272.4001	(32)
Party Wall 2			19.3000	0.0000	0.0000	20.0000	386.0000	(32)
Party Ceiling 1			28.6100			30.0000	858.3000	(32b)
Internal Wall - Timber			50.9000			9.0000	458.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9506.5601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		264.4384 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.7360 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	42.9847 (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	33.0919	32.4430	31.7944	28.7271	28.1532	25.4816	25.4816	24.9869	26.5107	28.1532	29.3141	30.5279	(38)
Heat transfer coeff	76.0766	75.4277	74.7791	71.7118	71.1379	68.4663	68.4663	67.9716	69.4954	71.1379	72.2988	73.5126	(39)
Average = Sum(39)m / 12 =												71.7068	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1162	2.0981	2.0801	1.9948	1.9788	1.9045	1.9045	1.8907	1.9331	1.9788	2.0111	2.0449	(40)
HLP (average)												1.9946	
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												1.3033 (42)
Hot water usage for mixer showers	84.2063	82.9409	81.0969	77.5687	74.9649	72.0613	70.4109	72.2409	74.2470	77.3646	80.9686	83.8837 (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	27.9776	26.9602	25.9428	24.9255	23.9081	22.8907	22.8907	23.9081	24.9255	25.9428	26.9602	27.9776 (42c)
Average daily hot water use (litres/day)												103.0696 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.1839	109.9011	107.0397	102.4941	98.8730	94.9520	93.3016	96.1490	99.1725	103.3075	107.9288	111.8613	(44)
Energy conte	177.6719	156.4977	164.5160	140.3093	133.1021	116.7546	112.8402	119.0526	122.2896	140.1873	153.7644	175.1477	(45)
Energy content (annual)										Total = Sum(45)m =		1712.1334	
Distribution loss (46)m = 0.15 x (45)m	26.6508	23.4747	24.6774	21.0464	19.9653	17.5132	16.9260	17.8579	18.3434	21.0281	23.0647	26.2722	(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	(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	17.8224	16.0987	17.8157	17.2111	17.7573	17.1383	17.6836	17.7093	17.1675	17.7683	17.2228	17.8180	(61)
Total heat required for water heating calculated for each month	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(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	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(64)
										Total per year (kWh/year) = Sum(64)m =		1921.3465	(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	63.5315	56.0601	59.1555	50.9556	48.6958	43.1055	41.9403	44.0123	44.9532	51.0543	55.4324	62.6911	(65)

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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	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.9301	13.2607	10.7844	8.1645	6.1030	5.1524	5.5674	7.2367	9.7131	12.3330	14.3944	15.3450	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	166.4165	168.1434	163.7917	154.5275	142.8330	131.8419	124.4992	122.7723	127.1240	136.3882	148.0827	159.0738	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	(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)	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	(71)
Water heating gains (Table 5)	85.3918	83.4228	79.5101	70.7717	65.4513	59.8687	56.3713	59.1563	62.4349	68.6214	76.9894	84.2622	(72)
Total internal gains	336.9287	335.0173	324.2765	303.6540	284.5777	267.0534	256.6283	259.3557	269.4624	287.5330	309.6568	328.8714	(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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	358.6673	376.8454	394.7067	413.7817	429.3304	420.3152	400.4017	375.7422	353.3447	337.2772	336.5576	346.9225	(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	34.7112	35.0098	35.3135	36.8240	37.1210	38.5695	38.5695	38.8502	37.9984	37.1210	36.5249	35.9219	
alpha	3.3141	3.3340	3.3542	3.4549	3.4747	3.5713	3.5713	3.5900	3.5332	3.4747	3.4350	3.3948	
util living area	0.9891	0.9860	0.9783	0.9579	0.9087	0.7972	0.6597	0.7054	0.8806	0.9634	0.9844	0.9903	(86)
MIT	18.7649	18.9372	19.2867	19.8283	20.3235	20.7401	20.9065	20.8797	20.5775	19.9661	19.3295	18.8007	(87)
Th 2	19.9419	19.9509	19.9600	20.0026	20.0106	20.0478	20.0478	20.0546	20.0334	20.0106	19.9945	19.9776	(88)
util rest of house	0.9868	0.9830	0.9732	0.9471	0.8816	0.7324	0.5493	0.6015	0.8353	0.9519	0.9805	0.9883	(89)
MIT 2	17.9012	18.0790	18.4326	18.9976	19.4806	19.8836	20.0071	19.9980	19.7393	19.1425	18.5010	17.9620	(90)
Living area fraction										fLA = Living area / (4) =		0.5166	(91)
MIT	18.3473	18.5223	18.8738	19.4267	19.9160	20.3260	20.4717	20.4535	20.1723	19.5679	18.9290	18.3952	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3473	18.5223	18.8738	19.4267	19.9160	20.3260	20.4717	20.4535	20.1723	19.5679	18.9290	18.3952	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9820	0.9774	0.9663	0.9392	0.8786	0.7533	0.6016	0.6487	0.8429	0.9454	0.9750	0.9840	(94)
Useful gains	352.2158	368.3136	381.3891	388.6309	377.2062	316.6107	240.8668	243.7420	297.8216	318.8569	328.1315	341.3694	(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	1068.6737	1027.5020	925.2993	754.8885	584.4710	392.0398	265.0797	275.5206	421.9982	637.9589	855.2215	1043.5281	(97)
Space heating kWh	533.0446	442.9746	404.6692	263.7055	154.2050	0.0000	0.0000	0.0000	0.0000	237.4120	379.5048	522.4060	(98a)
Space heating requirement - total per year (kWh/year)												2937.9216	
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	533.0446	442.9746	404.6692	263.7055	154.2050	0.0000	0.0000	0.0000	0.0000	237.4120	379.5048	522.4060	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2937.9216	
Space heating per m2											(98c) / (4) =	81.7224	(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 %) 84.0000 (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	533.0446	442.9746	404.6692	263.7055	154.2050	0.0000	0.0000	0.0000	0.0000	237.4120	379.5048	522.4060	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	634.5769	527.3507	481.7490	313.9351	183.5773	0.0000	0.0000	0.0000	0.0000	282.6333	451.7914	621.9119	(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	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(64)
Efficiency of water heater												78.9000	(216)
(217)m	86.0444	85.9163	85.5965	84.9342	83.7014	78.9000	78.9000	78.9000	78.9000	84.6698	85.5966	86.0294	(217)
Fuel for water heating, kWh/month	227.2017	200.8890	213.0130	185.4618	180.2352	169.6995	165.4294	173.3358	176.7517	186.5548	199.7593	224.3020	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	13.0682	10.4838	9.4395	6.9158	5.3419	4.3644	4.8731	6.3342	8.2275	10.7950	12.1929	13.4314	(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)
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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	3497.5257	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2302.6332	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	105.4678	(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	5950.6267	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3497.5257	3.6400	127.3099	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2302.6332	3.6400	83.8158	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	105.4678	16.4900	17.3916	(250)
Additional standing charges			92.0000	(251)
Total energy cost			327.9379	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.4584	(257)
SAP value		76.3593	
SAP rating (Section 12)		76	(258)
SAP band		C	

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	3497.5257	0.2100	734.4804	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.6332	0.2100	483.5530	(264)
Space and water heating			1218.0334	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	105.4678	0.1443	15.2223	(268)
Total CO2, kg/year			1239.4977	(272)
CO2 emissions per m2			34.4800	(273)
EI value			79.4821	
EI rating			79	(274)
EI band			C	

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

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	35.9500 (1b)	x 2.6900 (2b) =	96.7055	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 35.9500				(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	96.7055	(5)

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2. Ventilation rate

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		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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2068 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9568 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8133 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.8743	0.8336	0.8336	0.7726	0.7930	0.6913	0.6913	0.6710	0.6913	0.7726	0.7523	0.8133	(22b)
Effective ac	0.8822	0.8475	0.8475	0.7985	0.8144	0.7389	0.7389	0.7251	0.7389	0.7985	0.7830	0.8307	(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								
Window			5.8000	1.5918	9.2322			(27)
Heatloss Floor 1			35.9500	0.2500	8.9875	110.0000	3954.5000	(28a)
External Wall 1	22.1200	1.0500	21.0700	0.3000	6.3210	0.0000	0.0000	(29a)
External Cavity Wall	13.2700	4.7500	8.5200	0.1800	1.5336	60.0000	511.2000	(29a)
External Roof 1	7.3400		7.3400	0.1600	1.1744	9.0000	66.0600	(30)
Total net area of external elements Aum(A, m2)			78.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2487			(33)
Main dwelling								
Party Wall 1			18.1800	0.0000	0.0000	180.0000	3272.4001	(32)
Party Wall 2			19.3000	0.0000	0.0000	20.0000	386.0000	(32)
Party Ceiling 1			28.6100			30.0000	858.3000	(32b)
Internal Wall - Timber			50.9000			9.0000	458.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9506.5601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		264.4384 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.7360 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	42.9847 (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	28.1532	27.0450	27.0450	25.4816	25.9895	23.5819	23.5819	23.1399	23.5819	25.4816	24.9869	26.5107	(38)
Heat transfer coeff	71.1379	70.0297	70.0297	68.4663	68.9743	66.5666	66.5666	66.1246	66.5666	68.4663	67.9716	69.4954	(39)
Average = Sum(39)m / 12 =												68.3663	
HLP	1.9788	1.9480	1.9480	1.9045	1.9186	1.8516	1.8516	1.8393	1.8516	1.9045	1.8907	1.9331	(40)
HLP (average)												1.9017	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.3033 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	84.2063	82.9409	81.0969	77.5687	74.9649	72.0613	70.4109	72.2409	74.2470	77.3646	80.9686	83.8837	(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	27.9776	26.9602	25.9428	24.9255	23.9081	22.8907	22.8907	23.9081	24.9255	25.9428	26.9602	27.9776	(42c)
Average daily hot water use (litres/day)												103.0696	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.1839	109.9011	107.0397	102.4941	98.8730	94.9520	93.3016	96.1490	99.1725	103.3075	107.9288	111.8613	(44)
Energy conte	177.6719	156.4977	164.5160	140.3093	133.1021	116.7546	112.8402	119.0526	122.2896	140.1873	153.7644	175.1477	(45)
Energy content (annual)										Total = Sum(45)m =		1712.1334	
Distribution loss (46)m = 0.15 x (45)m	26.6508	23.4747	24.6774	21.0464	19.9653	17.5132	16.9260	17.8579	18.3434	21.0281	23.0647	26.2722	(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	(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	17.8224	16.0987	17.8157	17.2111	17.7573	17.1383	17.6836	17.7093	17.1675	17.7683	17.2228	17.8180	(61)
Total heat required for water heating calculated for each month	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(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	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(64)
										Total per year (kWh/year) = Sum(64)m =		1921.3465	(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	63.5315	56.0601	59.1555	50.9556	48.6958	43.1055	41.9403	44.0123	44.9532	51.0543	55.4324	62.6911	(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	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.9301	13.2607	10.7844	8.1645	6.1030	5.1524	5.5674	7.2367	9.7131	12.3330	14.3944	15.3450	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
166.4165 168.1434 163.7917 154.5275 142.8330 131.8419 124.4992 122.7723 127.1240 136.3882 148.0827 159.0738 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
44.1234 44.1234 44.1234 44.1234 44.1234 44.1234 44.1234 44.1234 44.1234 44.1234 44.1234 44.1234 (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)
-52.1339 -52.1339 -52.1339 -52.1339 -52.1339 -52.1339 -52.1339 -52.1339 -52.1339 -52.1339 -52.1339 -52.1339 (71)
Water heating gains (Table 5)
85.3918 83.4228 79.5101 70.7717 65.4513 59.8687 56.3713 59.1563 62.4349 68.6214 76.9894 84.2622 (72)
Total internal gains
336.9287 335.0173 324.2765 303.6540 284.5777 267.0534 256.6283 259.3557 269.4624 287.5330 309.6568 328.8714 (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	
North	4.7500	12.7650	0.6300	0.7000	0.7700	18.5305	(74)
East	1.0500	23.8018	0.6300	0.7000	0.7700	7.6378	(76)

Solar gains 26.1684 44.2835 74.5620 118.7397 151.9098 169.9124 157.9212 131.2772 94.8457 56.6982 31.9610 21.8144 (83)
Total gains 363.0971 379.3008 398.8385 422.3937 436.4875 436.9658 414.5494 390.6329 364.3081 344.2312 341.6178 350.6857 (84)

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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	37.1210	37.7085	37.7085	38.5695	38.2855	39.6702	39.6702	39.9354	39.6702	38.5695	38.8502	37.9984	
alpha	3.4747	3.5139	3.5139	3.5713	3.5524	3.6447	3.6447	3.6624	3.6447	3.5713	3.5900	3.5332	
util living area	0.9868	0.9830	0.9722	0.9415	0.8652	0.6856	0.5039	0.5406	0.8192	0.9487	0.9795	0.9881	(86)
MIT	19.0743	19.2510	19.5863	20.0869	20.5446	20.8817	20.9726	20.9652	20.7435	20.1837	19.6133	19.0968	(87)
Th 2	20.0106	20.0260	20.0260	20.0478	20.0407	20.0742	20.0742	20.0803	20.0742	20.0478	20.0546	20.0334	(88)
util rest of house	0.9840	0.9794	0.9656	0.9261	0.8249	0.5961	0.3741	0.4095	0.7541	0.9321	0.9743	0.9856	(89)
MIT 2	18.2578	18.4443	18.7765	19.2826	19.7075	20.0130	20.0667	20.0701	19.9140	19.3814	18.8258	18.2965	(90)
Living area fraction										fLA = Living area / (4) =		0.5166	(91)
MIT	18.6795	18.8610	19.1948	19.6980	20.1399	20.4618	20.5347	20.5325	20.3425	19.7959	19.2326	18.7099	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6795	18.8610	19.1948	19.6980	20.1399	20.4618	20.5347	20.5325	20.3425	19.7959	19.2326	18.7099	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9789	0.9735	0.9584	0.9193	0.8296	0.6359	0.4407	0.4764	0.7751	0.9267	0.9684	0.9809	(94)
Useful gains	355.4386	369.2604	382.2447	388.2971	362.1044	277.8617	182.7020	186.0986	282.3901	318.9978	330.8279	343.9846	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	966.0203	921.6593	825.9850	670.8348	499.3684	310.3172	188.6938	193.9077	355.6289	567.9874	763.4971	945.8239	(97)
Space heating kWh	454.2728	371.2121	330.1428	203.4272	102.1244	0.0000	0.0000	0.0000	0.0000	185.2483	311.5218	447.7685	(98a)
Space heating requirement - total per year (kWh/year)												2405.7178	
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	454.2728	371.2121	330.1428	203.4272	102.1244	0.0000	0.0000	0.0000	0.0000	185.2483	311.5218	447.7685	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2405.7178	
Space heating per m2											(98c) / (4) =	66.9184	(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 %) 84.0000 (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	454.2728	371.2121	330.1428	203.4272	102.1244	0.0000	0.0000	0.0000	0.0000	185.2483	311.5218	447.7685	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	540.8010	441.9191	393.0272	242.1752	121.5767	0.0000	0.0000	0.0000	0.0000	220.5337	370.8593	533.0577	(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	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.6994	85.5252	85.1231	84.2911	82.6880	78.9000	78.9000	78.9000	78.9000	84.0483	85.1379	85.6962	(217)
Fuel for water heating, kWh/month	228.1164	201.8075	214.1977	186.8767	182.4442	169.6995	165.4294	173.3358	176.7517	187.9343	200.8356	225.1741	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	13.0682	10.4838	9.4395	6.9158	5.3419	4.3644	4.8731	6.3342	8.2275	10.7950	12.1929	13.4314	(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)
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	2863.9498	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2312.6028	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	105.4678	(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	5327.0204	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2863.9498	5.6000	160.3812	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2312.6028	5.6000	129.5058	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	105.4678	26.0600	27.4849	(250)
Additional standing charges			99.0000	(251)
Total energy cost			428.0988	(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	2863.9498	0.2100	601.4295	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2312.6028	0.2100	485.6466	(264)
Space and water heating			1087.0761	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	105.4678	0.1443	15.2223	(268)
Total CO2, kg/year			1108.5404	(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	2863.9498	1.1300	3236.2633	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2312.6028	1.1300	2613.2412	(278)
Space and water heating			5849.5045	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	105.4678	1.5338	161.7700	(282)
Total Primary energy kWh/year			6079.3505	(286)

SAP 10 EPC IMPROVEMENTS

Ground Floor Flat

Current energy efficiency rating:	C 76
Current environmental impact rating:	C 79

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

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

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

Potential energy efficiency rating: C 76
Potential environmental impact rating: C 79

Fuel prices for cost data on this page from database revision number 561 TEST (31 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£39	£39	£0
Mains gas	£389	£389	£0
Space heating	£271	£271	£0
Water heating	£130	£130	£0
Lighting	£27	£27	£0
Total cost of fuels	£428	£428	£0
Total cost of uses	£428	£428	£0
Delivered energy	148 kWh/m²	148 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	31 kg/m²	31 kg/m²	0 kg/m²
Primary energy	169 kWh/m²	169 kWh/m²	0 kWh/m²

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.9500	(1b)	x 2.6900	(2b) =	96.7055	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.9500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		96.7055	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2068	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9568	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8133	(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	1.0369	1.0166	0.9963	0.8946	0.8743	0.7726	0.7726	0.7523	0.8133	0.8743	0.9150	0.9556	(22b)
Effective ac	1.0369	1.0166	0.9963	0.9002	0.8822	0.7985	0.7985	0.7830	0.8307	0.8822	0.9186	0.9566	(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								
Window			5.8000	1.5918	9.2322			(27)
Heatloss Floor 1			35.9500	0.2500	8.9875	110.0000	3954.5000	(28a)
External Wall 1	22.1200	1.0500	21.0700	0.3000	6.3210	0.0000	0.0000	(29a)
External Cavity Wall	13.2700	4.7500	8.5200	0.1800	1.5336	60.0000	511.2000	(29a)
External Roof 1	7.3400		7.3400	0.1600	1.1744	9.0000	66.0600	(30)
Total net area of external elements Aum(A, m2)			78.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2487			(33)
Main dwelling								
Party Wall 1			18.1800	0.0000	0.0000	180.0000	3272.4001	(32)
Party Wall 2			19.3000	0.0000	0.0000	20.0000	386.0000	(32)
Party Ceiling 1			28.6100			30.0000	858.3000	(32b)
Internal Wall - Timber			50.9000			9.0000	458.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9506.5601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		264.4384 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.7360 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	42.9847 (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	33.0919	32.4430	31.7944	28.7271	28.1532	25.4816	25.4816	24.9869	26.5107	28.1532	29.3141	30.5279	(38)
Heat transfer coeff													
	76.0766	75.4277	74.7791	71.7118	71.1379	68.4663	68.4663	67.9716	69.4954	71.1379	72.2988	73.5126	(39)
Average = Sum(39)m / 12 =												71.7068	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1162	2.0981	2.0801	1.9948	1.9788	1.9045	1.9045	1.8907	1.9331	1.9788	2.0111	2.0449	(40)
HLP (average)												1.9946	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3033	(42)
Hot water usage for mixer showers													
	84.2063	82.9409	81.0969	77.5687	74.9649	72.0613	70.4109	72.2409	74.2470	77.3646	80.9686	83.8837	(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													
	27.9776	26.9602	25.9428	24.9255	23.9081	22.8907	22.8907	23.9081	24.9255	25.9428	26.9602	27.9776	(42c)
Average daily hot water use (litres/day)												103.0696	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	112.1839	109.9011	107.0397	102.4941	98.8730	94.9520	93.3016	96.1490	99.1725	103.3075	107.9288	111.8613	(44)
Energy conte	177.6719	156.4977	164.5160	140.3093	133.1021	116.7546	112.8402	119.0526	122.2896	140.1873	153.7644	175.1477	(45)
Energy content (annual)										Total = Sum(45)m =		1712.1334	
Distribution loss (46)m = 0.15 x (45)m													
	26.6508	23.4747	24.6774	21.0464	19.9653	17.5132	16.9260	17.8579	18.3434	21.0281	23.0647	26.2722	(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	(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	17.8224	16.0987	17.8157	17.2111	17.7573	17.1383	17.6836	17.7093	17.1675	17.7683	17.2228	17.8180	(61)
Total heat required for water heating calculated for each month													
	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(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													
	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(64)
										Total per year (kWh/year) = Sum(64)m =		1921.3465	(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													
	63.5315	56.0601	59.1555	50.9556	48.6958	43.1055	41.9403	44.0123	44.9532	51.0543	55.4324	62.6911	(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	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.9301	13.2607	10.7844	8.1645	6.1030	5.1524	5.5674	7.2367	9.7131	12.3330	14.3944	15.3450	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	166.4165	168.1434	163.7917	154.5275	142.8330	131.8419	124.4992	122.7723	127.1240	136.3882	148.0827	159.0738	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	(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)													
	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	(71)
Water heating gains (Table 5)													
	85.3918	83.4228	79.5101	70.7717	65.4513	59.8687	56.3713	59.1563	62.4349	68.6214	76.9894	84.2622	(72)
Total internal gains													
	336.9287	335.0173	324.2765	303.6540	284.5777	267.0534	256.6283	259.3557	269.4624	287.5330	309.6568	328.8714	(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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	358.6673	376.8454	394.7067	413.7817	429.3304	420.3152	400.4017	375.7422	353.3447	337.2772	336.5576	346.9225	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.7112	35.0098	35.3135	36.8240	37.1210	38.5695	38.5695	38.8502	37.9984	37.1210	36.5249	35.9219	
alpha	3.3141	3.3340	3.3542	3.4549	3.4747	3.5713	3.5713	3.5900	3.5332	3.4747	3.4350	3.3948	
util living area													
	0.9891	0.9860	0.9783	0.9579	0.9087	0.7972	0.6597	0.7054	0.8806	0.9634	0.9844	0.9903	(86)
MIT	18.7649	18.9372	19.2867	19.8283	20.3235	20.7401	20.9065	20.8797	20.5775	19.9661	19.3295	18.8007	(87)
Th 2	19.9419	19.9509	19.9600	20.0026	20.0106	20.0478	20.0478	20.0546	20.0334	20.0106	19.9945	19.9776	(88)
util rest of house													
	0.9868	0.9830	0.9732	0.9471	0.8816	0.7324	0.5493	0.6015	0.8353	0.9519	0.9805	0.9883	(89)
MIT 2	17.9012	18.0790	18.4326	18.9976	19.4806	19.8836	20.0071	19.9980	19.7393	19.1425	18.5010	17.9620	(90)

Living area fraction										fLA = Living area / (4) =		0.5166	(91)
MIT	18.3473	18.5223	18.8738	19.4267	19.9160	20.3260	20.4717	20.4535	20.1723	19.5679	18.9290	18.3952	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3473	18.5223	18.8738	19.4267	19.9160	20.3260	20.4717	20.4535	20.1723	19.5679	18.9290	18.3952	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9820	0.9774	0.9663	0.9392	0.8786	0.7533	0.6016	0.6487	0.8429	0.9454	0.9750	0.9840	(94)
Useful gains	352.2158	368.3136	381.3891	388.6309	377.2062	316.6107	240.8668	243.7420	297.8216	318.8569	328.1315	341.3694	(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													
	1068.6737	1027.5020	925.2993	754.8885	584.4710	392.0398	265.0797	275.5206	421.9982	637.9589	855.2215	1043.5281	(97)
Space heating kWh													
	533.0446	442.9746	404.6692	263.7055	154.2050	0.0000	0.0000	0.0000	0.0000	237.4120	379.5048	522.4060	(98a)
Space heating requirement - total per year (kWh/year)												2937.9216	
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													
	533.0446	442.9746	404.6692	263.7055	154.2050	0.0000	0.0000	0.0000	0.0000	237.4120	379.5048	522.4060	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2937.9216	
Space heating per m2											(98c) / (4) =	81.7224	(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 %)												84.0000	(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													
	533.0446	442.9746	404.6692	263.7055	154.2050	0.0000	0.0000	0.0000	0.0000	237.4120	379.5048	522.4060	(98)
Space heating efficiency (main heating system 1)													
	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)													
	634.5769	527.3507	481.7490	313.9351	183.5773	0.0000	0.0000	0.0000	0.0000	282.6333	451.7914	621.9119	(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													
	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(64)
Efficiency of water heater												78.9000	(216)
(217)m	86.0444	85.9163	85.5965	84.9342	83.7014	78.9000	78.9000	78.9000	78.9000	84.6698	85.5966	86.0294	(217)
Fuel for water heating, kWh/month													
	227.2017	200.8890	213.0130	185.4618	180.2352	169.6995	165.4294	173.3358	176.7517	186.5548	199.7593	224.3020	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	13.0682	10.4838	9.4395	6.9158	5.3419	4.3644	4.8731	6.3342	8.2275	10.7950	12.1929	13.4314	(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)
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												3497.5257	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												78.9000	
Water heating fuel used												2302.6332	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												45.0000	(231)
Electricity for lighting (calculated in Appendix L)												105.4678	(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												5950.6267	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3497.5257	3.6400	127.3099	(240)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	2302.6332	3.6400	83.8158	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	105.4678	16.4900	17.3916	(250)
Additional standing charges			92.0000	(251)
Total energy cost			327.9379	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.4584	(257)
SAP value		76.3593	
SAP rating (Section 12)		76	(258)
SAP band		C	

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	3497.5257	0.2100	734.4804	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2302.6332	0.2100	483.5530	(264)
Space and water heating			1218.0334	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	105.4678	0.1443	15.2223	(268)
Total CO2, kg/year			1239.4977	(272)
CO2 emissions per m2			34.4800	(273)
EI value			79.4821	
EI rating			79	(274)
EI band			C	

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

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	35.9500 (1b)	x 2.6900 (2b)	= 96.7055	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.9500			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	96.7055	(5)

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2. Ventilation rate

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	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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2068	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9568	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8133	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.8743	0.8336	0.8336	0.7726	0.7930	0.6913	0.6913	0.6710	0.6913	0.7726	0.7523	0.8133	(22b)
Effective ac	0.8822	0.8475	0.8475	0.7985	0.8144	0.7389	0.7389	0.7251	0.7389	0.7985	0.7830	0.8307	(25)

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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								
Window			5.8000	1.5918	9.2322			(27)
Heatloss Floor 1			35.9500	0.2500	8.9875	110.0000	3954.5000	(28a)
External Wall 1	22.1200	1.0500	21.0700	0.3000	6.3210	0.0000	0.0000	(29a)
External Cavity Wall	13.2700	4.7500	8.5200	0.1800	1.5336	60.0000	511.2000	(29a)
External Roof 1	7.3400		7.3400	0.1600	1.1744	9.0000	66.0600	(30)
Total net area of external elements Aum(A, m2)			78.6800					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	27.2487	(33)
Main dwelling					
Party Wall 1	18.1800	0.0000	0.0000	180.0000	3272.4001 (32)
Party Wall 2	19.3000	0.0000	0.0000	20.0000	386.0000 (32)
Party Ceiling 1	28.6100			30.0000	858.3000 (32b)
Internal Wall - Timber	50.9000			9.0000	458.1000 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =		9506.5601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					264.4384 (35)
Thermal bridges (Default value 0.200 * total exposed area)					15.7360 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =		42.9847 (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	28.1532	27.0450	27.0450	25.4816	25.9895	23.5819	23.5819	23.1399	23.5819	25.4816	24.9869	26.5107	(38)
Heat transfer coeff	71.1379	70.0297	70.0297	68.4663	68.9743	66.5666	66.5666	66.1246	66.5666	68.4663	67.9716	69.4954	(39)
Average = Sum(39)m / 12 =												68.3663	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9788	1.9480	1.9480	1.9045	1.9186	1.8516	1.8516	1.8393	1.8516	1.9045	1.8907	1.9331	(40)
HLP (average)												1.9017	
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												1.3033	(42)
Hot water usage for mixer showers													
	84.2063	82.9409	81.0969	77.5687	74.9649	72.0613	70.4109	72.2409	74.2470	77.3646	80.9686	83.8837	(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													
	27.9776	26.9602	25.9428	24.9255	23.9081	22.8907	22.8907	23.9081	24.9255	25.9428	26.9602	27.9776	(42c)
Average daily hot water use (litres/day)												103.0696	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	112.1839	109.9011	107.0397	102.4941	98.8730	94.9520	93.3016	96.1490	99.1725	103.3075	107.9288	111.8613	(44)
Energy conte	177.6719	156.4977	164.5160	140.3093	133.1021	116.7546	112.8402	119.0526	122.2896	140.1873	153.7644	175.1477	(45)
Energy content (annual)										Total = Sum(45)m =		1712.1334	
Distribution loss (46)m = 0.15 x (45)m													
	26.6508	23.4747	24.6774	21.0464	19.9653	17.5132	16.9260	17.8579	18.3434	21.0281	23.0647	26.2722	(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	(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	17.8224	16.0987	17.8157	17.2111	17.7573	17.1383	17.6836	17.7093	17.1675	17.7683	17.2228	17.8180	(61)
Total heat required for water heating calculated for each month													
	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(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													
	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(64)
										Total per year (kWh/year) = Sum(64)m =		1921.3465	(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)
Heat gains from water heating, kWh/month													
	63.5315	56.0601	59.1555	50.9556	48.6958	43.1055	41.9403	44.0123	44.9532	51.0543	55.4324	62.6911	(65)

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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	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.9301	13.2607	10.7844	8.1645	6.1030	5.1524	5.5674	7.2367	9.7131	12.3330	14.3944	15.3450	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	166.4165	168.1434	163.7917	154.5275	142.8330	131.8419	124.4992	122.7723	127.1240	136.3882	148.0827	159.0738	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	(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)													
	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	(71)
Water heating gains (Table 5)													
	85.3918	83.4228	79.5101	70.7717	65.4513	59.8687	56.3713	59.1563	62.4349	68.6214	76.9894	84.2622	(72)
Total internal gains													
	336.9287	335.0173	324.2765	303.6540	284.5777	267.0534	256.6283	259.3557	269.4624	287.5330	309.6568	328.8714	(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	
North	4.7500	12.7650	0.6300	0.7000	0.7700	18.5305	(74)
East	1.0500	23.8018	0.6300	0.7000	0.7700	7.6378	(76)

Solar gains	26.1684	44.2835	74.5620	118.7397	151.9098	169.9124	157.9212	131.2772	94.8457	56.6982	31.9610	21.8144	(83)
Total gains	363.0971	379.3008	398.8385	422.3937	436.4875	436.9658	414.5494	390.6329	364.3081	344.2312	341.6178	350.6857	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	37.1210	37.7085	37.7085	38.5695	38.2855	39.6702	39.6702	39.9354	39.6702	38.5695	38.8502	37.9984	
alpha	3.4747	3.5139	3.5139	3.5713	3.5524	3.6447	3.6447	3.6624	3.6447	3.5713	3.5900	3.5332	
util living area	0.9868	0.9830	0.9722	0.9415	0.8652	0.6856	0.5039	0.5406	0.8192	0.9487	0.9795	0.9881	(86)
MIT	19.0743	19.2510	19.5863	20.0869	20.5446	20.8817	20.9726	20.9652	20.7435	20.1837	19.6133	19.0968	(87)
Th 2	20.0106	20.0260	20.0260	20.0478	20.0407	20.0742	20.0742	20.0803	20.0742	20.0478	20.0546	20.0334	(88)
util rest of house	0.9840	0.9794	0.9656	0.9261	0.8249	0.5961	0.3741	0.4095	0.7541	0.9321	0.9743	0.9856	(89)
MIT 2	18.2578	18.4443	18.7765	19.2826	19.7075	20.0130	20.0667	20.0701	19.9140	19.3814	18.8258	18.2965	(90)
Living area fraction									fLA = Living area / (4) =			0.5166	(91)
MIT	18.6795	18.8610	19.1948	19.6980	20.1399	20.4618	20.5347	20.5325	20.3425	19.7959	19.2326	18.7099	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6795	18.8610	19.1948	19.6980	20.1399	20.4618	20.5347	20.5325	20.3425	19.7959	19.2326	18.7099	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9789	0.9735	0.9584	0.9193	0.8296	0.6359	0.4407	0.4764	0.7751	0.9267	0.9684	0.9809	(94)
Useful gains	355.4386	369.2604	382.2447	388.2971	362.1044	277.8617	182.7020	186.0986	282.3901	318.9978	330.8279	343.9846	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	966.0203	921.6593	825.9850	670.8348	499.3684	310.3172	188.6938	193.9077	355.6289	567.9874	763.4971	945.8239	(97)
Space heating kWh	454.2728	371.2121	330.1428	203.4272	102.1244	0.0000	0.0000	0.0000	0.0000	185.2483	311.5218	447.7685	(98a)
Space heating requirement - total per year (kWh/year)												2405.7178	
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	454.2728	371.2121	330.1428	203.4272	102.1244	0.0000	0.0000	0.0000	0.0000	185.2483	311.5218	447.7685	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2405.7178	
Space heating per m2											(98c) / (4) =	66.9184	(99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)												84.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement	454.2728	371.2121	330.1428	203.4272	102.1244	0.0000	0.0000	0.0000	0.0000	185.2483	311.5218	447.7685	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	540.8010	441.9191	393.0272	242.1752	121.5767	0.0000	0.0000	0.0000	0.0000	220.5337	370.8593	533.0577	(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	195.4943	172.5964	182.3317	157.5205	150.8594	133.8929	130.5238	136.7619	139.4571	157.9556	170.9872	192.9657	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.6994	85.5252	85.1231	84.2911	82.6880	78.9000	78.9000	78.9000	78.9000	84.0483	85.1379	85.6962	(217)
Fuel for water heating, kWh/month	228.1164	201.8075	214.1977	186.8767	182.4442	169.6995	165.4294	173.3358	176.7517	187.9343	200.8356	225.1741	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	13.0682	10.4838	9.4395	6.9158	5.3419	4.3644	4.8731	6.3342	8.2275	10.7950	12.1929	13.4314	(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)
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												2863.9498	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												78.9000	
Water heating fuel used												2312.6028	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												45.0000	(231)
Electricity for lighting (calculated in Appendix L)												105.4678	(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	5327.0204	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2863.9498	5.6000	160.3812	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2312.6028	5.6000	129.5058	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	105.4678	26.0600	27.4849	(250)
Additional standing charges			99.0000	(251)
Total energy cost			428.0988	(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	2863.9498	0.2100	601.4295	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2312.6028	0.2100	485.6466	(264)
Space and water heating			1087.0761	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	105.4678	0.1443	15.2223	(268)
Total CO2, kg/year			1108.5404	(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	2863.9498	1.1300	3236.2633	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2312.6028	1.1300	2613.2412	(278)
Space and water heating			5849.5045	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	105.4678	1.5338	161.7700	(282)
Total Primary energy kWh/year			6079.3505	(286)

Predicted Energy Assessment

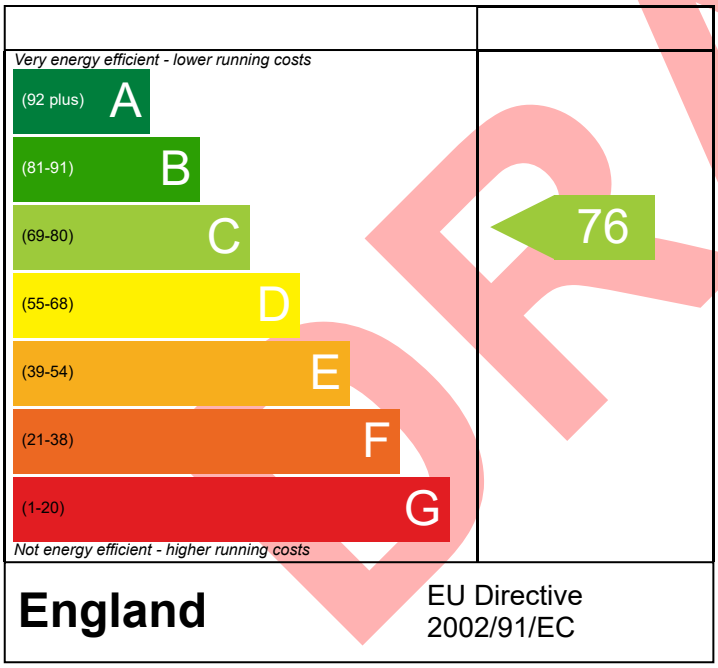
Flat 1, 99 London Road, Reading, RG1 5BY

Dwelling type:	Flat, Semi-Detached
Date of assessment:	17/02/2025
Produced by:	Sammit Pancholi
Total floor area:	35.95 m²
DRRN:	

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.

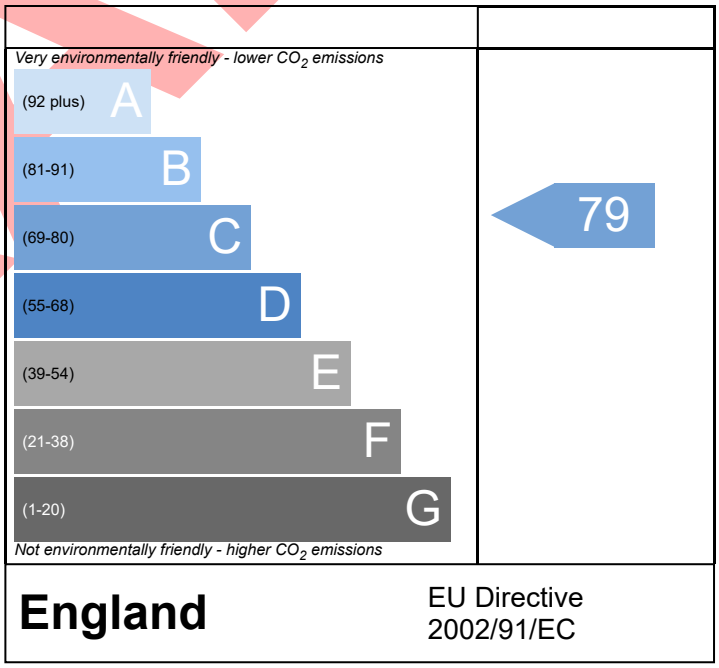
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

Property Reference	Flat 1 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Ground Floor Flat	**Prop Type Ref**	Ground Floor, Flat
Property	Flat 1, 99 London Road, Reading, RG1 5BY		

SAP Rating	76 C	**DER**	35.29	**TER**	
Environmental	79 C	**% DER < TER**			N/A
CO_2 Emissions (t/year)	1.11	**DFEE**	88.25	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	193.07	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	5	
Terrain Type	Suburban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	0	
2.0 Number of Storeys	1	
3.0 Date Built	2025	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	264.44	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	13.65 m	35.95 m²	2.69 m

8.0 Living Area	18.57	m²

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
External Wall 1	Solid Wall	Other	0.30	0.00	22.12	21.07	0.00	None	1.05	Enter Gross Area
External Cavity Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.18	60.00	13.27	8.52	0.00	None	4.75	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, dense blocks, cavity or cavity fill	0.00	180.00	18.18		None
Party Wall 2	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	20.00	19.30		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall - Timber	Plasterboard on timber frame	9.00	50.90

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
External Roof 1	External Plane Roof	Plasterboard, insulated at ceiling level	0.16	9.00	7.34	7.34	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Summary for Input Data

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Timber I-joists, carpeted	20.00	28.61

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.25	None	0.00	110.00	35.95

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	SAP table	Solid Door				0.00			3.00
Window	SAP table	Window	Double Low-E Soft 0.05	≥ 16 mm	Argon Filled	0.63	PVC	0.70	1.70

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening 1	Window	External Wall 1	East	1.05	
Opening 2	Window	External Cavity Wall	North	4.75	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.20	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	2	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	No	
Test Method	Blower Door	
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
LED	66.00	8.00	528.00	15

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18830	
Fuel Type	Mains gas	
In Winter	84.00	
In Summer	78.90	
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Controls SAP Code	2104	
Delayed Start Stat	No	

Summary for Input Data

Flue Type	Open
Fan Assisted Flue	Yes
Is MHS Pumped	No pump
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	No
Combi boiler type	Standard Combi
Combi keep hot type	None

25.0 Main Heating 2 — None

26.0 Heat Networks — None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	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	0

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.40		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder — None

In Airing Cupboard — No

34.0 Small-scale Hydro — None

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

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
			0	0
			0	0
			0	0

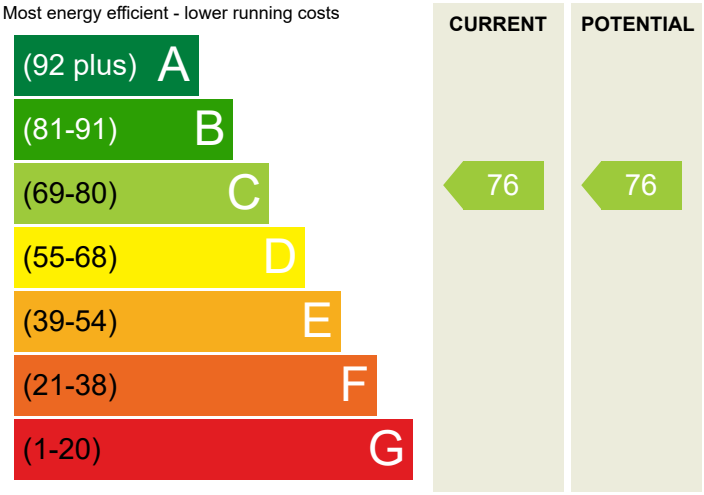
Energy Report

Dwelling Address	Flat 1, 99 London Road, Reading, RG1 5BY
Reference	Flat 1 - Baseline-Ground Floor Flat
Assessment Date	17/02/2025
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	36

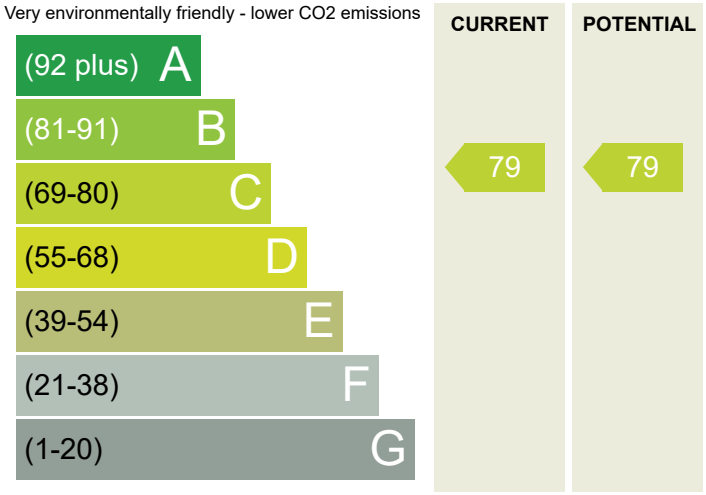
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

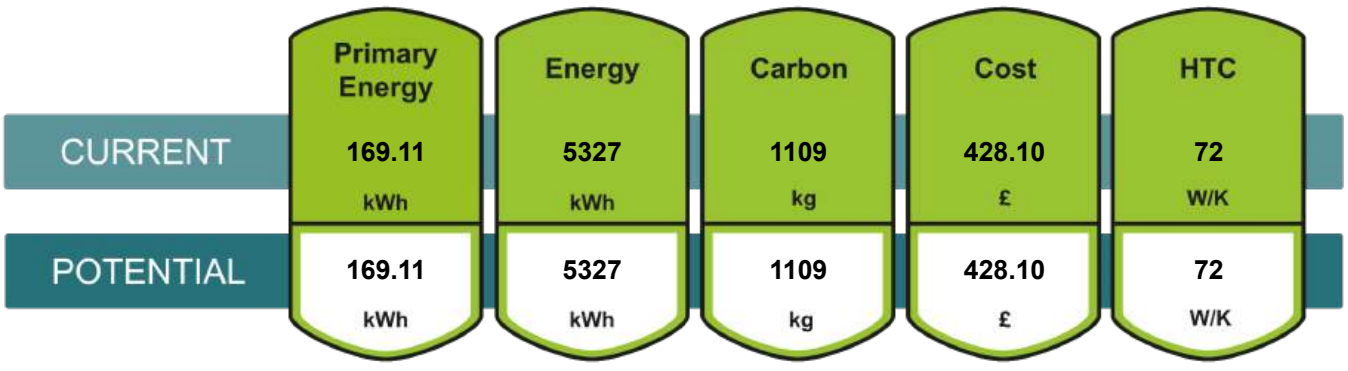
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.27 W/m²K	Good
Roof	Average thermal transmittance 0.16 W/m²K	Very Good
Floor	Average thermal transmittance 0.25 W/m²K	Good
Windows	Fully double glazed	Average
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer and room thermostat	Average
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Energy Report

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£27	£27	
Heating	£271	£271	
Hot Water	£130	£130	
New Technologies e.g. Impact of PV	£0	£0	
TOTAL	£428	£428	

Estimated energy use and potential savings

Space Heating
2864
kWh per year

Water Heating
2313
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report

Property Reference	Flat 1 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Ground Floor Flat	**Prop Type Ref**	Semi-Detached Flat
Property	Flat 1, 99 London Road, Reading, RG1 5BY		

SAP Rating	76 C	**DER**	35.29	**TER**	
Environmental	79 C	**% DER < TER**			N/A
CO_2 Emissions (t/year)	1.11	**DFEE**	88.25	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	193.07	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	Flat 1, 99 London Road	
House Number		
Postcode	RG1 5BY	
Street		
Town	Reading	
County		

Dwelling Orientation South (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Suburban

Property Type Flat, Semi-Detached

Comments

Electricity Tariff Standard

Smart electricity meter fitted: No

Smart gas meter fitted: No

Comments

Section 2: Dwelling Construction Details

External Walls

Description	External Wall 1		
Type	Solid Wall		
Construction	Other		
U-value	0.30	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	22.12	m²	

Description	External Cavity Wall		
Type	Cavity Wall		
Construction	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure		
U-value	0.18	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	13.27	m²	

Comments

Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	18.18
Party Wall 2	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	19.30

Comments

External Roofs

Description	External Roof 1		
Type	External Plane Roof		
Construction	Plasterboard, insulated at ceiling level		
U-value	0.16	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	7.34	m²	

Comments

Heat Loss Floors

Description	Heatloss Floor 1		
Type	Ground Floor - Solid		
Construction	Slab on ground, screed over insulation		
U-value	0.25	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Area	35.95	m²	

Comments

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
Door	SAP table	Solid Door		0.00	Wood	3.00
Window	SAP table	Window	Double Low-E Soft 0.05	0.63	PVC	1.70

Comments

Openings

Name	Opening Type	Location	Orientation	Area (m^2)
Opening 1	Window	External Wall 1	East	1.05
Opening 2	Window	External Cavity Wall	North	4.75

Comments

Thermal Bridging Default

Y-value 0.200

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing No

Designed AP_{50} 8.00 $m^3/(h.m^2)$ @ 50 Pa

Property Tested? Yes

Test Method Blower Door

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

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	2
Number of passive vents	0
Number of flueless gas fires	0

Comments

Fixed Cooling System No

Comments

Lighting

No Fixed Lighting: No

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
LED	66.00	8.00	528.00	15

Comments

Main Heating 1: Database

Fuel Type	Mains gas	
Winter Efficiency	84.00	%
Summer Efficiency	78.90	%
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Flue Type	Open	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Programmer and room thermostat
Boiler Interlock	No
Delayed Start Stat	No
PCDF Control Description	

Comments

Main Heating 2: None

Secondary Heating: None

Water Heating System

Water Heating	Main Heating 1
Supplementary Immersion	No
SAP Code	901
Water use <= 125 l/p/day	Yes
Cold Water Source	From mains

Number of baths: 0

Comments

Hot Water Cylinder: None

Comments

Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.40		No	

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit: None

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed .....

Date .....

Full SAP Calculation Printout

Property Reference	Flat 1 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Ground Floor Flat	**Prop Type Ref**	Ground Floor, Flat
Property	Flat 1, 99 London Road, Reading, RG1 5BY		

SAP Rating	83 B	**DER**	26.80	**TER**	
Environmental	85 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.82	**DFEE**	73.63	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	143.41	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.9500	(1b)	x 2.6900	(2b) =	96.7055	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.9500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	96.7055	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.2068 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9568 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8133 (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	1.0369	1.0166	0.9963	0.8946	0.8743	0.7726	0.7726	0.7523	0.8133	0.8743	0.9150	0.9556	(22b)
Effective ac	1.0369	1.0166	0.9963	0.9002	0.8822	0.7985	0.7985	0.7830	0.8307	0.8822	0.9186	0.9566	(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								
Window			5.8000	1.1450	6.6412			(27)
Heatloss Floor 1			35.9500	0.1000	3.5950	110.0000	3954.5000	(28a)
External Wall 1	22.1200	1.0500	21.0700	0.2100	4.4247	0.0000	0.0000	(29a)
External Cavity Wall	13.2700	4.7500	8.5200	0.1800	1.5336	60.0000	511.2000	(29a)
External Roof 1	7.3400		7.3400	0.1400	1.0276	9.0000	66.0600	(30)
Total net area of external elements Aum(A, m2)			78.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.2221			(33)
Main dwelling								
Party Wall 1			18.1800	0.0000	0.0000	180.0000	3272.4001	(32)
Party Wall 2			19.3000	0.0000	0.0000	20.0000	386.0000	(32)
Party Ceiling 1			28.6100			20.0000	572.2000	(32b)
Internal Wall - Timber			50.9000			9.0000	458.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9220.4601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		256.4801 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.7360 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	32.9581 (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	33.0919	32.4430	31.7944	28.7271	28.1532	25.4816	25.4816	24.9869	26.5107	28.1532	29.3141	30.5279	(38)
Heat transfer coeff													
	66.0500	65.4011	64.7525	61.6852	61.1113	58.4397	58.4397	57.9450	59.4688	61.1113	62.2723	63.4860	(39)
Average = Sum(39)m / 12 =												61.6802	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8373	1.8192	1.8012	1.7159	1.6999	1.6256	1.6256	1.6118	1.6542	1.6999	1.7322	1.7660	(40)
HLP (average)												1.7157	
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												1.3033	(42)
Hot water usage for mixer showers													
	70.1719	69.1174	67.5807	64.6405	62.4708	60.0511	58.6757	60.2008	61.8725	64.4705	67.4739	69.9031	(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													
	27.9776	26.9602	25.9428	24.9255	23.9081	22.8907	22.8907	23.9081	24.9255	25.9428	26.9602	27.9776	(42c)
Average daily hot water use (litres/day)												90.1303	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	98.1495	96.0776	93.5236	89.5660	86.3789	82.9418	81.5665	84.1089	86.7980	90.4134	94.4341	97.8807	(44)
Energy conte	155.4448	136.8132	143.7422	122.6114	116.2826	101.9866	98.6476	104.1444	107.0306	122.6901	134.5386	153.2575	(45)
Energy content (annual)										Total = Sum(45)m =		1497.1896	
Distribution loss (46)m = 0.15 x (45)m													
	23.3167	20.5220	21.5613	18.3917	17.4424	15.2980	14.7971	15.6217	16.0546	18.4035	20.1808	22.9886	(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	(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	17.8160	16.0741	17.7652	17.1354	17.6701	17.0648	17.6141	17.6341	17.0880	17.6994	17.1836	17.8089	(61)
Total heat required for water heating calculated for each month													
	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663	(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													
	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663	(64)
										Total per year (kWh/year) = Sum(64)m =		1705.7433	(64)
12Total per year (kWh/year)												1706	(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													
	56.1394	49.5089	52.2356	45.0521	43.0815	38.1767	37.2038	39.0365	39.8597	45.2193	49.0300	55.4103	(65)

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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	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	58.5768	64.8529	58.5768	60.5294	58.5768	60.5294	58.5768	58.5768	60.5294	58.5768	60.5294	58.5768	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	111.4991	112.6561	109.7404	103.5334	95.6981	88.3341	83.4145	82.2574	85.1731	91.3801	99.2154	106.5794	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	(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)													
	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	(71)
Water heating gains (Table 5)													
	75.4562	73.6740	70.2091	62.5724	57.9052	53.0233	50.0052	52.4684	55.3607	60.7786	68.0972	74.4762	(72)
Total internal gains													
	288.0823	293.7332	281.0766	269.1854	254.7304	244.4369	234.5466	235.8529	243.6133	253.2858	270.3922	282.1827	(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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	309.8208	335.5612	351.5068	379.3131	399.4830	397.6987	378.3201	352.2394	327.4957	303.0299	297.2930	300.2338	(84)

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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	38.7773	39.1620	39.5543	41.5211	41.9111	43.8270	43.8270	44.2012	43.0686	41.9111	41.1297	40.3434	
alpha	3.5852	3.6108	3.6370	3.7681	3.7941	3.9218	3.9218	3.9467	3.8712	3.7941	3.7420	3.6896	
util living area													
	0.9924	0.9890	0.9823	0.9600	0.9044	0.7717	0.6234	0.6748	0.8735	0.9676	0.9879	0.9933	(86)
MIT	18.9294	19.1178	19.4460	19.9856	20.4491	20.8192	20.9426	20.9221	20.6669	20.0891	19.4862	18.9773	(87)
Th 2	19.4440	19.4566	19.4692	19.5295	19.5409	19.5946	19.5946	19.6047	19.5738	19.5409	19.5178	19.4939	(88)
util rest of house													
	0.9896	0.9849	0.9751	0.9421	0.8567	0.6597	0.4502	0.5064	0.7923	0.9494	0.9826	0.9909	(89)

MIT 2	17.6386	17.8343	18.1681	18.7378	19.1765	19.5151	19.5820	19.5849	19.3968	18.8526	18.2442	17.7210	(90)
Living area fraction									fLA = Living area / (4) =			0.5166	(91)
MIT	18.3054	18.4973	18.8282	19.3823	19.8339	20.1887	20.2848	20.2756	20.0528	19.4913	18.8858	18.3700	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.1554	18.3473	18.6782	19.2323	19.6839	20.0387	20.1348	20.1256	19.9028	19.3413	18.7358	18.2200	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9863	0.9807	0.9699	0.9374	0.8623	0.6995	0.5217	0.5752	0.8150	0.9461	0.9787	0.9879	(94)
Useful gains	305.5720	329.0855	340.9439	355.5855	344.4928	278.1835	197.3665	202.6007	266.8982	286.6911	290.9480	296.6022	(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	915.1472	879.4673	788.5682	637.3517	487.9036	317.8384	206.5755	215.8828	345.0881	534.1916	724.5875	890.0706	(97)
Space heating kWh	453.5239	369.8566	333.0324	202.8716	106.6976	0.0000	0.0000	0.0000	0.0000	184.1404	312.2204	441.5404	(98a)
Space heating requirement - total per year (kWh/year)												2403.8835	
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	453.5239	369.8566	333.0324	202.8716	106.6976	0.0000	0.0000	0.0000	0.0000	184.1404	312.2204	441.5404	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2403.8835	
Space heating per m2											(98c) / (4) =	66.8674	(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 %)												89.0000	(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	453.5239	369.8566	333.0324	202.8716	106.6976	0.0000	0.0000	0.0000	0.0000	184.1404	312.2204	441.5404	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	509.5775	415.5692	374.1938	227.9457	119.8850	0.0000	0.0000	0.0000	0.0000	206.8993	350.8095	496.1129	(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	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.9583	85.7882	85.4286	84.5837	83.0802	78.9000	78.9000	78.9000	78.9000	84.3301	85.4239	85.9284	(217)
Fuel for water heating, kWh/month	201.5638	178.2149	189.0555	165.2172	161.2329	150.8890	147.3532	154.3453	157.3113	166.4762	177.6110	199.0801	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	13.0682	10.4838	9.4395	6.9158	5.3419	4.3644	4.8731	6.3342	8.2275	10.7950	12.1929	13.4314	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.4283	-12.1905	-20.6352	-26.7310	-31.4928	-30.3757	-29.8387	-26.6554	-21.4097	-15.1801	-8.6539	-6.1793	(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	-2.0737	-5.1607	-12.5578	-22.4965	-33.0437	-34.5014	-33.5849	-26.3524	-16.7225	-8.0229	-2.9196	-1.5635	(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	2700.9926	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2048.3505	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	105.4678	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-435.7700	(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	4464.0408	(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	2700.9926	0.2100	567.2085	(261)

Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2048.3505	0.2100	430.1536	(264)
Space and water heating			997.3621	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	105.4678	0.1443	15.2223	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-236.7706	0.1319	-31.2311	
PV Unit electricity exported	-198.9994	0.1218	-24.2350	
Total			-55.4661	(269)
Total CO2, kg/year			963.3603	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			26.8000	(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	2700.9926	1.1300	3052.1217	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2048.3505	1.1300	2314.6360	(278)
Space and water heating			5366.7577	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	105.4678	1.5338	161.7700	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-236.7706	1.4873	-352.1597	
PV Unit electricity exported	-198.9994	0.4468	-88.9181	
Total			-441.0779	(283)
Total Primary energy kWh/year			5155.5258	(286)
Dwelling Primary energy Rate (DPER)			143.4100	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.9500	(1b) x	2.6900	(2b) =	96.7055	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.9500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		96.7055	(5)

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2. Ventilation rate

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		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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2068	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9568	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8133	(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	1.0369	1.0166	0.9963	0.8946	0.8743	0.7726	0.7726	0.7523	0.8133	0.8743	0.9150	0.9556	(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	1.0369	1.0166	0.9963	0.9002	0.8822	0.7985	0.7985	0.7830	0.8307	0.8822	0.9186	0.9566	(25)

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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								
Window			5.8000	1.1450	6.6412			(27)
Heatloss Floor 1			35.9500	0.1000	3.5950	110.0000	3954.5000	(28a)
External Wall 1	22.1200	1.0500	21.0700	0.2100	4.4247	0.0000	0.0000	(29a)
External Cavity Wall	13.2700	4.7500	8.5200	0.1800	1.5336	60.0000	511.2000	(29a)
External Roof 1	7.3400		7.3400	0.1400	1.0276	9.0000	66.0600	(30)
Total net area of external elements Aum(A, m2)			78.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.2221			(33)
Main dwelling								

Party Wall 1	18.1800	0.0000	0.0000	180.0000	3272.4001 (32)
Party Wall 2	19.3000	0.0000	0.0000	20.0000	386.0000 (32)
Party Ceiling 1	28.6100			30.0000	858.3000 (32b)
Internal Wall - Timber	50.9000			9.0000	458.1000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9506.5601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 264.4384 (35)
Thermal bridges (Default value 0.200 * total exposed area) 15.7360 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.9581 (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	33.0919	32.4430	31.7944	28.7271	28.1532	25.4816	25.4816	24.9869	26.5107	28.1532	29.3141	30.5279	(38)
Heat transfer coeff	66.0500	65.4011	64.7525	61.6852	61.1113	58.4397	58.4397	57.9450	59.4688	61.1113	62.2723	63.4860	(39)
Average = Sum(39)m / 12 =												61.6802	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8373	1.8192	1.8012	1.7159	1.6999	1.6256	1.6256	1.6118	1.6542	1.6999	1.7322	1.7660	(40)
HLP (average)												1.7157	
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 1.3033 (42)
Hot water usage for mixer showers

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

19.9358	19.6397	19.2228	18.4540	17.8784	17.2401	16.8953	17.3094	17.7601	18.4431	19.2277	19.8684	(42b)

Hot water usage for other uses

27.9776	26.9602	25.9428	24.9255	23.9081	22.8907	22.8907	23.9081	24.9255	25.9428	26.9602	27.9776	(42c)

Average daily hot water use (litres/day) 43.9178 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	47.9134	46.5999	45.1656	43.3795	41.7865	40.1309	39.7861	41.2175	42.6856	44.3860	46.1879	47.8460	(44)
Energy conte	75.8831	66.3577	69.4179	59.3844	56.2527	49.3456	48.1178	51.0358	52.6356	60.2314	65.8032	74.9152	(45)
Energy content (annual)										Total = Sum(45)m =		729.3803	

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	(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

64.5006	56.4040	59.0052	50.4767	47.8148	41.9437	40.9001	43.3805	44.7403	51.1966	55.9327	63.6779	(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

64.5006	56.4040	59.0052	50.4767	47.8148	41.9437	40.9001	43.3805	44.7403	51.1966	55.9327	63.6779	(64)

Total per year (kWh/year) = Sum(64)m = 619.9732 (64)
12Total per year (kWh/year) 620 (64)
Electric shower(s)

36.8962	32.8748	35.8980	34.2570	34.8998	33.2911	34.4008	34.8998	34.2570	35.8980	35.2230	36.8962	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 419.6917 (64a)
Heat gains from water heating, kWh/month

25.3492	22.3197	23.7258	21.1834	20.6787	18.8087	18.8252	19.5701	19.7493	21.7737	22.7889	25.1435	(65)

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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	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	65.1673	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.5768	64.8529	58.5768	60.5294	58.5768	60.5294	58.5768	58.5768	60.5294	58.5768	60.5294	58.5768	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	111.4991	112.6561	109.7404	103.5334	95.6981	88.3341	83.4145	82.2574	85.1731	91.3801	99.2154	106.5794	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	29.5167	(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)	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	(71)
Water heating gains (Table 5)	34.0715	33.2138	31.8895	29.4214	27.7939	26.1232	25.3027	26.3039	27.4296	29.2657	31.6513	33.7951	(72)
Total internal gains	246.6976	253.2730	242.7570	236.0344	224.6190	217.5369	209.8442	209.6883	215.6823	221.7728	233.9462	241.5015	(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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	268.4361	295.1011	313.1872	346.1622	369.3717	370.7986	353.6177	326.0749	299.5646	271.5170	260.8470	259.5526	(84)

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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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.9805	40.3771	40.7816	42.8095	43.2115	45.1869	45.1869	45.5727	44.4050	43.2115	42.4059	41.5952	
alpha	3.6654	3.6918	3.7188	3.8540	3.8808	4.0125	4.0125	4.0382	3.9603	3.8808	3.8271	3.7730	
util living area	0.9957	0.9934	0.9887	0.9716	0.9251	0.8039	0.6579	0.7138	0.9017	0.9785	0.9929	0.9963	(86)
MIT	18.8716	19.0595	19.3884	19.9355	20.4102	20.8001	20.9355	20.9108	20.6324	20.0375	19.4295	18.9192	(87)
Th 2	19.4440	19.4566	19.4692	19.5295	19.5409	19.5946	19.5946	19.6047	19.5738	19.5409	19.5178	19.4939	(88)
util rest of house	0.9941	0.9908	0.9838	0.9578	0.8840	0.6954	0.4796	0.5427	0.8301	0.9655	0.9896	0.9949	(89)
MIT 2	17.5762	17.7719	18.1075	18.6882	19.1436	19.5050	19.5804	19.5816	19.3724	18.8012	18.1841	17.6585	(90)
Living area fraction									fLA = Living area / (4) =			0.5166	(91)
MIT	18.2453	18.4370	18.7691	19.3325	19.7979	20.1740	20.2804	20.2682	20.0233	19.4398	18.8274	18.3097	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2453	18.4370	18.7691	19.3325	19.7979	20.1740	20.2804	20.2682	20.0233	19.4398	18.8274	18.3097	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9923	0.9884	0.9808	0.9554	0.8928	0.7456	0.5729	0.6317	0.8574	0.9643	0.9874	0.9934	(94)
Useful gains	266.3567	291.6742	307.1595	330.7405	329.7656	276.4648	202.5849	205.9716	256.8571	261.8245	257.5632	257.8266	(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	921.0885	885.3380	794.4578	643.5303	494.8728	325.7413	215.0789	224.1423	352.2500	540.2120	730.2909	895.7692	(97)
Space heating kWh	487.1205	398.9421	362.5499	225.2087	122.8397	0.0000	0.0000	0.0000	0.0000	207.1204	340.3640	474.6293	(98a)
Space heating requirement - total per year (kWh/year)												2618.7746	
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	487.1205	398.9421	362.5499	225.2087	122.8397	0.0000	0.0000	0.0000	0.0000	207.1204	340.3640	474.6293	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2618.7746	
Space heating per m2											(98c) / (4) =	72.8449	(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	549.3336	432.4541	440.3821	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6731	0.7611	0.7170	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	369.7344	329.1547	315.7485	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	412.4178	393.5772	362.5012	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	30.7321	47.9304	34.7841	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	7.6830	11.9826	8.6960	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												28.3616	(107)
Energy for space heating												72.8449	(99)
Energy for space cooling												0.7889	(108)
Total												73.6338	(109)
Fabric Energy Efficiency (DFEE)												73.6	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.9500	(1b)	x 2.6900	(2b) =	96.7055	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.9500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		96.7055	(5)

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2. Ventilation rate

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	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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.2068 (8)
Pressure test		No
Pressure Test Method		Blower Door

Measured/design AP50	15.0000	(17)
Infiltration rate	0.9568	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.8133	(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	1.0369	1.0166	0.9963	0.8946	0.8743	0.7726	0.7726	0.7523	0.8133	0.8743	0.9150	0.9556	(22b)
Effective ac	1.0369	1.0166	0.9963	0.9002	0.8822	0.7985	0.7985	0.7830	0.8307	0.8822	0.9186	0.9566	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			5.8000	1.1450	6.6412			(27)
Heatloss Floor 1			35.9500	0.1000	3.5950	110.0000	3954.5000	(28a)
External Wall 1	22.1200	1.0500	21.0700	0.2100	4.4247	0.0000	0.0000	(29a)
External Cavity Wall	13.2700	4.7500	8.5200	0.1800	1.5336	60.0000	511.2000	(29a)
External Roof 1	7.3400		7.3400	0.1400	1.0276	9.0000	66.0600	(30)
Total net area of external elements Aum(A, m2)			78.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.2221			(33)
Main dwelling								
Party Wall 1			18.1800	0.0000	0.0000	180.0000	3272.4001	(32)
Party Wall 2			19.3000	0.0000	0.0000	20.0000	386.0000	(32)
Party Ceiling 1			28.6100			30.0000	858.3000	(32b)
Internal Wall - Timber			50.9000			9.0000	458.1000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	9506.5601	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	264.4384	(35)
Thermal bridges (Default value 0.200 * total exposed area)	15.7360	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	32.9581	(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	33.0919	32.4430	31.7944	28.7271	28.1532	25.4816	25.4816	24.9869	26.5107	28.1532	29.3141	30.5279	(38)
Heat transfer coeff	66.0500	65.4011	64.7525	61.6852	61.1113	58.4397	58.4397	57.9450	59.4688	61.1113	62.2723	63.4860	(39)
Average = Sum(39)m / 12 =												61.6802	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8373	1.8192	1.8012	1.7159	1.6999	1.6256	1.6256	1.6118	1.6542	1.6999	1.7322	1.7660	(40)
HLP (average)												1.7157	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.3033	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	70.1719	69.1174	67.5807	64.6405	62.4708	60.0511	58.6757	60.2008	61.8725	64.4705	67.4739	69.9031	(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	27.9776	26.9602	25.9428	24.9255	23.9081	22.8907	22.8907	23.9081	24.9255	25.9428	26.9602	27.9776	(42c)
Average daily hot water use (litres/day)												90.1303	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.1495	96.0776	93.5236	89.5660	86.3789	82.9418	81.5665	84.1089	86.7980	90.4134	94.4341	97.8807	(44)
Energy conte	155.4448	136.8132	143.7422	122.6114	116.2826	101.9866	98.6476	104.1444	107.0306	122.6901	134.5386	153.2575	(45)
Energy content (annual)										Total = Sum(45)m =		1497.1896	
Distribution loss (46)m = 0.15 x (45)m	23.3167	20.5220	21.5613	18.3917	17.4424	15.2980	14.7971	15.6217	16.0546	18.4035	20.1808	22.9886	(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	(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	17.8160	16.0741	17.7652	17.1354	17.6701	17.0648	17.6141	17.6341	17.0880	17.6994	17.1836	17.8089	(61)
Total heat required for water heating calculated for each month	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663	(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	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663	(64)
									Total per year (kWh/year) = Sum(64)m =			1705.7433	(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	56.1394	49.5089	52.2356	45.0521	43.0815	38.1767	37.2038	39.0365	39.8597	45.2193	49.0300	55.4103	(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	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.9301	13.2607	10.7844	8.1645	6.1030	5.1524	5.5674	7.2367	9.7131	12.3330	14.3944	15.3450	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	166.4165	168.1434	163.7917	154.5275	142.8330	131.8419	124.4992	122.7723	127.1240	136.3882	148.0827	159.0738	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	(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)	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	(71)
Water heating gains (Table 5)	75.4562	73.6740	70.2091	62.5724	57.9052	53.0233	50.0052	52.4684	55.3607	60.7786	68.0972	74.4762	(72)
Total internal gains	326.9931	325.2685	314.9756	295.4547	277.0316	260.2080	250.2621	252.6678	262.3881	279.6902	300.7647	319.0854	(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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	348.7316	367.0965	385.4058	405.5824	421.7843	413.4697	394.0356	369.0543	346.2705	329.4344	327.6655	337.1365	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.9805	40.3771	40.7816	42.8095	43.2115	45.1869	45.1869	45.5727	44.4050	43.2115	42.4059	41.5952	
alpha	3.6654	3.6918	3.7188	3.8540	3.8808	4.0125	4.0125	4.0382	3.9603	3.8808	3.8271	3.7730	
util living area	0.9899	0.9866	0.9782	0.9541	0.8943	0.7585	0.6062	0.6553	0.8600	0.9608	0.9848	0.9911	(86)
MIT	19.0700	19.2358	19.5609	20.0670	20.5026	20.8409	20.9519	20.9348	20.7049	20.1698	19.5944	19.1137	(87)
Th 2	19.4440	19.4566	19.4692	19.5295	19.5409	19.5946	19.5946	19.6047	19.5738	19.5409	19.5178	19.4939	(88)
util rest of house	0.9862	0.9816	0.9693	0.9337	0.8425	0.6438	0.4345	0.4870	0.7730	0.9391	0.9781	0.9879	(89)
MIT 2	17.7725	17.9454	18.2752	18.8104	19.2187	19.5269	19.5846	19.5890	19.4222	18.9241	18.3455	17.8511	(90)
Living area fraction										fLA = Living area / (4) =		0.5166	(91)
MIT	18.4427	18.6120	18.9393	19.4595	19.8819	20.2057	20.2909	20.2842	20.0848	19.5675	18.9906	18.5033	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2927	18.4620	18.7893	19.3095	19.7319	20.0557	20.1409	20.1342	19.9348	19.4175	18.8406	18.3533	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9823	0.9771	0.9640	0.9297	0.8506	0.6857	0.5056	0.5562	0.7992	0.9367	0.9739	0.9844	(94)
Useful gains	342.5673	358.6766	371.5442	377.0878	358.7783	283.5132	199.2084	205.2586	276.7483	308.5789	319.1067	331.8726	(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	924.2193	886.9686	795.7627	642.1132	490.8386	318.8277	206.9277	216.3773	346.9878	538.8517	731.1142	898.5380	(97)
Space heating kWh	432.7491	355.0122	315.6185	190.8183	98.2529	0.0000	0.0000	0.0000	0.0000	171.3230	296.6454	421.5991	(98a)
Space heating requirement - total per year (kWh/year)												2282.0186	
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	432.7491	355.0122	315.6185	190.8183	98.2529	0.0000	0.0000	0.0000	0.0000	171.3230	296.6454	421.5991	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2282.0186	
Space heating per m2											(98c) / (4) =	63.4776	(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 %)	89.0000 (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	432.7491	355.0122	315.6185	190.8183	98.2529	0.0000	0.0000	0.0000	0.0000	171.3230	296.6454	421.5991	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	486.2350	398.8902	354.6275	214.4026	110.3965	0.0000	0.0000	0.0000	0.0000	192.4978	333.3094	473.7069	(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	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.8577	85.6978	85.3037	84.4309	82.8797	78.9000	78.9000	78.9000	78.9000	84.1486	85.3048	85.8287	(217)
Fuel for water heating, kWh/month	201.8000	178.4029	189.3324	165.5162	161.6230	150.8890	147.3532	154.3453	157.3113	166.8353	177.8589	199.3112	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	13.0682	10.4838	9.4395	6.9158	5.3419	4.3644	4.8731	6.3342	8.2275	10.7950	12.1929	13.4314	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.4283	-12.1905	-20.6352	-26.7310	-31.4928	-30.3757	-29.8387	-26.6554	-21.4097	-15.1801	-8.6539	-6.1793	(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	-2.0737	-5.1607	-12.5578	-22.4965	-33.0437	-34.5014	-33.5849	-26.3524	-16.7225	-8.0229	-2.9196	-1.5635	(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	2564.0659	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2050.5787	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	105.4678	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-435.7700	(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	4329.3423	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2564.0659	3.6400	93.3320	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2050.5787	3.6400	74.6411	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	105.4678	16.4900	17.3916	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-236.7706	16.4900	-39.0435	
PV Unit electricity exported	-198.9994	5.5900	-11.1241	
Total			-50.1675	(252)
Total energy cost			234.6177	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0434	(257)
SAP value		83.0867	
SAP rating (Section 12)		83	(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	2564.0659	0.2100	538.4538	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2050.5787	0.2100	430.6215	(264)
Space and water heating			969.0754	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	105.4678	0.1443	15.2223	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-236.7706	0.1319	-31.2311	
PV Unit electricity exported	-198.9994	0.1218	-24.2350	
Total			-55.4661	(269)
Total CO2, kg/year			935.0736	(272)
CO2 emissions per m2			26.0100	(273)
EI value			84.5213	
EI rating			85	(274)
EI band			B	

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.9500	(1b)	x 2.6900	(2b) =	96.7055	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.9500					(4)

Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 96.7055 (5)

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2. Ventilation rate

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		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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2068	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9568	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8133	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.8743	0.8336	0.8336	0.7726	0.7930	0.6913	0.6913	0.6710	0.6913	0.7726	0.7523	0.8133	(22b)
Effective ac	0.8822	0.8475	0.8475	0.7985	0.8144	0.7389	0.7389	0.7251	0.7389	0.7985	0.7830	0.8307	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			5.8000	1.1450	6.6412			(27)
Heatloss Floor 1			35.9500	0.1000	3.5950	110.0000	3954.5000	(28a)
External Wall 1	22.1200	1.0500	21.0700	0.2100	4.4247	0.0000	0.0000	(29a)
External Cavity Wall	13.2700	4.7500	8.5200	0.1800	1.5336	60.0000	511.2000	(29a)
External Roof 1	7.3400		7.3400	0.1400	1.0276	9.0000	66.0600	(30)
Total net area of external elements Aum(A, m2)			78.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.2221			(33)
Main dwelling								
Party Wall 1			18.1800	0.0000	0.0000	180.0000	3272.4001	(32)
Party Wall 2			19.3000	0.0000	0.0000	20.0000	386.0000	(32)
Party Ceiling 1			28.6100			30.0000	858.3000	(32b)
Internal Wall - Timber			50.9000			9.0000	458.1000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9506.5601	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							264.4384	(35)
Thermal bridges (Default value 0.200 * total exposed area)							15.7360	(36)
Point Thermal bridges					(36a) =		0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		32.9581	(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	28.1532	27.0450	27.0450	25.4816	25.9895	23.5819	23.5819	23.1399	23.5819	25.4816	24.9869	26.5107	(38)
Heat transfer coeff	61.1113	60.0031	60.0031	58.4397	58.9477	56.5400	56.5400	56.0980	56.5400	58.4397	57.9450	59.4688	(39)
Average = Sum(39)m / 12 =												58.3397	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6999	1.6691	1.6691	1.6256	1.6397	1.5727	1.5727	1.5604	1.5727	1.6256	1.6118	1.6542	(40)
HLP (average)												1.6228	
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 1.3033 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
70.1719	69.1174	67.5807	64.6405	62.4708	60.0511	58.6757	60.2008	61.8725	64.4705	67.4739	69.9031	(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

27.9776	26.9602	25.9428	24.9255	23.9081	22.8907	22.8907	23.9081	24.9255	25.9428	26.9602	27.9776	(42c)

Average daily hot water use (litres/day) 90.1303 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.1495	96.0776	93.5236	89.5660	86.3789	82.9418	81.5665	84.1089	86.7980	90.4134	94.4341	97.8807	(44)
Energy conte	155.4448	136.8132	143.7422	122.6114	116.2826	101.9866	98.6476	104.1444	107.0306	122.6901	134.5386	153.2575	(45)
Energy content (annual)										Total = Sum(45)m =		1497.1896	
Distribution loss (46)m = 0.15 x (45)m	23.3167	20.5220	21.5613	18.3917	17.4424	15.2980	14.7971	15.6217	16.0546	18.4035	20.1808	22.9886	(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	(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	17.8160	16.0741	17.7652	17.1354	17.6701	17.0648	17.6141	17.6341	17.0880	17.6994	17.1836	17.8089	(61)
Total heat required for water heating calculated for each month	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663	(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													
	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663	(64)
											Total per year (kWh/year) = Sum(64)m =	1705.7433	(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													
	56.1394	49.5089	52.2356	45.0521	43.0815	38.1767	37.2038	39.0365	39.8597	45.2193	49.0300	55.4103	(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	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.9301	13.2607	10.7844	8.1645	6.1030	5.1524	5.5674	7.2367	9.7131	12.3330	14.3944	15.3450	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	166.4165	168.1434	163.7917	154.5275	142.8330	131.8419	124.4992	122.7723	127.1240	136.3882	148.0827	159.0738	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	(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)													
	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	(71)
Water heating gains (Table 5)													
	75.4562	73.6740	70.2091	62.5724	57.9052	53.0233	50.0052	52.4684	55.3607	60.7786	68.0972	74.4762	(72)
Total internal gains													
	326.9931	325.2685	314.9756	295.4547	277.0316	260.2080	250.2621	252.6678	262.3881	279.6902	300.7647	319.0854	(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	
North	4.7500	12.7650	0.6300	0.7000	0.7700	18.5305	(74)
East	1.0500	23.8018	0.6300	0.7000	0.7700	7.6378	(76)

Solar gains	26.1684	44.2835	74.5620	118.7397	151.9098	169.9124	157.9212	131.2772	94.8457	56.6982	31.9610	21.8144	(83)
Total gains	353.1615	369.5520	389.5376	414.1944	428.9414	430.1203	408.1833	383.9450	357.2338	336.3884	332.7256	340.8997	(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	43.2115	44.0096	44.0096	45.1869	44.7976	46.7052	46.7052	47.0732	46.7052	45.1869	45.5727	44.4050	
alpha	3.8808	3.9340	3.9340	4.0125	3.9865	4.1137	4.1137	4.1382	4.1137	4.0125	4.0382	3.9603	
util living area													
	0.9874	0.9832	0.9707	0.9332	0.8399	0.6308	0.4470	0.4826	0.7831	0.9426	0.9791	0.9887	(86)
MIT	19.3788	19.5493	19.8548	20.3096	20.6920	20.9397	20.9891	20.9855	20.8420	20.3729	19.8716	19.4048	(87)
Th 2	19.5409	19.5631	19.5631	19.5946	19.5843	19.6334	19.6334	19.6425	19.6334	19.5946	19.6047	19.5738	(88)
util rest of house													
	0.9826	0.9767	0.9587	0.9034	0.7642	0.4885	0.2669	0.2970	0.6647	0.9102	0.9696	0.9844	(89)
MIT 2	18.1474	18.3317	18.6311	19.0880	19.4103	19.6158	19.6324	19.6410	19.5682	19.1552	18.6814	18.1972	(90)
Living area fraction										fLA = Living area / (4) =		0.5166	(91)
MIT	18.7835	18.9606	19.2632	19.7190	20.0724	20.2997	20.3332	20.3355	20.2262	19.7842	19.2962	18.8210	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6335	18.8106	19.1132	19.5690	19.9224	20.1497	20.1832	20.1855	20.0762	19.6342	19.1462	18.6710	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9722	0.9538	0.9027	0.7850	0.5457	0.3412	0.3736	0.7081	0.9113	0.9655	0.9807	(94)
Useful gains	345.5962	359.2743	371.5218	373.8968	336.7167	234.7256	139.2533	143.4243	252.9623	306.5632	321.2415	334.3218	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	827.0491	786.6784	702.8284	565.0556	413.9519	245.9311	140.4002	145.0418	287.0088	475.3607	645.8677	807.0509	(97)
Space heating kWh													
	358.2010	287.2155	246.4921	137.6343	57.4630	0.0000	0.0000	0.0000	0.0000	125.5853	233.7309	351.7104	(98a)
Space heating requirement - total per year (kWh/year)												1798.0326	
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													
	358.2010	287.2155	246.4921	137.6343	57.4630	0.0000	0.0000	0.0000	0.0000	125.5853	233.7309	351.7104	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1798.0326	
Space heating per m2											(98c) / (4) =	50.0148	(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 %)	89.0000	(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													
	358.2010	287.2155	246.4921	137.6343	57.4630	0.0000	0.0000	0.0000	0.0000	125.5853	233.7309	351.7104	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													

	402.4730	322.7141	276.9574	154.6453	64.5652	0.0000	0.0000	0.0000	0.0000	141.1071	262.6190	395.1803 (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												
	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663 (64)
Efficiency of water heater												78.9000 (216)
(217)m	85.4346	85.2107	84.7076	83.6079	81.6827	78.9000	78.9000	78.9000	78.9000	83.3671	84.7306	85.4218 (217)
Fuel for water heating, kWh/month												
	202.7994	179.4226	190.6647	167.1454	163.9914	150.8890	147.3532	154.3453	157.3113	168.3992	179.0642	200.2607 (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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219 (231)
Lighting	13.0682	10.4838	9.4395	6.9158	5.3419	4.3644	4.8731	6.3342	8.2275	10.7950	12.1929	13.4314 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-8.8380	-12.8603	-21.5335	-28.0082	-32.2845	-32.1519	-31.4156	-28.6371	-23.2623	-16.8664	-10.1204	-7.4042 (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	-2.7713	-5.6655	-13.5906	-24.7037	-34.8476	-39.1396	-37.6314	-30.6720	-19.6999	-9.7125	-3.8111	-2.1085 (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	2020.2614 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	78.9000
Water heating fuel used	2061.6463 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	45.0000 (231)
Electricity for lighting (calculated in Appendix L)	105.4678 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-477.7360 (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	3754.6395 (238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2020.2614	5.6000	113.1346	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2061.6463	5.6000	115.4522	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	105.4678	26.0600	27.4849	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-253.3824	26.0600	-66.0314	
PV Unit electricity exported	-224.3536	5.8100	-13.0349	
Total			-79.0664	(252)
Total energy cost			287.7323	(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	2020.2614	0.2100	424.2549	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2061.6463	0.2100	432.9457	(264)
Space and water heating			857.2006	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	105.4678	0.1443	15.2223	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-253.3824	0.1321	-33.4792	
PV Unit electricity exported	-224.3536	0.1217	-27.3031	
Total			-60.7823	(269)
Total CO2, kg/year			817.8826	(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	2020.2614	1.1300	2282.8954	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2061.6463	1.1300	2329.6604	(278)
Space and water heating			4612.5557	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)

Energy for lighting	105.4678	1.5338	161.7700	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-253.3824	1.4882	-377.0782	
PV Unit electricity exported	-224.3536	0.4464	-100.1590	
Total			-477.2372	(283)
Total Primary energy kWh/year			4365.1645	(286)

SAP 10 EPC IMPROVEMENTS

Ground Floor Flat

Current energy efficiency rating: B 83
Current environmental impact rating: B 85

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

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

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

Potential energy efficiency rating: B 83
Potential environmental impact rating: B 85

Fuel prices for cost data on this page from database revision number 561 TEST (31 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£39	£39	£0
Mains gas	£328	£328	£0
Space heating	£224	£224	£0
Water heating	£115	£115	£0
Lighting	£27	£27	£0
Generated (PV)	-£79	-£79	£0
Total cost of fuels	£288	£288	£0
Total cost of uses	£287	£287	£0
Delivered energy	104 kWh/m²	104 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	23 kg/m²	23 kg/m²	0 kg/m²
Primary energy	121 kWh/m²	121 kWh/m²	0 kWh/m²

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	35.9500	(1b) x	2.6900	(2b) =	96.7055	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.9500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		96.7055	(5)

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2. Ventilation rate

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		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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2068	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9568	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8133	(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													
	1.0369	1.0166	0.9963	0.8946	0.8743	0.7726	0.7726	0.7523	0.8133	0.8743	0.9150	0.9556	(22b)
Effective ac	1.0369	1.0166	0.9963	0.9002	0.8822	0.7985	0.7985	0.7830	0.8307	0.8822	0.9186	0.9566	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			5.8000	1.1450	6.6412			(27)
Heatloss Floor 1			35.9500	0.1000	3.5950	110.0000	3954.5000	(28a)
External Wall 1	22.1200	1.0500	21.0700	0.2100	4.4247	0.0000	0.0000	(29a)
External Cavity Wall	13.2700	4.7500	8.5200	0.1800	1.5336	60.0000	511.2000	(29a)
External Roof 1	7.3400		7.3400	0.1400	1.0276	9.0000	66.0600	(30)
Total net area of external elements Aum(A, m2)			78.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.2221			(33)
Main dwelling								
Party Wall 1			18.1800	0.0000	0.0000	180.0000	3272.4001	(32)
Party Wall 2			19.3000	0.0000	0.0000	20.0000	386.0000	(32)
Party Ceiling 1			28.6100			30.0000	858.3000	(32b)
Internal Wall - Timber			50.9000			9.0000	458.1000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9506.5601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		264.4384 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.7360 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	32.9581 (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	33.0919	32.4430	31.7944	28.7271	28.1532	25.4816	25.4816	24.9869	26.5107	28.1532	29.3141	30.5279	(38)
Heat transfer coeff													
	66.0500	65.4011	64.7525	61.6852	61.1113	58.4397	58.4397	57.9450	59.4688	61.1113	62.2723	63.4860	(39)
Average = Sum(39)m / 12 =												61.6802	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8373	1.8192	1.8012	1.7159	1.6999	1.6256	1.6256	1.6118	1.6542	1.6999	1.7322	1.7660	(40)
HLP (average)												1.7157	
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												1.3033 (42)
Hot water usage for mixer showers												
	70.1719	69.1174	67.5807	64.6405	62.4708	60.0511	58.6757	60.2008	61.8725	64.4705	67.4739	69.9031 (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												
	27.9776	26.9602	25.9428	24.9255	23.9081	22.8907	22.8907	23.9081	24.9255	25.9428	26.9602	27.9776 (42c)
Average daily hot water use (litres/day)												90.1303 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	98.1495	96.0776	93.5236	89.5660	86.3789	82.9418	81.5665	84.1089	86.7980	90.4134	94.4341	97.8807	(44)
Energy conte	155.4448	136.8132	143.7422	122.6114	116.2826	101.9866	98.6476	104.1444	107.0306	122.6901	134.5386	153.2575	(45)
Energy content (annual)										Total = Sum(45)m =		1497.1896	
Distribution loss (46)m = 0.15 x (45)m													
	23.3167	20.5220	21.5613	18.3917	17.4424	15.2980	14.7971	15.6217	16.0546	18.4035	20.1808	22.9886	(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	(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	17.8160	16.0741	17.7652	17.1354	17.6701	17.0648	17.6141	17.6341	17.0880	17.6994	17.1836	17.8089	(61)
Total heat required for water heating calculated for each month													
	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663	(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													
	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663	(64)
										Total per year (kWh/year) = Sum(64)m =		1705.7433	(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													
	56.1394	49.5089	52.2356	45.0521	43.0815	38.1767	37.2038	39.0365	39.8597	45.2193	49.0300	55.4103	(65)

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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	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.9301	13.2607	10.7844	8.1645	6.1030	5.1524	5.5674	7.2367	9.7131	12.3330	14.3944	15.3450	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	166.4165	168.1434	163.7917	154.5275	142.8330	131.8419	124.4992	122.7723	127.1240	136.3882	148.0827	159.0738	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	(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)													
	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	(71)
Water heating gains (Table 5)													
	75.4562	73.6740	70.2091	62.5724	57.9052	53.0233	50.0052	52.4684	55.3607	60.7786	68.0972	74.4762	(72)
Total internal gains													
	326.9931	325.2685	314.9756	295.4547	277.0316	260.2080	250.2621	252.6678	262.3881	279.6902	300.7647	319.0854	(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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	348.7316	367.0965	385.4058	405.5824	421.7843	413.4697	394.0356	369.0543	346.2705	329.4344	327.6655	337.1365	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.9805	40.3771	40.7816	42.8095	43.2115	45.1869	45.1869	45.5727	44.4050	43.2115	42.4059	41.5952	
alpha	3.6654	3.6918	3.7188	3.8540	3.8808	4.0125	4.0125	4.0382	3.9603	3.8808	3.8271	3.7730	
util living area	0.9899	0.9866	0.9782	0.9541	0.8943	0.7585	0.6062	0.6553	0.8600	0.9608	0.9848	0.9911	(86)
MIT	19.0700	19.2358	19.5609	20.0670	20.5026	20.8409	20.9519	20.9348	20.7049	20.1698	19.5944	19.1137	(87)
Th 2	19.4440	19.4566	19.4692	19.5295	19.5409	19.5946	19.5946	19.6047	19.5738	19.5409	19.5178	19.4939	(88)
util rest of house	0.9862	0.9816	0.9693	0.9337	0.8425	0.6438	0.4345	0.4870	0.7730	0.9391	0.9781	0.9879	(89)
MIT 2	17.7725	17.9454	18.2752	18.8104	19.2187	19.5269	19.5846	19.5890	19.4222	18.9241	18.3455	17.8511	(90)
Living area fraction										fLA = Living area / (4) =		0.5166	(91)
MIT	18.4427	18.6120	18.9393	19.4595	19.8819	20.2057	20.2909	20.2842	20.0848	19.5675	18.9906	18.5033	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.2927	18.4620	18.7893	19.3095	19.7319	20.0557	20.1409	20.1342	19.9348	19.4175	18.8406	18.3533	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9823	0.9771	0.9640	0.9297	0.8506	0.6857	0.5056	0.5562	0.7992	0.9367	0.9739	0.9844	(94)
Useful gains	342.5673	358.6766	371.5442	377.0878	358.7783	283.5132	199.2084	205.2586	276.7483	308.5789	319.1067	331.8726	(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	924.2193	886.9686	795.7627	642.1132	490.8386	318.8277	206.9277	216.3773	346.9878	538.8517	731.1142	898.5380	(97)
Space heating kWh	432.7491	355.0122	315.6185	190.8183	98.2529	0.0000	0.0000	0.0000	0.0000	171.3230	296.6454	421.5991	(98a)
Space heating requirement - total per year (kWh/year)												2282.0186	
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	432.7491	355.0122	315.6185	190.8183	98.2529	0.0000	0.0000	0.0000	0.0000	171.3230	296.6454	421.5991	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2282.0186	
Space heating per m2										(98c) / (4) =		63.4776	(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 %)	89.0000	(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	432.7491	355.0122	315.6185	190.8183	98.2529	0.0000	0.0000	0.0000	0.0000	171.3230	296.6454	421.5991	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	486.2350	398.8902	354.6275	214.4026	110.3965	0.0000	0.0000	0.0000	0.0000	192.4978	333.3094	473.7069	(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	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.8577	85.6978	85.3037	84.4309	82.8797	78.9000	78.9000	78.9000	78.9000	84.1486	85.3048	85.8287	(217)
Fuel for water heating, kWh/month	201.8000	178.4029	189.3324	165.5162	161.6230	150.8890	147.3532	154.3453	157.3113	166.8353	177.8589	199.3112	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	13.0682	10.4838	9.4395	6.9158	5.3419	4.3644	4.8731	6.3342	8.2275	10.7950	12.1929	13.4314	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.4283	-12.1905	-20.6352	-26.7310	-31.4928	-30.3757	-29.8387	-26.6554	-21.4097	-15.1801	-8.6539	-6.1793	(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	-2.0737	-5.1607	-12.5578	-22.4965	-33.0437	-34.5014	-33.5849	-26.3524	-16.7225	-8.0229	-2.9196	-1.5635	(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	2564.0659	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2050.5787	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	105.4678	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-435.7700	(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	4329.3423	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2564.0659	3.6400	93.3320	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2050.5787	3.6400	74.6411	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	105.4678	16.4900	17.3916	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-236.7706	16.4900	-39.0435	
PV Unit electricity exported	-198.9994	5.5900	-11.1241	
Total			-50.1675	(252)
Total energy cost			234.6177	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0434	(257)
SAP value		83.0867	
SAP rating (Section 12)		83	(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	2564.0659	0.2100	538.4538	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2050.5787	0.2100	430.6215	(264)
Space and water heating			969.0754	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	105.4678	0.1443	15.2223	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-236.7706	0.1319	-31.2311	
PV Unit electricity exported	-198.9994	0.1218	-24.2350	
Total			-55.4661	(269)
Total CO2, kg/year			935.0736	(272)
CO2 emissions per m2			26.0100	(273)
EI value			84.5213	
EI rating			85	(274)
EI band			B	

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		35.9500	(1b)	x 2.6900	(2b) =	96.7055	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.9500						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		96.7055	(5)

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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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2068	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9568	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8133	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.8743	0.8336	0.8336	0.7726	0.7930	0.6913	0.6913	0.6710	0.6913	0.7726	0.7523	0.8133	(22b)
Effective ac	0.8822	0.8475	0.8475	0.7985	0.8144	0.7389	0.7389	0.7251	0.7389	0.7985	0.7830	0.8307	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			5.8000	1.1450	6.6412			(27)
Heatloss Floor 1			35.9500	0.1000	3.5950	110.0000	3954.5000	(28a)
External Wall 1	22.1200	1.0500	21.0700	0.2100	4.4247	0.0000	0.0000	(29a)
External Cavity Wall	13.2700	4.7500	8.5200	0.1800	1.5336	60.0000	511.2000	(29a)
External Roof 1	7.3400		7.3400	0.1400	1.0276	9.0000	66.0600	(30)
Total net area of external elements Aum(A, m2)			78.6800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.2221			(33)
Main dwelling								
Party Wall 1			18.1800	0.0000	0.0000	180.0000	3272.4001	(32)
Party Wall 2			19.3000	0.0000	0.0000	20.0000	386.0000	(32)
Party Ceiling 1			28.6100			30.0000	858.3000	(32b)
Internal Wall - Timber			50.9000			9.0000	458.1000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9506.5601	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							264.4384	(35)
Thermal bridges (Default value 0.200 * total exposed area)							15.7360	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		32.9581	(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	28.1532	27.0450	27.0450	25.4816	25.9895	23.5819	23.5819	23.1399	23.5819	25.4816	24.9869	26.5107	(38)
Heat transfer coeff	61.1113	60.0031	60.0031	58.4397	58.9477	56.5400	56.5400	56.0980	56.5400	58.4397	57.9450	59.4688	(39)
Average = Sum(39)m / 12 =												58.3397	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6999	1.6691	1.6691	1.6256	1.6397	1.5727	1.5727	1.5604	1.5727	1.6256	1.6118	1.6542	(40)
HLP (average)												1.6228	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3033	(42)
Hot water usage for mixer showers	70.1719	69.1174	67.5807	64.6405	62.4708	60.0511	58.6757	60.2008	61.8725	64.4705	67.4739	69.9031	(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	27.9776	26.9602	25.9428	24.9255	23.9081	22.8907	22.8907	23.9081	24.9255	25.9428	26.9602	27.9776	(42c)
Average daily hot water use (litres/day)												90.1303	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.1495	96.0776	93.5236	89.5660	86.3789	82.9418	81.5665	84.1089	86.7980	90.4134	94.4341	97.8807	(44)
Energy conte	155.4448	136.8132	143.7422	122.6114	116.2826	101.9866	98.6476	104.1444	107.0306	122.6901	134.5386	153.2575	(45)
Energy content (annual)										Total = Sum(45)m =		1497.1896	
Distribution loss (46)m = 0.15 x (45)m	23.3167	20.5220	21.5613	18.3917	17.4424	15.2980	14.7971	15.6217	16.0546	18.4035	20.1808	22.9886	(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	(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	17.8160	16.0741	17.7652	17.1354	17.6701	17.0648	17.6141	17.6341	17.0880	17.6994	17.1836	17.8089	(61)
Total heat required for water heating calculated for each month	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663	(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	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663	(64)
										Total per year (kWh/year) = Sum(64)m =		1705.7433	(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

	56.1394	49.5089	52.2356	45.0521	43.0815	38.1767	37.2038	39.0365	39.8597	45.2193	49.0300	55.4103 (65)

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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	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	78.2008	(66)

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

	14.9301	13.2607	10.7844	8.1645	6.1030	5.1524	5.5674	7.2367	9.7131	12.3330	14.3944	15.3450 (67)

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

	166.4165	168.1434	163.7917	154.5275	142.8330	131.8419	124.4992	122.7723	127.1240	136.3882	148.0827	159.0738 (68)

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

	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234	44.1234 (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)

	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339	-52.1339 (71)

Water heating gains (Table 5)

	75.4562	73.6740	70.2091	62.5724	57.9052	53.0233	50.0052	52.4684	55.3607	60.7786	68.0972	74.4762 (72)

Total internal gains

	326.9931	325.2685	314.9756	295.4547	277.0316	260.2080	250.2621	252.6678	262.3881	279.6902	300.7647	319.0854 (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	
North	4.7500	12.7650	0.6300	0.7000	0.7700	18.5305	(74)
East	1.0500	23.8018	0.6300	0.7000	0.7700	7.6378	(76)

Solar gains	26.1684	44.2835	74.5620	118.7397	151.9098	169.9124	157.9212	131.2772	94.8457	56.6982	31.9610	21.8144	(83)
Total gains	353.1615	369.5520	389.5376	414.1944	428.9414	430.1203	408.1833	383.9450	357.2338	336.3884	332.7256	340.8997	(84)

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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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.2115	44.0096	44.0096	45.1869	44.7976	46.7052	46.7052	47.0732	46.7052	45.1869	45.5727	44.4050	
alpha	3.8808	3.9340	3.9340	4.0125	3.9865	4.1137	4.1137	4.1382	4.1137	4.0125	4.0382	3.9603	
util living area	0.9874	0.9832	0.9707	0.9332	0.8399	0.6308	0.4470	0.4826	0.7831	0.9426	0.9791	0.9887	(86)
MIT	19.3788	19.5493	19.8548	20.3096	20.6920	20.9397	20.9891	20.9855	20.8420	20.3729	19.8716	19.4048	(87)
Th 2	19.5409	19.5631	19.5631	19.5946	19.5843	19.6334	19.6334	19.6425	19.6334	19.5946	19.6047	19.5738	(88)
util rest of house	0.9826	0.9767	0.9587	0.9034	0.7642	0.4885	0.2669	0.2970	0.6647	0.9102	0.9696	0.9844	(89)
MIT 2	18.1474	18.3317	18.6311	19.0880	19.4103	19.6158	19.6324	19.6410	19.5682	19.1552	18.6814	18.1972	(90)
Living area fraction										fLA = Living area / (4) =		0.5166	(91)
MIT	18.7835	18.9606	19.2632	19.7190	20.0724	20.2997	20.3332	20.3355	20.2262	19.7842	19.2962	18.8210	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6335	18.8106	19.1132	19.5690	19.9224	20.1497	20.1832	20.1855	20.0762	19.6342	19.1462	18.6710	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9722	0.9538	0.9027	0.7850	0.5457	0.3412	0.3736	0.7081	0.9113	0.9655	0.9807	(94)
Useful gains	345.5962	359.2743	371.5218	373.8968	336.7167	234.7256	139.2533	143.4243	252.9623	306.5632	321.2415	334.3218	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	827.0491	786.6784	702.8284	565.0556	413.9519	245.9311	140.4002	145.0418	287.0088	475.3607	645.8677	807.0509	(97)
Space heating kWh	358.2010	287.2155	246.4921	137.6343	57.4630	0.0000	0.0000	0.0000	0.0000	125.5853	233.7309	351.7104	(98a)
Space heating requirement - total per year (kWh/year)												1798.0326	
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	358.2010	287.2155	246.4921	137.6343	57.4630	0.0000	0.0000	0.0000	0.0000	125.5853	233.7309	351.7104	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1798.0326	
Space heating per m2											(98c) / (4) =	50.0148	(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 %)	89.0000	(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	358.2010	287.2155	246.4921	137.6343	57.4630	0.0000	0.0000	0.0000	0.0000	125.5853	233.7309	351.7104	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	402.4730	322.7141	276.9574	154.6453	64.5652	0.0000	0.0000	0.0000	0.0000	141.1071	262.6190	395.1803	(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

	173.2609	152.8873	161.5075	139.7468	133.9527	119.0514	116.2617	121.7784	124.1186	140.3895	151.7223	171.0663 (64)
Efficiency of water heater												78.9000 (216)
(217)m	85.4346	85.2107	84.7076	83.6079	81.6827	78.9000	78.9000	78.9000	78.9000	83.3671	84.7306	85.4218 (217)
Fuel for water heating, kWh/month												
	202.7994	179.4226	190.6647	167.1454	163.9914	150.8890	147.3532	154.3453	157.3113	168.3992	179.0642	200.2607 (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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219 (231)
Lighting	13.0682	10.4838	9.4395	6.9158	5.3419	4.3644	4.8731	6.3342	8.2275	10.7950	12.1929	13.4314 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-8.8380	-12.8603	-21.5335	-28.0082	-32.2845	-32.1519	-31.4156	-28.6371	-23.2623	-16.8664	-10.1204	-7.4042 (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	-2.7713	-5.6655	-13.5906	-24.7037	-34.8476	-39.1396	-37.6314	-30.6720	-19.6999	-9.7125	-3.8111	-2.1085 (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	2020.2614 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	78.9000
Water heating fuel used	2061.6463 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	45.0000 (231)
Electricity for lighting (calculated in Appendix L)	105.4678 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-477.7360 (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	3754.6395 (238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2020.2614	5.6000	113.1346	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2061.6463	5.6000	115.4522	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	105.4678	26.0600	27.4849	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-253.3824	26.0600	-66.0314	
PV Unit electricity exported	-224.3536	5.8100	-13.0349	
Total			-79.0664	(252)
Total energy cost			287.7323	(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	2020.2614	0.2100	424.2549	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2061.6463	0.2100	432.9457	(264)
Space and water heating			857.2006	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	105.4678	0.1443	15.2223	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-253.3824	0.1321	-33.4792	
PV Unit electricity exported	-224.3536	0.1217	-27.3031	
Total			-60.7823	(269)
Total CO2, kg/year			817.8826	(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	2020.2614	1.1300	2282.8954	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2061.6463	1.1300	2329.6604	(278)
Space and water heating			4612.5557	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	105.4678	1.5338	161.7700	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-253.3824	1.4882	-377.0782	
PV Unit electricity exported	-224.3536	0.4464	-100.1590	
Total			-477.2372	(283)
Total Primary energy kWh/year			4365.1645	(286)

Predicted Energy Assessment

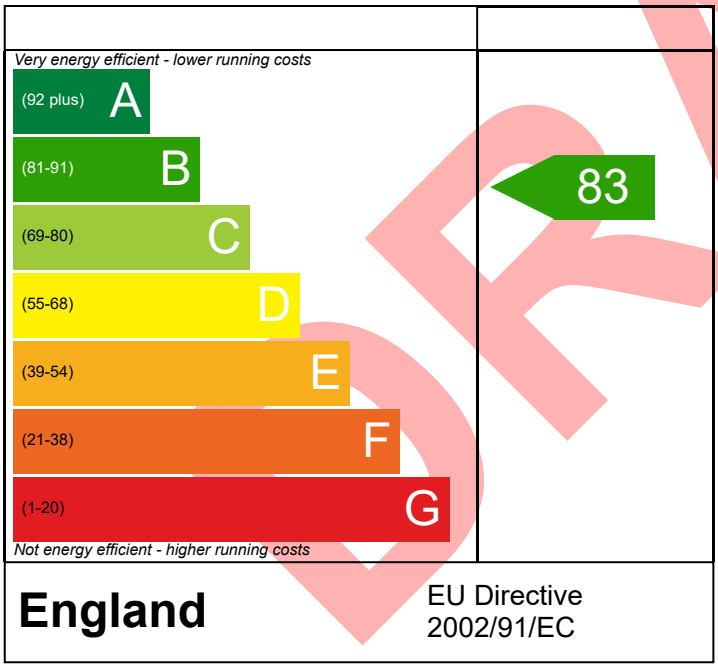
Flat 1, 99 London Road, Reading, RG1 5BY

Dwelling type:	Flat, Semi-Detached
Date of assessment:	17/02/2025
Produced by:	Sammit Pancholi
Total floor area:	35.95 m²
DRRN:	

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.

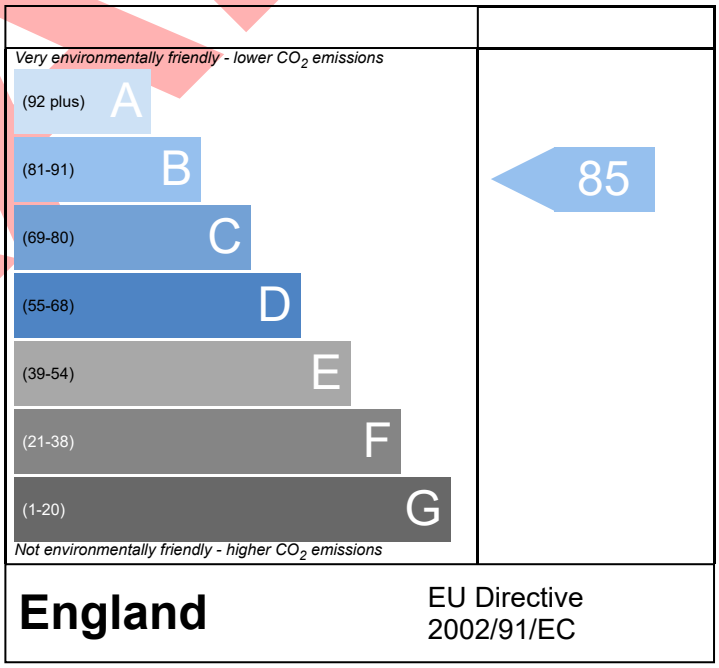
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

elmhurst energy

Property Reference	Flat 1 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Ground Floor Flat	**Prop Type Ref**	Ground Floor, Flat
Property	Flat 1, 99 London Road, Reading, RG1 5BY		

SAP Rating	83 B	**DER**	26.80	**TER**	
Environmental	85 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.82	**DFEE**	73.63	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	143.41	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	5	
Terrain Type	Suburban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	0	
2.0 Number of Storeys	1	
3.0 Date Built	2025	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	264.44	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	13.65 m	35.95 m²	2.69 m

8.0 Living Area	18.57	m²

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
External Wall 1	Solid Wall	Other	0.21	0.00	22.12	21.07	0.00	None	1.05	Enter Gross Area
External Cavity Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.18	60.00	13.27	8.52	0.00	None	4.75	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, dense blocks, cavity or cavity fill	0.00	180.00	18.18		None
Party Wall 2	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	20.00	19.30		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall - Timber	Plasterboard on timber frame	9.00	50.90

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
External Roof 1	External Plane Roof	Plasterboard, insulated at ceiling level	0.14	9.00	7.34	7.34	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Summary for Input Data

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Timber I-joists, carpeted	20.00	28.61

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.10	None	0.00	110.00	35.95

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			1.40
Window	Manufacturer	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 1	Window	External Wall 1	East	1.05	
Opening 2	Window	External Cavity Wall	North	4.75	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.20	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	2
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No
22.0 Pressure Testing	No
Test Method	Blower Door

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
LED	66.00	8.00	528.00	15

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18830	
Fuel Type	Mains gas	
In Winter	89.00	
In Summer	78.90	
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Controls SAP Code	2106	
Delayed Start Stat	Yes	

Summary for Input Data

Flue Type	Open
Fan Assisted Flue	Yes
Is MHS Pumped	No pump
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	Yes
Combi boiler type	Standard Combi
Combi keep hot type	None

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	0

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.50		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder — None

In Airing Cupboard — No

32.0 Photovoltaic Unit — One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.60	West	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro — None

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

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
			0	0
			0	0
			0	0

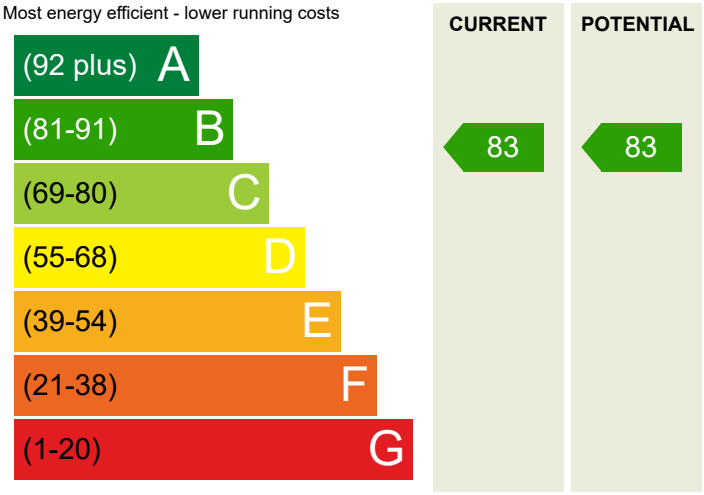
Energy Report

Dwelling Address	Flat 1, 99 London Road, Reading, RG1 5BY
Reference	Flat 1 - Gas + Solar-Ground Floor Flat
Assessment Date	17/02/2025
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	36

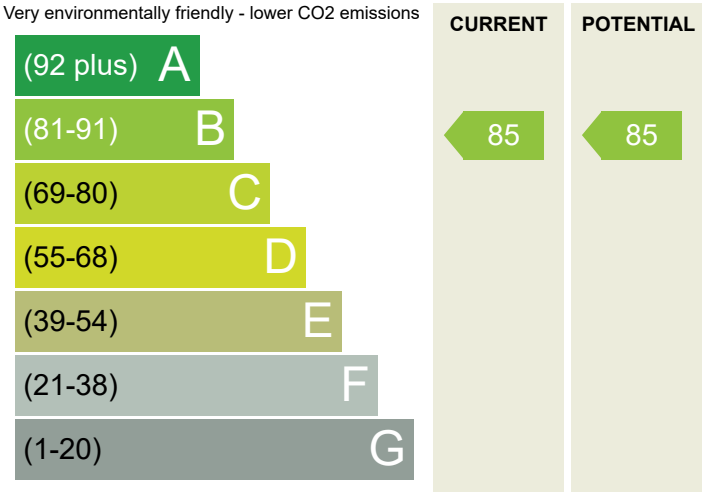
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

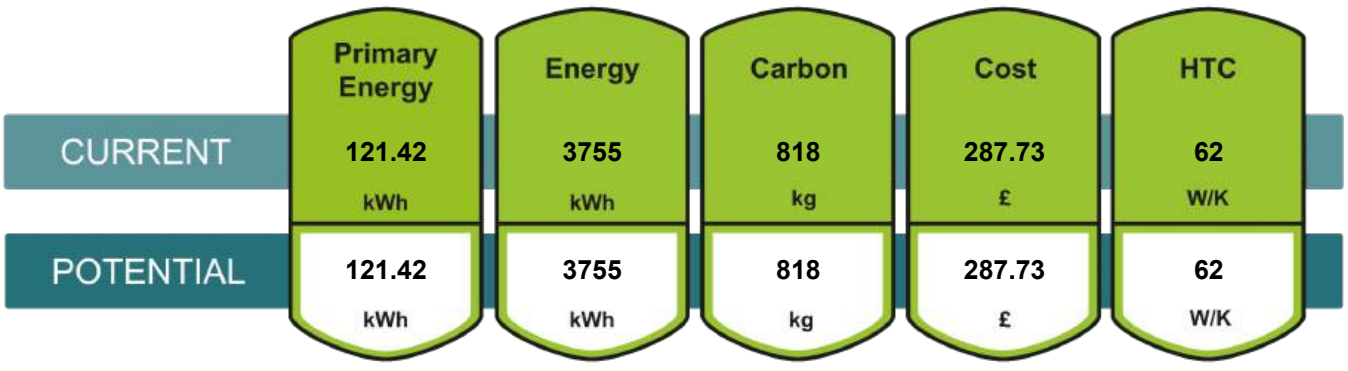
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.2 W/m²K	Very Good
Roof	Average thermal transmittance 0.14 W/m²K	Very Good
Floor	Average thermal transmittance 0.1 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Energy Report

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£27	£27	
Heating	£224	£224	
Hot Water	£115	£115	
New Technologies e.g. Impact of PV	-(£79)	-(£79)	
TOTAL	£288	£288	

Estimated energy use and potential savings

Space Heating
2020
kWh per year

Water Heating
2062
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report

Property Reference	Flat 1 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Ground Floor Flat	**Prop Type Ref**	Semi-Detached Flat
Property	Flat 1, 99 London Road, Reading, RG1 5BY		

SAP Rating	83 B	**DER**	26.80	**TER**	
Environmental	85 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.82	**DFEE**	73.63	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	143.41	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	Flat 1, 99 London Road	
House Number		
Postcode	RG1 5BY	
Street		
Town	Reading	
County		

Dwelling Orientation South (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Suburban

Property Type Flat, Semi-Detached

Comments

Electricity Tariff Standard

Smart electricity meter fitted: No

Smart gas meter fitted: No

Comments

Section 2: Dwelling Construction Details

External Walls

Description	External Wall 1		
Type	Solid Wall		
Construction	Other		
U-value	0.21	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	22.12	m²	

Description	External Cavity Wall		
Type	Cavity Wall		
Construction	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure		
U-value	0.18	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	13.27	m²	

Comments

Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	18.18
Party Wall 2	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	19.30

Comments

External Roofs

Description: External Roof 1
Type: External Plane Roof
Construction: Plasterboard, insulated at ceiling level
U-value: 0.14 W/m²K U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area: 7.34 m²
Comments

Heat Loss Floors

Description: Heatloss Floor 1
Type: Ground Floor - Solid
Construction: Slab on ground, screed over insulation
U-value: 0.10 W/m²K U-value calculations should be provided to verify the u-value entered into the Assessment
Area: 35.95 m²
Comments

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
Door	Manufacturer	Solid Door		0.00		1.40
Window	Manufacturer	Window	Double Low-E Soft 0.05	0.63		1.20

Comments

Openings

Name	Opening Type	Location	Orientation	Area (m^2)
Opening 1	Window	External Wall 1	East	1.05
Opening 2	Window	External Cavity Wall	North	4.75

Comments

Thermal Bridging Default

Y-value 0.200

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing No

Designed AP_{50} 8.00 $m^3/(h.m^2)$ @ 50 Pa

Property Tested? Yes

Test Method Blower Door

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

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	2
Number of passive vents	0
Number of flueless gas fires	0

Comments

Fixed Cooling System No

Comments

Lighting

No Fixed Lighting: No

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
LED	66.00	8.00	528.00	15

Comments

Main Heating 1: Database

Fuel Type	Mains gas	
Winter Efficiency	89.00	%
Summer Efficiency	78.90	%
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Flue Type	Open	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Programmer, room thermostat and TRVs
Boiler Interlock	Yes
Delayed Start Stat	Yes
PCDF Control Description	

Comments

Main Heating 2: None

Secondary Heating: None

Water Heating System

Water Heating	Main Heating 1
Supplementary Immersion	No
SAP Code	901
Water use <= 125 l/p/day	Yes
Cold Water Source	From mains

Number of baths: 0

Comments

Hot Water Cylinder: None

Comments

Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.50		No	

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit: One Dwelling

Export Capable Meter?: Yes

Connected To Dwelling: Yes

Diverter: No

Battery Capacity [kWh]: 0.00

PV Cells kWp	Orientation	Elevation	Overshading	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.60	West	30°	None Or Little	No	1.00		

Comments

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed .....

Dwelling Sign Off Report

Date .....

Full SAP Calculation Printout

Property Reference	Flat 2 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Ground Floor Maisonette	**Prop Type Ref**	Ground Floor, Maisonette
Property	Flat 2, 99 London Road, Reading, RG1 5BY		

SAP Rating	74 C	**DER**	41.06	**TER**	
Environmental	76 C	**% DER < TER**			N/A
CO_2 Emissions (t/year)	1.31	**DFEE**	110.45	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	224.02	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.2800	(1b)	x 2.4400	(2b) =	88.5232	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	36.2800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	88.5232	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.2259 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9759 (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) =	0.9027 (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	1.1510	1.1284	1.1059	0.9930	0.9704	0.8576	0.8576	0.8350	0.9027	0.9704	1.0156	1.0607	(22b)
Effective ac	1.1510	1.1284	1.1059	0.9930	0.9709	0.8677	0.8677	0.8486	0.9075	0.9709	1.0156	1.0607	(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			2.6300	3.0000	7.8900			(26)
Window			9.9000	1.5918	15.7584			(27)
Heatloss Floor 1			36.2800	0.2500	9.0700	110.0000	3990.8000	(28a)
External Wall 1	49.1700	12.5300	36.6400	0.3000	10.9920	0.0000	0.0000	(29a)
External Roof 1	15.5200		15.5200	0.1600	2.4832	9.0000	139.6800	(30)
Total net area of external elements Aum(A, m2)			100.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.1936			(33)
Main dwelling								
Party Wall 1			15.8800	0.0000	0.0000	180.0000	2858.4000	(32)
Party Ceiling 1			20.7600			20.0000	415.2000	(32b)
Internal Wall - Solid			18.3400			100.0000	1834.0000	(32c)
Internal Wall - Timber			33.4900			9.0000	301.4100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9539.4901 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		262.9407 (35)
Thermal bridges (Default value 0.200 * total exposed area)		20.1940 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	66.3876 (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	33.6234	32.9641	32.3048	29.0091	28.3619	25.3489	25.3489	24.7909	26.5095	28.3619	29.6677	30.9863	(38)
Heat transfer coeff													
	100.0110	99.3517	98.6924	95.3967	94.7495	91.7365	91.7365	91.1786	92.8971	94.7495	96.0553	97.3739	(39)
Average = Sum(39)m / 12 =												95.3274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.7566	2.7385	2.7203	2.6295	2.6116	2.5286	2.5286	2.5132	2.5606	2.6116	2.6476	2.6840	(40)
HLP (average)												2.6275	
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 1.3114 (42)

Hot water usage for mixer showers

84.4530	83.1838	81.3344	77.7959	75.1845	72.2724	70.6171	72.4525	74.4645	77.5913	81.2058	84.1294	(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

28.0596	27.0393	26.0189	24.9986	23.9782	22.9579	22.9579	23.9782	24.9986	26.0189	27.0393	28.0596	(42c)

Average daily hot water use (litres/day) 103.3716 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	112.5126	110.2231	107.3533	102.7944	99.1627	95.2302	93.5750	96.4307	99.4631	103.6102	108.2451	112.1890	(44)
Energy conte	178.1925	156.9562	164.9981	140.7204	133.4921	117.0967	113.1708	119.4014	122.6479	140.5980	154.2149	175.6609	(45)
Energy content (annual)										Total = Sum(45)m =		1717.1500	
Distribution loss (46)m = 0.15 x (45)m													
	26.7289	23.5434	24.7497	21.1081	20.0238	17.5645	16.9756	17.9102	18.3972	21.0897	23.1322	26.3491	(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	(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	17.8219	16.0983	17.8154	17.2110	17.7595	17.1401	17.6853	17.7112	17.1695	17.7681	17.2225	17.8175	(61)
Total heat required for water heating calculated for each month													
	196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(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													
	196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(64)
										Total per year (kWh/year) = Sum(64)m =		1926.3704	(64)
12Total per year (kWh/year)												1926	(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													
	63.7045	56.2125	59.3157	51.0923	48.8260	43.2197	42.0506	44.1288	45.0728	51.1909	55.5821	62.8616	(65)

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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	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	56.6446	62.7137	56.6446	58.5328	56.6446	58.5328	56.6446	56.6446	58.5328	56.6446	58.5328	56.6446	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	112.3043	113.4696	110.5329	104.2811	96.3892	88.9720	84.0168	82.8515	85.7882	92.0400	99.9319	107.3491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	(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)													
	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	(71)
Water heating gains (Table 5)													
	85.6243	83.6496	79.7254	70.9615	65.6263	60.0273	56.5197	59.3129	62.6011	68.8049	77.1973	84.4914	(72)
Total internal gains													
	297.2435	302.5032	289.5733	276.4457	261.3305	250.2024	239.8515	241.4793	249.5924	260.1599	278.3323	291.1555	(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	
North	1.9200	10.6334	0.6300	0.7000	0.7700	6.2394	(74)
East	2.7300	19.6403	0.6300	0.7000	0.7700	16.3863	(76)
West	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122	(80)

Solar gains	54.1379	105.6235	174.5716	257.5972	319.6510	329.2738	312.6178	265.6591	203.8299	125.3763	67.4210	44.5909	(83)
Total gains	351.3814	408.1267	464.1448	534.0429	580.9815	579.4762	552.4693	507.1383	453.4222	385.5362	345.7533	335.7464	(84)

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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	26.4957	26.6715	26.8497	27.7772	27.9670	28.8855	28.8855	29.0623	28.5247	27.9670	27.5868	27.2132	
alpha	2.7664	2.7781	2.7900	2.8518	2.8645	2.9257	2.9257	2.9375	2.9016	2.8645	2.8391	2.8142	
util living area													
	0.9894	0.9832	0.9704	0.9371	0.8709	0.7501	0.6197	0.6715	0.8554	0.9575	0.9839	0.9908	(86)
MIT	18.0697	18.3383	18.8164	19.5257	20.1519	20.6514	20.8599	20.8193	20.4237	19.6070	18.7621	18.0835	(87)
Th 2	19.6217	19.6308	19.6399	19.6853	19.6942	19.7357	19.7357	19.7434	19.7197	19.6942	19.6762	19.6580	(88)
util rest of house													

	0.9868	0.9791	0.9627	0.9194	0.8300	0.6639	0.4806	0.5390	0.7935	0.9422	0.9794	0.9886	(89)
MIT 2	16.9948	17.2676	17.7472	18.4725	19.0721	19.5381	19.6851	19.6712	19.3503	18.5676	17.7208	17.0323	(90)
Living area fraction										fLA = Living area / (4) =		0.4278	(91)
MIT	17.4546	17.7256	18.2046	18.9230	19.5340	20.0143	20.1876	20.1623	19.8095	19.0122	18.1663	17.4820	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4546	17.7256	18.2046	18.9230	19.5340	20.0143	20.1876	20.1623	19.8095	19.0122	18.1663	17.4820	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9809	0.9709	0.9515	0.9062	0.8240	0.6853	0.5348	0.5880	0.7988	0.9314	0.9718	0.9833	(94)
Useful gains	344.6555	396.2311	441.6214	483.9472	478.7297	397.1387	295.4819	298.2222	362.1893	359.0812	336.0042	330.1262	(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	1315.6093	1274.2471	1155.1541	956.1645	742.2673	496.6927	329.1172	343.0419	530.3955	797.0530	1062.9732	1293.3193	(97)
Space heating kWh	722.3896	590.0268	530.8683	339.9964	196.0720	0.0000	0.0000	0.0000	0.0000	325.8511	523.4177	716.6157	(98a)
Space heating requirement - total per year (kWh/year)												3945.2375	
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	722.3896	590.0268	530.8683	339.9964	196.0720	0.0000	0.0000	0.0000	0.0000	325.8511	523.4177	716.6157	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3945.2375	
Space heating per m2											(98c) / (4) =	108.7441	(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 %)	84.0000	(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	722.3896	590.0268	530.8683	339.9964	196.0720	0.0000	0.0000	0.0000	0.0000	325.8511	523.4177	716.6157	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	859.9876	702.4128	631.9861	404.7576	233.4191	0.0000	0.0000	0.0000	0.0000	387.9179	623.1163	853.1139	(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	196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(64)
Efficiency of water heater												78.9000	(216)
(217)m	86.6331	86.4892	86.1743	85.5274	84.3006	78.9000	78.9000	78.9000	78.9000	85.4236	86.2752	86.6421	(217)
Fuel for water heating, kWh/month	226.2581	200.0881	212.1438	184.6559	179.4193	170.1354	165.8507	173.7803	177.2083	185.3892	198.7101	223.3075	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.6371	10.1380	9.1281	6.6876	5.1657	4.2204	4.7124	6.1253	7.9562	10.4389	11.7907	12.9883	(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)
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	4696.7113	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2296.9467	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	101.9888	(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	7140.6468	(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	4696.7113	0.2100	986.3094	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2296.9467	0.2100	482.3588	(264)
Space and water heating			1468.6682	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	101.9888	0.1443	14.7201	(268)
Total CO2, kg/year			1489.6304	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			41.0600	(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	4696.7113	1.1300	5307.2838	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2296.9467	1.1300	2595.5497	(278)
Space and water heating			7902.8335	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	101.9888	1.5338	156.4338	(282)
Total Primary energy kWh/year			8127.3434	(286)
Dwelling Primary energy Rate (DPER)			224.0200	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.2800	(1b)	x 2.4400	(2b) =	88.5232	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	36.2800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		88.5232	(5)

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2. Ventilation rate

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	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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2259	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9759	(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) =	0.9027	(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	1.1510	1.1284	1.1059	0.9930	0.9704	0.8576	0.8576	0.8350	0.9027	0.9704	1.0156	1.0607	(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	1.1510	1.1284	1.1059	0.9930	0.9709	0.8677	0.8677	0.8486	0.9075	0.9709	1.0156	1.0607	(25)

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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			2.6300	3.0000	7.8900			(26)
Window			9.9000	1.5918	15.7584			(27)
Heatloss Floor 1			36.2800	0.2500	9.0700	110.0000	3990.8000	(28a)
External Wall 1	49.1700	12.5300	36.6400	0.3000	10.9920	0.0000	0.0000	(29a)
External Roof 1	15.5200		15.5200	0.1600	2.4832	9.0000	139.6800	(30)
Total net area of external elements Aum(A, m2)			100.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.1936			(33)
Main dwelling								
Party Wall 1			15.8800	0.0000	0.0000	180.0000	2858.4000	(32)
Party Ceiling 1			20.7600			30.0000	622.8000	(32b)
Internal Wall - Solid			18.3400			100.0000	1834.0000	(32c)
Internal Wall - Timber			33.4900			9.0000	301.4100	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9747.0901	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							268.6629	(35)
Thermal bridges (Default value 0.200 * total exposed area)							20.1940	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 66.3876 (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	33.6234	32.9641	32.3048	29.0091	28.3619	25.3489	25.3489	24.7909	26.5095	28.3619	29.6677	30.9863	(38)
Heat transfer coeff	100.0110	99.3517	98.6924	95.3967	94.7495	91.7365	91.7365	91.1786	92.8971	94.7495	96.0553	97.3739	(39)
Average = Sum(39)m / 12 =												95.3274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.7566	2.7385	2.7203	2.6295	2.6116	2.5286	2.5286	2.5132	2.5606	2.6116	2.6476	2.6840	(40)
HLP (average)												2.6275	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3114 (42)

Hot water usage for mixer showers

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

19.9935	19.6966	19.2785	18.5075	17.9302	17.2901	16.9443	17.3595	17.8116	18.4966	19.2834	19.9260	(42b)

Hot water usage for other uses

28.0596	27.0393	26.0189	24.9986	23.9782	22.9579	22.9579	23.9782	24.9986	26.0189	27.0393	28.0596	(42c)

Average daily hot water use (litres/day) 44.0459 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	48.0531	46.7359	45.2974	43.5060	41.9084	40.2479	39.9021	41.3377	42.8102	44.5155	46.3227	47.9856	(44)
Energy conte	76.1044	66.5513	69.6204	59.5576	56.4168	49.4895	48.2582	51.1847	52.7892	60.4071	65.9951	75.1338	(45)
Energy content (annual)										Total = Sum(45)m =		731.5081	

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	(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

64.6888	56.5686	59.1773	50.6240	47.9542	42.0661	41.0195	43.5070	44.8708	51.3460	56.0959	63.8637	(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

64.6888	56.5686	59.1773	50.6240	47.9542	42.0661	41.0195	43.5070	44.8708	51.3460	56.0959	63.8637	(64)
								Total per year (kWh/year) = Sum(64)m =			621.7818	(64)
12Total per year (kWh/year)											622	(64)

Electric shower(s)

37.0037	32.9706	36.0027	34.3569	35.0016	33.3881	34.5011	35.0016	34.3569	36.0027	35.3257	37.0037	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							420.9151	(64a)

Heat gains from water heating, kWh/month

25.4231	22.3848	23.7950	21.2452	20.7390	18.8635	18.8801	19.6271	19.8069	21.8372	22.8554	25.2169	(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	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	56.6446	62.7137	56.6446	58.5328	56.6446	58.5328	56.6446	56.6446	58.5328	56.6446	58.5328	56.6446	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	112.3043	113.4696	110.5329	104.2811	96.3892	88.9720	84.0168	82.8515	85.7882	92.0400	99.9319	107.3491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	(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)	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	(71)
Water heating gains (Table 5)	34.1709	33.3107	31.9825	29.5072	27.8749	26.1994	25.3765	26.3806	27.5096	29.3510	31.7436	33.8936	(72)
Total internal gains	245.7901	252.1643	241.8304	234.9914	223.5791	216.3745	208.7083	208.5470	214.5009	220.7060	232.8786	240.5577	(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	
North	1.9200	10.6334	0.6300	0.7000	0.7700	6.2394	(74)
East	2.7300	19.6403	0.6300	0.7000	0.7700	16.3863	(76)
West	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122	(80)

Solar gains	54.1379	105.6235	174.5716	257.5972	319.6510	329.2738	312.6178	265.6591	203.8299	125.3763	67.4210	44.5909	(83)
Total gains	299.9280	357.7879	416.4019	492.5886	543.2301	545.6482	521.3262	474.2061	418.3307	346.0823	300.2995	285.1486	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.0723	27.2519	27.4340	28.3817	28.5756	29.5141	29.5141	29.6948	29.1454	28.5756	28.1871	27.8055	
alpha	2.8048	2.8168	2.8289	2.8921	2.9050	2.9676	2.9676	2.9797	2.9430	2.9050	2.8791	2.8537	
util living area	0.9933	0.9885	0.9782	0.9493	0.8892	0.7747	0.6460	0.7011	0.8785	0.9684	0.9894	0.9943	(86)

MIT	18.0002	18.2698	18.7512	19.4727	20.1123	20.6292	20.8492	20.8034	20.3859	19.5502	18.6970	18.0145	(87)
Th 2	18.8766	18.8865	18.8964	18.9467	18.9568	19.0042	19.0042	19.0132	18.9858	18.9568	18.9365	18.9163	(88)
util rest of house													
	0.9906	0.9837	0.9682	0.9234	0.8240	0.6273	0.4034	0.4681	0.7760	0.9471	0.9840	0.9920	(89)
MIT 2	16.3393	16.6126	17.0944	17.8267	18.4218	18.8650	18.9811	18.9763	18.6956	17.9222	17.0696	16.3773	(90)
Living area fraction										fLA = Living area / (4) =		0.4278	(91)
MIT	17.0498	17.3215	17.8032	18.5308	19.1449	19.6197	19.7802	19.7579	19.4187	18.6186	17.7658	17.0777	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0498	17.3215	17.8032	18.5308	19.1449	19.6197	19.7802	19.7579	19.4187	18.6186	17.7658	17.0777	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9867	0.9781	0.9605	0.9161	0.8317	0.6815	0.5107	0.5703	0.8048	0.9418	0.9792	0.9887	(94)
Useful gains	295.9524	349.9510	399.9588	451.2730	451.7922	371.8365	266.2526	270.4460	336.6620	325.9575	294.0453	281.9205	(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													
	1275.1208	1234.1010	1115.5368	918.7501	705.4046	460.4899	291.7447	306.1711	494.0889	759.7605	1024.5060	1253.9493	(97)
Space heating kWh													
	728.5012	594.1488	532.3900	336.5835	188.6876	0.0000	0.0000	0.0000	0.0000	322.7494	525.9317	723.1895	(98a)
Space heating requirement - total per year (kWh/year)												3952.1817	
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													
	728.5012	594.1488	532.3900	336.5835	188.6876	0.0000	0.0000	0.0000	0.0000	322.7494	525.9317	723.1895	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3952.1817	
Space heating per m2											(98c) / (4) =	108.9356	(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	862.3234	678.8503	692.9572	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6145	0.6947	0.6477	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	529.8726	471.5795	448.8060	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	619.2216	591.9342	537.9178	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	64.3313	89.5439	66.2992	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	16.0828	22.3860	16.5748	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												55.0436	(107)
Energy for space heating												108.9356	(99)
Energy for space cooling												1.5172	(108)
Total												110.4527	(109)
Fabric Energy Efficiency (DFEE)												110.5	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.2800	(1b)	x 2.4400	(2b) =	88.5232	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	36.2800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		88.5232	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2259	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9759	(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) =	0.9027	(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	1.1510	1.1284	1.1059	0.9930	0.9704	0.8576	0.8576	0.8350	0.9027	0.9704	1.0156	1.0607	(22b)
Effective ac	1.1510	1.1284	1.1059	0.9930	0.9709	0.8677	0.8677	0.8486	0.9075	0.9709	1.0156	1.0607	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			2.6300	3.0000	7.8900			(26)
Window			9.9000	1.5918	15.7584			(27)
Heatloss Floor 1			36.2800	0.2500	9.0700	110.0000	3990.8000	(28a)
External Wall 1	49.1700	12.5300	36.6400	0.3000	10.9920	0.0000	0.0000	(29a)
External Roof 1	15.5200		15.5200	0.1600	2.4832	9.0000	139.6800	(30)
Total net area of external elements Aum(A, m2)			100.9700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.1936			(33)
Main dwelling								
Party Wall 1			15.8800	0.0000	0.0000	180.0000	2858.4000	(32)
Party Ceiling 1			20.7600			30.0000	622.8000	(32b)
Internal Wall - Solid			18.3400			100.0000	1834.0000	(32c)
Internal Wall - Timber			33.4900			9.0000	301.4100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9747.0901 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		268.6629 (35)
Thermal bridges (Default value 0.200 * total exposed area)		20.1940 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	66.3876 (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	33.6234	32.9641	32.3048	29.0091	28.3619	25.3489	25.3489	24.7909	26.5095	28.3619	29.6677	30.9863	(38)
Heat transfer coeff	100.0110	99.3517	98.6924	95.3967	94.7495	91.7365	91.7365	91.1786	92.8971	94.7495	96.0553	97.3739	(39)
Average = Sum(39)m / 12 =												95.3274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.7566	2.7385	2.7203	2.6295	2.6116	2.5286	2.5286	2.5132	2.5606	2.6116	2.6476	2.6840	(40)
HLP (average)												2.6275	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.3114 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
84.4530	83.1838	81.3344	77.7959	75.1845	72.2724	70.6171	72.4525	74.4645	77.5913	81.2058	84.1294	(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

28.0596	27.0393	26.0189	24.9986	23.9782	22.9579	22.9579	23.9782	24.9986	26.0189	27.0393	28.0596	(42c)

Average daily hot water use (litres/day)	103.3716 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.5126	110.2231	107.3533	102.7944	99.1627	95.2302	93.5750	96.4307	99.4631	103.6102	108.2451	112.1890	(44)
Energy conte	178.1925	156.9562	164.9981	140.7204	133.4921	117.0967	113.1708	119.4014	122.6479	140.5980	154.2149	175.6609	(45)
Energy content (annual)										Total = Sum(45)m =		1717.1500	
Distribution loss (46)m = 0.15 x (45)m	26.7289	23.5434	24.7497	21.1081	20.0238	17.5645	16.9756	17.9102	18.3972	21.0897	23.1322	26.3491	(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	(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	17.8219	16.0983	17.8154	17.2110	17.7595	17.1401	17.6853	17.7112	17.1695	17.7681	17.2225	17.8175	(61)
Total heat required for water heating calculated for each month	196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(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	196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(64)
										Total per year (kWh/year) = Sum(64)m =		1926.3704	(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	63.7045	56.2125	59.3157	51.0923	48.8260	43.2197	42.0506	44.1288	45.0728	51.1909	55.5821	62.8616	(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	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.4376	12.8233	10.4286	7.8951	5.9017	4.9825	5.3837	6.9980	9.3927	11.9262	13.9196	14.8388	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.6183	169.3576	164.9745	155.6434	143.8645	132.7940	125.3983	123.6589	128.0420	137.3732	149.1520	160.2225	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	(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)	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	(71)
Water heating gains (Table 5)	85.6243	83.6496	79.7254	70.9615	65.6263	60.0273	56.5197	59.3129	62.6011	68.8049	77.1973	84.4914	(72)
Total internal gains	338.0868	336.2372	325.5352	304.9067	285.7992	268.2105	257.7083	260.3764	270.4424	288.5109	310.6756	329.9594	(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	
North	1.9200	10.6334	0.6300	0.7000	0.7700	6.2394	(74)
East	2.7300	19.6403	0.6300	0.7000	0.7700	16.3863	(76)
West	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122	(80)

Solar gains	54.1379	105.6235	174.5716	257.5972	319.6510	329.2738	312.6178	265.6591	203.8299	125.3763	67.4210	44.5909	(83)
Total gains	392.2247	441.8607	500.1067	562.5039	605.4502	597.4842	570.3262	526.0355	474.2723	413.8872	378.0966	374.5503	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.0723	27.2519	27.4340	28.3817	28.5756	29.5141	29.5141	29.6948	29.1454	28.5756	28.1871	27.8055	
alpha	2.8048	2.8168	2.8289	2.8921	2.9050	2.9676	2.9676	2.9797	2.9430	2.9050	2.8791	2.8537	
util living area	0.9868	0.9805	0.9662	0.9317	0.8632	0.7414	0.6084	0.6588	0.8458	0.9517	0.9809	0.9885	(86)
MIT	18.1951	18.4442	18.9178	19.5984	20.2006	20.6749	20.8722	20.8353	20.4615	19.6812	18.8606	18.2059	(87)
Th 2	19.6217	19.6308	19.6399	19.6853	19.6942	19.7357	19.7357	19.7434	19.7197	19.6942	19.6762	19.6580	(88)
util rest of house	0.9836	0.9758	0.9574	0.9126	0.8204	0.6536	0.4693	0.5254	0.7810	0.9345	0.9755	0.9857	(89)
MIT 2	17.1153	17.3685	17.8429	18.5387	19.1129	19.5538	19.6905	19.6790	19.3792	18.6354	17.8144	17.1502	(90)
Living area fraction									fLA = Living area / (4) =			0.4278	(91)
MIT	17.5772	17.8287	18.3027	18.9920	19.5782	20.0334	20.1960	20.1737	19.8422	19.0828	18.2619	17.6018	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5772	17.8287	18.3027	18.9920	19.5782	20.0334	20.1960	20.1737	19.8422	19.0828	18.2619	17.6018	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9767	0.9670	0.9457	0.8998	0.8159	0.6767	0.5242	0.5758	0.7884	0.9237	0.9672	0.9796	(94)
Useful gains	383.1001	427.2651	472.9394	506.1136	493.9838	404.3461	298.9696	302.8740	373.9396	382.3266	365.7040	366.9090	(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	1327.8690	1284.4858	1164.8395	962.7419	746.4571	498.4416	329.8877	344.0779	533.4334	803.7392	1072.1640	1304.9851	(97)
Space heating kWh	702.9081	576.0523	514.7737	328.7724	187.8402	0.0000	0.0000	0.0000	0.0000	313.5310	508.6512	697.9286	(98a)
Space heating requirement - total per year (kWh/year)												3830.4574	
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	702.9081	576.0523	514.7737	328.7724	187.8402	0.0000	0.0000	0.0000	0.0000	313.5310	508.6512	697.9286	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3830.4574	
Space heating per m2											(98c) / (4) =	105.5804	(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 %)	84.0000	(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	702.9081	576.0523	514.7737	328.7724	187.8402	0.0000	0.0000	0.0000	0.0000	313.5310	508.6512	697.9286	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	836.7954	685.7766	612.8258	391.3957	223.6193	0.0000	0.0000	0.0000	0.0000	373.2512	605.5371	830.8674	(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	196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(64)
Efficiency of water heater												78.9000	(216)
(217)m	86.5832	86.4437	86.1112	85.4505	84.1927	78.9000	78.9000	78.9000	78.9000	85.3341	86.2178	86.5940	(217)
Fuel for water heating, kWh/month	226.3885	200.1934	212.2992	184.8220	179.6493	170.1354	165.8507	173.7803	177.2083	185.5837	198.8422	223.4316	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.6371	10.1380	9.1281	6.6876	5.1657	4.2204	4.7124	6.1253	7.9562	10.4389	11.7907	12.9883	(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)
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	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4560.0684	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2298.1845	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	101.9888	(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	7005.2417	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4560.0684	3.6400	165.9865	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2298.1845	3.6400	83.6539	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	101.9888	16.4900	16.8180	(250)
Additional standing charges			92.0000	(251)
Total energy cost			365.8789	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.6205	(257)
SAP value		73.7313	
SAP rating (Section 12)		74	(258)
SAP band		C	

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	4560.0684	0.2100	957.6144	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2298.1845	0.2100	482.6188	(264)
Space and water heating			1440.2331	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	101.9888	0.1443	14.7201	(268)
Total CO2, kg/year			1461.1953	(272)
CO2 emissions per m2			40.2800	(273)
EI value			75.9104	
EI rating			76	(274)
EI band			C	

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.2800	(1b)	x 2.4400	(2b) =	88.5232	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	36.2800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	88.5232	(5)

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2. Ventilation rate

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	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	2 * 10 = 20.0000	(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) =	20.0000 / (5) =	0.2259 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9759 (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) =	0.9027 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.9704	0.9253	0.9253	0.8576	0.8802	0.7673	0.7673	0.7448	0.7673	0.8576	0.8350	0.9027	(22b)
Effective ac	0.9709	0.9281	0.9281	0.8677	0.8873	0.7944	0.7944	0.7773	0.7944	0.8677	0.8486	0.9075	(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			2.6300	3.0000	7.8900			(26)
Window			9.9000	1.5918	15.7584			(27)
Heatloss Floor 1			36.2800	0.2500	9.0700	110.0000	3990.8000	(28a)
External Wall 1	49.1700	12.5300	36.6400	0.3000	10.9920	0.0000	0.0000	(29a)
External Roof 1	15.5200		15.5200	0.1600	2.4832	9.0000	139.6800	(30)
Total net area of external elements Aum(A, m2)			100.9700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.1936			(33)
Main dwelling								
Party Wall 1			15.8800	0.0000	0.0000	180.0000	2858.4000	(32)
Party Ceiling 1			20.7600			30.0000	622.8000	(32b)
Internal Wall - Solid			18.3400			100.0000	1834.0000	(32c)
Internal Wall - Timber			33.4900			9.0000	301.4100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9747.0901 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		268.6629 (35)
Thermal bridges (Default value 0.200 * total exposed area)		20.1940 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	66.3876 (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	28.3619	27.1121	27.1121	25.3489	25.9217	23.2063	23.2063	22.7079	23.2063	25.3489	24.7909	26.5095	(38)
Heat transfer coeff	94.7495	93.4997	93.4997	91.7365	92.3094	89.5940	89.5940	89.0955	89.5940	91.7365	91.1786	92.8971	(39)
Average = Sum(39)m / 12 =												91.6237	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.6116	2.5772	2.5772	2.5286	2.5444	2.4695	2.4695	2.4558	2.4695	2.5286	2.5132	2.5606	(40)
HLP (average)												2.5255	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.3114 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
84.4530	83.1838	81.3344	77.7959	75.1845	72.2724	70.6171	72.4525	74.4645	77.5913	81.2058	84.1294	(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

28.0596	27.0393	26.0189	24.9986	23.9782	22.9579	22.9579	23.9782	24.9986	26.0189	27.0393	28.0596	(42c)

Average daily hot water use (litres/day)		103.3716 (43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
112.5126	110.2231	107.3533	102.7944	99.1627	95.2302	93.5750	96.4307	99.4631	103.6102	108.2451	112.1890	(44)
178.1925	156.9562	164.9981	140.7204	133.4921	117.0967	113.1708	119.4014	122.6479	140.5980	154.2149	175.6609	(45)

Energy content (annual)	Total = Sum(45)m =	1717.1500

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

26.7289	23.5434	24.7497	21.1081	20.0238	17.5645	16.9756	17.9102	18.3972	21.0897	23.1322	26.3491	(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	(57)
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)
17.8219	16.0983	17.8154	17.2110	17.7595	17.1401	17.6853	17.7112	17.1695	17.7681	17.2225	17.8175	(61)

Total heat required for water heating calculated for each month

196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(62)
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)
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)
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)
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)
196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(64)

	Total per year (kWh/year) = Sum(64)m =	1926.3704 (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

63.7045	56.2125	59.3157	51.0923	48.8260	43.2197	42.0506	44.1288	45.0728	51.1909	55.5821	62.8616	(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	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.4376	12.8233	10.4286	7.8951	5.9017	4.9825	5.3837	6.9980	9.3927	11.9262	13.9196	14.8388	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	167.6183	169.3576	164.9745	155.6434	143.8645	132.7940	125.3983	123.6589	128.0420	137.3732	149.1520	160.2225	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	(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)													
	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	(71)
Water heating gains (Table 5)													
	85.6243	83.6496	79.7254	70.9615	65.6263	60.0273	56.5197	59.3129	62.6011	68.8049	77.1973	84.4914	(72)
Total internal gains													
	338.0868	336.2372	325.5352	304.9067	285.7992	268.2105	257.7083	260.3764	270.4424	288.5109	310.6756	329.9594	(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	
North	1.9200	12.7650	0.6300	0.7000	0.7700	7.4902	(74)
East	2.7300	23.8018	0.6300	0.7000	0.7700	19.8584	(76)
West	5.2500	23.8018	0.6300	0.7000	0.7700	38.1892	(80)

Solar gains	65.5378	111.8084	183.3946	274.3247	331.1552	360.5861	339.0726	295.7987	228.1490	142.4527	80.4245	54.2746	(83)
Total gains	403.6246	448.0456	508.9298	579.2314	616.9544	628.7966	596.7809	556.1751	498.5915	430.9636	391.1002	384.2340	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.5756	28.9576	28.9576	29.5141	29.3310	30.2199	30.2199	30.3890	30.2199	29.5141	29.6948	29.1454	
alpha	2.9050	2.9305	2.9305	2.9676	2.9554	3.0147	3.0147	3.0259	3.0147	2.9676	2.9797	2.9430	
util living area													
	0.9840	0.9769	0.9579	0.9095	0.8139	0.6299	0.4634	0.5015	0.7784	0.9334	0.9751	0.9859	(86)
MIT	18.5266	18.7758	19.2435	19.8916	20.4474	20.8412	20.9566	20.9453	20.6601	19.9417	19.1829	18.5340	(87)
Th 2	19.6942	19.7114	19.7114	19.7357	19.7278	19.7652	19.7652	19.7721	19.7652	19.7357	19.7434	19.7197	(88)
util rest of house													
	0.9800	0.9712	0.9468	0.8839	0.7551	0.5161	0.3037	0.3385	0.6900	0.9090	0.9678	0.9824	(89)
MIT 2	17.4931	17.7514	18.2122	18.8554	19.3578	19.6953	19.7567	19.7602	19.5767	18.9153	18.1789	17.5178	(90)
Living area fraction									fLA = Living area / (4) =			0.4278	(91)
MIT	17.9352	18.1897	18.6533	19.2987	19.8239	20.1855	20.2700	20.2671	20.0402	19.3544	18.6084	17.9526	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9352	18.1897	18.6533	19.2987	19.8239	20.1855	20.2700	20.2671	20.0402	19.3544	18.6084	17.9526	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9725	0.9619	0.9348	0.8730	0.7602	0.5579	0.3721	0.4080	0.7126	0.8995	0.9588	0.9756	(94)
Useful gains	392.5279	430.9805	475.7450	505.6669	469.0247	350.8276	222.0651	226.8960	355.2871	387.6450	374.9746	374.8625	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1216.1291	1167.7789	1052.1839	862.2048	639.1442	392.9157	230.2536	237.6295	451.5707	720.5332	967.2573	1193.9647	(97)
Space heating kWh													
	612.7593	495.1285	428.8705	256.7073	126.5690	0.0000	0.0000	0.0000	0.0000	247.6689	426.4436	609.4120	(98a)
Space heating requirement - total per year (kWh/year)												3203.5591	
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													
	612.7593	495.1285	428.8705	256.7073	126.5690	0.0000	0.0000	0.0000	0.0000	247.6689	426.4436	609.4120	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3203.5591	
Space heating per m2											(98c) / (4) =	88.3010	(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 %)												84.0000	(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													
	612.7593	495.1285	428.8705	256.7073	126.5690	0.0000	0.0000	0.0000	0.0000	247.6689	426.4436	609.4120	(98)
Space heating efficiency (main heating system 1)													
	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)													
	729.4754	589.4387	510.5602	305.6039	150.6773	0.0000	0.0000	0.0000	0.0000	294.8439	507.6709	725.4905	(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													
	196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(64)
Efficiency of water heater												78.9000	(216)
(217)m	86.3219	86.1440	85.7205	84.8623	83.2016	78.9000	78.9000	78.9000	78.9000	84.7677	85.8488	86.3367	(217)
Fuel for water heating, kWh/month													
	227.0738	200.8898	213.2670	186.1031	181.7894	170.1354	165.8507	173.7803	177.2083	186.8236	199.6968	224.0975	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.6371	10.1380	9.1281	6.6876	5.1657	4.2204	4.7124	6.1253	7.9562	10.4389	11.7907	12.9883	(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)
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	3813.7608	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2306.7156	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	101.9888	(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	6267.4652	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3813.7608	5.6000	213.5706	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2306.7156	5.6000	129.1761	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	101.9888	26.0600	26.5783	(250)
Additional standing charges			99.0000	(251)
Total energy cost			480.0520	(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	3813.7608	0.2100	800.8898	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2306.7156	0.2100	484.4103	(264)
Space and water heating			1285.3000	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	101.9888	0.1443	14.7201	(268)
Total CO2, kg/year			1306.2622	(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	3813.7608	1.1300	4309.5497	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2306.7156	1.1300	2606.5886	(278)
Space and water heating			6916.1383	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	101.9888	1.5338	156.4338	(282)
Total Primary energy kWh/year			7140.6482	(286)

SAP 10 EPC IMPROVEMENTS

Ground Floor Maisonette

Current energy efficiency rating:	C 74
Current environmental impact rating:	C 76

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

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

	Energy	Environmental

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

Potential energy efficiency rating: C 74
Potential environmental impact rating: C 76

Fuel prices for cost data on this page from database revision number 561 TEST (31 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£38	£38	£0
Mains gas	£442	£442	£0
Space heating	£324	£324	£0
Water heating	£129	£129	£0
Lighting	£27	£27	£0
Total cost of fuels	£480	£480	£0
Total cost of uses	£480	£480	£0
Delivered energy	173 kWh/m²	173 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.3 tonnes	1.3 tonnes	0.0 tonnes
CO2 emissions per m²	36 kg/m²	36 kg/m²	0 kg/m²
Primary energy	197 kWh/m²	197 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.2800	(1b)	x 2.4400	(2b) =	88.5232	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	36.2800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		88.5232	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2259	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9759	(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) =	0.9027	(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	1.1510	1.1284	1.1059	0.9930	0.9704	0.8576	0.8576	0.8350	0.9027	0.9704	1.0156	1.0607	(22b)
Effective ac	1.1510	1.1284	1.1059	0.9930	0.9709	0.8677	0.8677	0.8486	0.9075	0.9709	1.0156	1.0607	(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			2.6300	3.0000	7.8900			(26)
Window			9.9000	1.5918	15.7584			(27)
Heatloss Floor 1			36.2800	0.2500	9.0700	110.0000	3990.8000	(28a)
External Wall 1	49.1700	12.5300	36.6400	0.3000	10.9920	0.0000	0.0000	(29a)
External Roof 1	15.5200		15.5200	0.1600	2.4832	9.0000	139.6800	(30)
Total net area of external elements Aum(A, m2)			100.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.1936			(33)
Main dwelling								
Party Wall 1			15.8800	0.0000	0.0000	180.0000	2858.4000	(32)
Party Ceiling 1			20.7600			30.0000	622.8000	(32b)
Internal Wall - Solid			18.3400			100.0000	1834.0000	(32c)
Internal Wall - Timber			33.4900			9.0000	301.4100	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9747.0901	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							268.6629	(35)
Thermal bridges (Default value 0.200 * total exposed area)							20.1940	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.3876 (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	33.6234	32.9641	32.3048	29.0091	28.3619	25.3489	25.3489	24.7909	26.5095	28.3619	29.6677	30.9863	(38)
Heat transfer coeff	100.0110	99.3517	98.6924	95.3967	94.7495	91.7365	91.7365	91.1786	92.8971	94.7495	96.0553	97.3739	(39)
Average = Sum(39)m / 12 =												95.3274	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.7566	2.7385	2.7203	2.6295	2.6116	2.5286	2.5286	2.5132	2.5606	2.6116	2.6476	2.6840	(40)
HLP (average)												2.6275	
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 1.3114 (42)
Hot water usage for mixer showers

84.4530	83.1838	81.3344	77.7959	75.1845	72.2724	70.6171	72.4525	74.4645	77.5913	81.2058	84.1294	(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

28.0596	27.0393	26.0189	24.9986	23.9782	22.9579	22.9579	23.9782	24.9986	26.0189	27.0393	28.0596	(42c)

Average daily hot water use (litres/day) 103.3716 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.5126	110.2231	107.3533	102.7944	99.1627	95.2302	93.5750	96.4307	99.4631	103.6102	108.2451	112.1890	(44)
Energy conte	178.1925	156.9562	164.9981	140.7204	133.4921	117.0967	113.1708	119.4014	122.6479	140.5980	154.2149	175.6609	(45)
Energy content (annual)										Total = Sum(45)m =		1717.1500	
Distribution loss (46)m = 0.15 x (45)m	26.7289	23.5434	24.7497	21.1081	20.0238	17.5645	16.9756	17.9102	18.3972	21.0897	23.1322	26.3491	(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	(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	17.8219	16.0983	17.8154	17.2110	17.7595	17.1401	17.6853	17.7112	17.1695	17.7681	17.2225	17.8175	(61)
Total heat required for water heating calculated for each month	196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(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	196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(64)
										Total per year (kWh/year) = Sum(64)m =		1926.3704	(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	63.7045	56.2125	59.3157	51.0923	48.8260	43.2197	42.0506	44.1288	45.0728	51.1909	55.5821	62.8616	(65)

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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	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.4376	12.8233	10.4286	7.8951	5.9017	4.9825	5.3837	6.9980	9.3927	11.9262	13.9196	14.8388	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.6183	169.3576	164.9745	155.6434	143.8645	132.7940	125.3983	123.6589	128.0420	137.3732	149.1520	160.2225	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	(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)	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	(71)
Water heating gains (Table 5)	85.6243	83.6496	79.7254	70.9615	65.6263	60.0273	56.5197	59.3129	62.6011	68.8049	77.1973	84.4914	(72)
Total internal gains	338.0868	336.2372	325.5352	304.9067	285.7992	268.2105	257.7083	260.3764	270.4424	288.5109	310.6756	329.9594	(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	
North	1.9200	10.6334	0.6300	0.7000	0.7700	6.2394	(74)
East	2.7300	19.6403	0.6300	0.7000	0.7700	16.3863	(76)
West	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122	(80)

Solar gains	54.1379	105.6235	174.5716	257.5972	319.6510	329.2738	312.6178	265.6591	203.8299	125.3763	67.4210	44.5909	(83)
Total gains	392.2247	441.8607	500.1067	562.5039	605.4502	597.4842	570.3262	526.0355	474.2723	413.8872	378.0966	374.5503	(84)

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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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.0723	27.2519	27.4340	28.3817	28.5756	29.5141	29.5141	29.6948	29.1454	28.5756	28.1871	27.8055	
alpha	2.8048	2.8168	2.8289	2.8921	2.9050	2.9676	2.9676	2.9797	2.9430	2.9050	2.8791	2.8537	
util living area	0.9868	0.9805	0.9662	0.9317	0.8632	0.7414	0.6084	0.6588	0.8458	0.9517	0.9809	0.9885	(86)

MIT	18.1951	18.4442	18.9178	19.5984	20.2006	20.6749	20.8722	20.8353	20.4615	19.6812	18.8606	18.2059	(87)
Th 2	19.6217	19.6308	19.6399	19.6853	19.6942	19.7357	19.7357	19.7434	19.7197	19.6942	19.6762	19.6580	(88)
util rest of house													
	0.9836	0.9758	0.9574	0.9126	0.8204	0.6536	0.4693	0.5254	0.7810	0.9345	0.9755	0.9857	(89)
MIT 2	17.1153	17.3685	17.8429	18.5387	19.1129	19.5538	19.6905	19.6790	19.3792	18.6354	17.8144	17.1502	(90)
Living area fraction										fLA = Living area / (4) =		0.4278	(91)
MIT	17.5772	17.8287	18.3027	18.9920	19.5782	20.0334	20.1960	20.1737	19.8422	19.0828	18.2619	17.6018	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5772	17.8287	18.3027	18.9920	19.5782	20.0334	20.1960	20.1737	19.8422	19.0828	18.2619	17.6018	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9767	0.9670	0.9457	0.8998	0.8159	0.6767	0.5242	0.5758	0.7884	0.9237	0.9672	0.9796	(94)
Useful gains	383.1001	427.2651	472.9394	506.1136	493.9838	404.3461	298.9696	302.8740	373.9396	382.3266	365.7040	366.9090	(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													
	1327.8690	1284.4858	1164.8395	962.7419	746.4571	498.4416	329.8877	344.0779	533.4334	803.7392	1072.1640	1304.9851	(97)
Space heating kWh													
	702.9081	576.0523	514.7737	328.7724	187.8402	0.0000	0.0000	0.0000	0.0000	313.5310	508.6512	697.9286	(98a)
Space heating requirement - total per year (kWh/year)												3830.4574	
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													
	702.9081	576.0523	514.7737	328.7724	187.8402	0.0000	0.0000	0.0000	0.0000	313.5310	508.6512	697.9286	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3830.4574	
Space heating per m2											(98c) / (4) =	105.5804	(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 %)												84.0000	(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													
	702.9081	576.0523	514.7737	328.7724	187.8402	0.0000	0.0000	0.0000	0.0000	313.5310	508.6512	697.9286	(98)
Space heating efficiency (main heating system 1)													
	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)													
	836.7954	685.7766	612.8258	391.3957	223.6193	0.0000	0.0000	0.0000	0.0000	373.2512	605.5371	830.8674	(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													
	196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(64)
Efficiency of water heater												78.9000	(216)
(217)m	86.5832	86.4437	86.1112	85.4505	84.1927	78.9000	78.9000	78.9000	78.9000	85.3341	86.2178	86.5940	(217)
Fuel for water heating, kWh/month													
	226.3885	200.1934	212.2992	184.8220	179.6493	170.1354	165.8507	173.7803	177.2083	185.5837	198.8422	223.4316	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.6371	10.1380	9.1281	6.6876	5.1657	4.2204	4.7124	6.1253	7.9562	10.4389	11.7907	12.9883	(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)
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												4560.0684	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												78.9000	
Water heating fuel used												2298.1845	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												45.0000	(231)
Electricity for lighting (calculated in Appendix L)												101.9888	(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												7005.2417	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4560.0684	3.6400	165.9865	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2298.1845	3.6400	83.6539	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	101.9888	16.4900	16.8180	(250)
Additional standing charges			92.0000	(251)
Total energy cost			365.8789	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.6205	(257)
SAP value		73.7313	
SAP rating (Section 12)		74	(258)
SAP band		C	

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	4560.0684	0.2100	957.6144	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2298.1845	0.2100	482.6188	(264)
Space and water heating			1440.2331	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	101.9888	0.1443	14.7201	(268)
Total CO2, kg/year			1461.1953	(272)
CO2 emissions per m2			40.2800	(273)
EI value			75.9104	
EI rating			76	(274)
EI band			C	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.2800	(1b)	x 2.4400	(2b) =	88.5232	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	36.2800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	88.5232	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2259	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9759	(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) =	0.9027	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.9704	0.9253	0.9253	0.8576	0.8802	0.7673	0.7673	0.7448	0.7673	0.8576	0.8350	0.9027	(22b)
Effective ac	0.9709	0.9281	0.9281	0.8677	0.8873	0.7944	0.7944	0.7773	0.7944	0.8677	0.8486	0.9075	(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			2.6300	3.0000	7.8900			(26)

Window			9.9000	1.5918	15.7584		(27)
Heatloss Floor 1			36.2800	0.2500	9.0700	110.0000	3990.8000 (28a)
External Wall 1	49.1700	12.5300	36.6400	0.3000	10.9920	0.0000	0.0000 (29a)
External Roof 1	15.5200		15.5200	0.1600	2.4832	9.0000	139.6800 (30)
Total net area of external elements Aum(A, m2)			100.9700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.1936		(33)
Main dwelling							
Party Wall 1			15.8800	0.0000	0.0000	180.0000	2858.4000 (32)
Party Ceiling 1			20.7600			30.0000	622.8000 (32b)
Internal Wall - Solid			18.3400			100.0000	1834.0000 (32c)
Internal Wall - Timber			33.4900			9.0000	301.4100 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 9747.0901 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	268.6629 (35)
Thermal bridges (Default value 0.200 * total exposed area)	20.1940 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 66.3876 (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	28.3619	27.1121	27.1121	25.3489	25.9217	23.2063	23.2063	22.7079	23.2063	25.3489	24.7909	26.5095	(38)
Heat transfer coeff	94.7495	93.4997	93.4997	91.7365	92.3094	89.5940	89.5940	89.0955	89.5940	91.7365	91.1786	92.8971	(39)
Average = Sum(39)m / 12 =												91.6237	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.6116	2.5772	2.5772	2.5286	2.5444	2.4695	2.4695	2.4558	2.4695	2.5286	2.5132	2.5606	(40)
HLP (average)												2.5255	
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												1.3114	(42)
Hot water usage for mixer showers	84.4530	83.1838	81.3344	77.7959	75.1845	72.2724	70.6171	72.4525	74.4645	77.5913	81.2058	84.1294	(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	28.0596	27.0393	26.0189	24.9986	23.9782	22.9579	22.9579	23.9782	24.9986	26.0189	27.0393	28.0596	(42c)
Average daily hot water use (litres/day)												103.3716	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.5126	110.2231	107.3533	102.7944	99.1627	95.2302	93.5750	96.4307	99.4631	103.6102	108.2451	112.1890	(44)
Energy conte	178.1925	156.9562	164.9981	140.7204	133.4921	117.0967	113.1708	119.4014	122.6479	140.5980	154.2149	175.6609	(45)
Energy content (annual)										Total = Sum(45)m =		1717.1500	
Distribution loss (46)m = 0.15 x (45)m	26.7289	23.5434	24.7497	21.1081	20.0238	17.5645	16.9756	17.9102	18.3972	21.0897	23.1322	26.3491	(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	(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	17.8219	16.0983	17.8154	17.2110	17.7595	17.1401	17.6853	17.7112	17.1695	17.7681	17.2225	17.8175	(61)
Total heat required for water heating calculated for each month	196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(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	196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(64)
										Total per year (kWh/year) = Sum(64)m =		1926.3704	(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	63.7045	56.2125	59.3157	51.0923	48.8260	43.2197	42.0506	44.1288	45.0728	51.1909	55.5821	62.8616	(65)

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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	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.4376	12.8233	10.4286	7.8951	5.9017	4.9825	5.3837	6.9980	9.3927	11.9262	13.9196	14.8388	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.6183	169.3576	164.9745	155.6434	143.8645	132.7940	125.3983	123.6589	128.0420	137.3732	149.1520	160.2225	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	(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)	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	(71)
Water heating gains (Table 5)	85.6243	83.6496	79.7254	70.9615	65.6263	60.0273	56.5197	59.3129	62.6011	68.8049	77.1973	84.4914	(72)
Total internal gains	338.0868	336.2372	325.5352	304.9067	285.7992	268.2105	257.7083	260.3764	270.4424	288.5109	310.6756	329.9594	(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	
North	1.9200	12.7650	0.6300	0.7000	0.7700	7.4902	(74)
East	2.7300	23.8018	0.6300	0.7000	0.7700	19.8584	(76)
West	5.2500	23.8018	0.6300	0.7000	0.7700	38.1892	(80)

Solar gains	65.5378	111.8084	183.3946	274.3247	331.1552	360.5861	339.0726	295.7987	228.1490	142.4527	80.4245	54.2746	(83)

Total gains	403.6246	448.0456	508.9298	579.2314	616.9544	628.7966	596.7809	556.1751	498.5915	430.9636	391.1002	384.2340	(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	28.5756	28.9576	28.9576	29.5141	29.3310	30.2199	30.2199	30.3890	30.2199	29.5141	29.6948	29.1454	
alpha	2.9050	2.9305	2.9305	2.9676	2.9554	3.0147	3.0147	3.0259	3.0147	2.9676	2.9797	2.9430	
util living area													
	0.9840	0.9769	0.9579	0.9095	0.8139	0.6299	0.4634	0.5015	0.7784	0.9334	0.9751	0.9859	(86)
MIT	18.5266	18.7758	19.2435	19.8916	20.4474	20.8412	20.9566	20.9453	20.6601	19.9417	19.1829	18.5340	(87)
Th 2	19.6942	19.7114	19.7114	19.7357	19.7278	19.7652	19.7652	19.7721	19.7652	19.7357	19.7434	19.7197	(88)
util rest of house													
	0.9800	0.9712	0.9468	0.8839	0.7551	0.5161	0.3037	0.3385	0.6900	0.9090	0.9678	0.9824	(89)
MIT 2	17.4931	17.7514	18.2122	18.8554	19.3578	19.6953	19.7567	19.7602	19.5767	18.9153	18.1789	17.5178	(90)
Living area fraction										fLA = Living area / (4) =		0.4278	(91)
MIT	17.9352	18.1897	18.6533	19.2987	19.8239	20.1855	20.2700	20.2671	20.0402	19.3544	18.6084	17.9526	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9352	18.1897	18.6533	19.2987	19.8239	20.1855	20.2700	20.2671	20.0402	19.3544	18.6084	17.9526	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9725	0.9619	0.9348	0.8730	0.7602	0.5579	0.3721	0.4080	0.7126	0.8995	0.9588	0.9756	(94)
Useful gains	392.5279	430.9805	475.7450	505.6669	469.0247	350.8276	222.0651	226.8960	355.2871	387.6450	374.9746	374.8625	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1216.1291	1167.7789	1052.1839	862.2048	639.1442	392.9157	230.2536	237.6295	451.5707	720.5332	967.2573	1193.9647	(97)
Space heating kWh													
	612.7593	495.1285	428.8705	256.7073	126.5690	0.0000	0.0000	0.0000	0.0000	247.6689	426.4436	609.4120	(98a)
Space heating requirement - total per year (kWh/year)												3203.5591	
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													
	612.7593	495.1285	428.8705	256.7073	126.5690	0.0000	0.0000	0.0000	0.0000	247.6689	426.4436	609.4120	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3203.5591	
Space heating per m2											(98c) / (4) =	88.3010	(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 %)												84.0000	(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													
	612.7593	495.1285	428.8705	256.7073	126.5690	0.0000	0.0000	0.0000	0.0000	247.6689	426.4436	609.4120	(98)
Space heating efficiency (main heating system 1)													
	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)													
	729.4754	589.4387	510.5602	305.6039	150.6773	0.0000	0.0000	0.0000	0.0000	294.8439	507.6709	725.4905	(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													
	196.0144	173.0545	182.8135	157.9314	151.2516	134.2368	130.8562	137.1126	139.8174	158.3661	171.4374	193.4784	(64)
Efficiency of water heater												78.9000	(216)
(217)m	86.3219	86.1440	85.7205	84.8623	83.2016	78.9000	78.9000	78.9000	78.9000	84.7677	85.8488	86.3367	(217)
Fuel for water heating, kWh/month													
	227.0738	200.8898	213.2670	186.1031	181.7894	170.1354	165.8507	173.7803	177.2083	186.8236	199.6968	224.0975	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.6371	10.1380	9.1281	6.6876	5.1657	4.2204	4.7124	6.1253	7.9562	10.4389	11.7907	12.9883	(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)
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												3813.7608	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												78.9000	
Water heating fuel used												2306.7156	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												45.0000	(231)
Electricity for lighting (calculated in Appendix L)												101.9888	(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	6267.4652	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3813.7608	5.6000	213.5706	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2306.7156	5.6000	129.1761	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	101.9888	26.0600	26.5783	(250)
Additional standing charges			99.0000	(251)
Total energy cost			480.0520	(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	3813.7608	0.2100	800.8898	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2306.7156	0.2100	484.4103	(264)
Space and water heating			1285.3000	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	101.9888	0.1443	14.7201	(268)
Total CO2, kg/year			1306.2622	(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	3813.7608	1.1300	4309.5497	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2306.7156	1.1300	2606.5886	(278)
Space and water heating			6916.1383	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	101.9888	1.5338	156.4338	(282)
Total Primary energy kWh/year			7140.6482	(286)

Predicted Energy Assessment

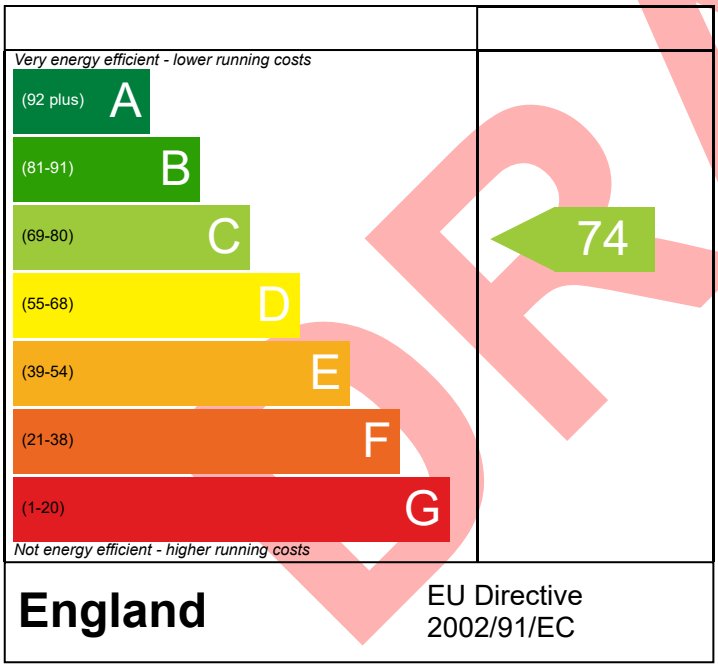
Flat 2, 99 London Road, Reading, RG1 5BY

Dwelling type:	Maisonette, Semi-Detached
Date of assessment:	17/02/2025
Produced by:	Sammit Pancholi
Total floor area:	36.28 m²
DRRN:	

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.

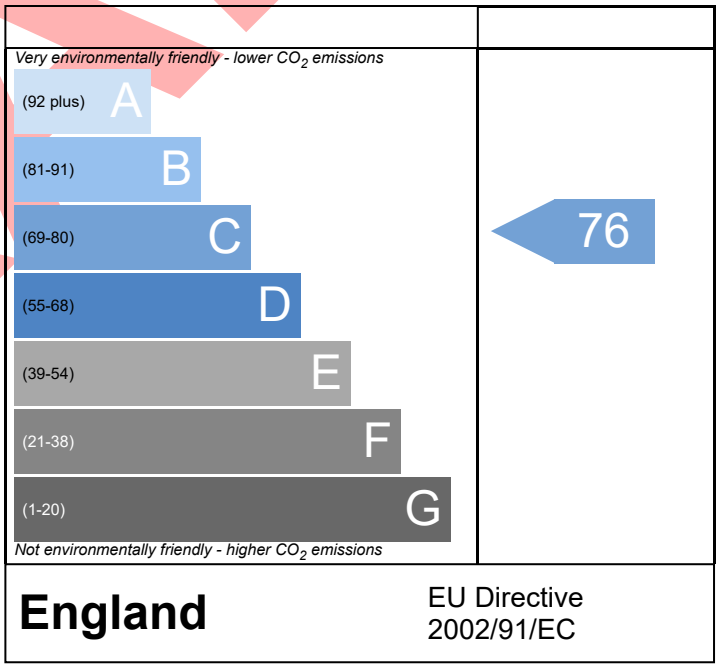
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

elmhurst energy

Property Reference	Flat 2 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Ground Floor Maisonette	**Prop Type Ref**	Ground Floor, Maisonette
Property	Flat 2, 99 London Road, Reading, RG1 5BY		

SAP Rating	74 C	**DER**	41.06	**TER**	
Environmental	76 C	**% DER < TER**			N/A
CO_2 Emissions (t/year)	1.31	**DFEE**	110.45	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	224.02	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	East	
Property Tenture	ND	
Transaction Type	5	
Terrain Type	Suburban	
1.0 Property Type	Maisonette, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	0	
2.0 Number of Storeys	1	
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	268.66	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	20.32 m	36.28 m²	2.44 m

8.0 Living Area	15.52	m²

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
External Wall 1	Solid Wall	Other	0.30	0.00	49.17	36.64	0.00	None	12.53	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, dense blocks, cavity or cavity fill	0.00	180.00	15.88		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall - Solid	Dense block, dense plaster	100.00	18.34
Internal Wall - Timber	Plasterboard on timber frame	9.00	33.49

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
External Roof 1	External Plane Roof	Plasterboard, insulated at ceiling level	0.16	9.00	15.52	15.52	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Timber I-joists, carpeted	20.00	20.76

Summary for Input Data

elmhurst energy

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.25	None	0.00	110.00	36.28

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	SAP table	Solid Door				0.00			3.00
Window	SAP table	Window	Double Low-E Soft 0.05	≥ 16 mm	Argon Filled	0.63	PVC	0.70	1.70

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening 1	Window	External Wall 1	East	0.91	
Opening 2	Window	External Wall 1	East	0.91	
Opening 4	Window	External Wall 1	East	0.91	
Opening 3	Door	External Wall 1	East	2.63	
Opening 5	Window	External Wall 1	North	0.96	
Opening 6	Window	External Wall 1	North	0.96	
Opening 7	Window	External Wall 1	West	5.25	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.20	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	2
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No
22.0 Pressure Testing	No
Test Method	Blower Door

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
LED	66.00	8.00	528.00	15

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18830	
Fuel Type	Mains gas	
In Winter	84.00	
In Summer	78.90	
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Controls SAP Code	2104	

Summary for Input Data

elmhurst energy

Delayed Start Stat	No
Flue Type	Open
Fan Assisted Flue	Yes
Is MHS Pumped	No pump
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	No
Combi boiler type	Standard Combi
Combi keep hot type	None

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	0

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.40		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder — None

In Airing Cupboard — No

34.0 Small-scale Hydro — None

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

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
			0	0
			0	0
			0	0

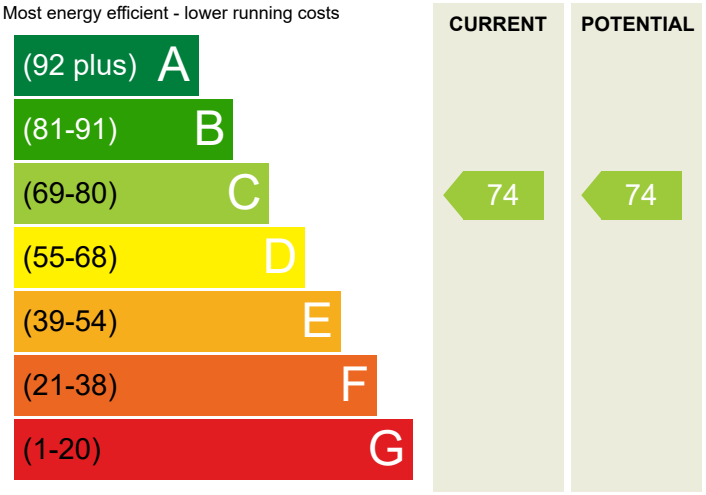
Energy Report

Dwelling Address	Flat 2, 99 London Road, Reading, RG1 5BY
Reference	Flat 2 - Baseline-Ground Floor Maisonette
Assessment Date	17/02/2025
Submission Date	
Property Type	Maisonette, Semi-Detached
Total Floor Area	36

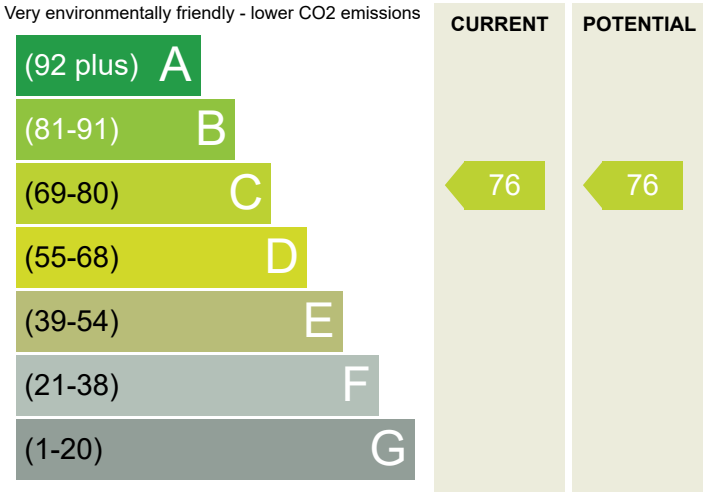
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

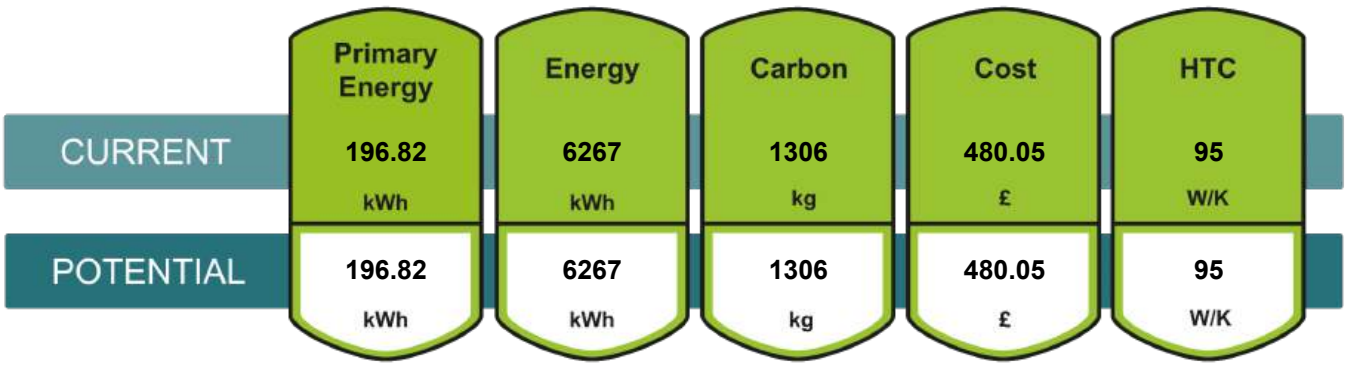
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.3 W/m²K	Good
Roof	Average thermal transmittance 0.16 W/m²K	Very Good
Floor	Average thermal transmittance 0.25 W/m²K	Good
Windows	High performance glazing	Average
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer and room thermostat	Average
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Energy Report

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£27	£27	
Heating	£324	£324	
Hot Water	£129	£129	
New Technologies e.g. Impact of PV	£0	£0	
TOTAL	£480	£480	

Estimated energy use and potential savings

Space Heating
3814
kWh per year

Water Heating
2307
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report

Property Reference	Flat 2 - Baseline	Issued on Date	17/02/2025
Assessment Reference	Ground Floor Maisonette	Prop Type Ref	Semi-Detached Maisonette
Property	Flat 2, 99 London Road, Reading, RG1 5BY		

SAP Rating	74 C	DER	41.06	TER	
Environmental	76 C	% DER < TER			N/A
CO_2 Emissions (t/year)	1.31	DFEE	110.45	TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER	224.02	TPER	

Assessor Details	Mr. Sammit Pancholi	Assessor ID	DB55-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	Flat 2, 99 London Road	
House Number		
Postcode	RG1 5BY	
Street		
Town	Reading	
County		

Dwelling Orientation East (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Suburban

Property Type Maisonette, Semi-Detached

Comments

Electricity Tariff Standard

Smart electricity meter fitted: No

Smart gas meter fitted: No

Comments

Section 2: Dwelling Construction Details

External Walls

Description	External Wall 1		
Type	Solid Wall		
Construction	Other		
U-value	0.30	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	49.17	m²	

Comments

Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	15.88

Comments

External Roofs

Description: External Roof 1
Type: External Plane Roof
Construction: Plasterboard, insulated at ceiling level
U-value: 0.16 W/m²K U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area: 15.52 m²
Comments

Heat Loss Floors

Description: Heatloss Floor 1
Type: Ground Floor - Solid
Construction: Slab on ground, screed over insulation
U-value: 0.25 W/m²K U-value calculations should be provided to verify the u-value entered into the Assessment
Area: 36.28 m²
Comments

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
Door	SAP table	Solid Door		0.00	Wood	3.00
Window	SAP table	Window	Double Low-E Soft 0.05	0.63	PVC	1.70

Comments

Openings

Name	Opening Type	Location	Orientation	Area (m²)
Opening 1	Window	External Wall 1	East	0.91
Opening 2	Window	External Wall 1	East	0.91
Opening 4	Window	External Wall 1	East	0.91
Opening 3	Door	External Wall 1	East	2.63
Opening 5	Window	External Wall 1	North	0.96
Opening 6	Window	External Wall 1	North	0.96
Opening 7	Window	External Wall 1	West	5.25

Comments

Thermal Bridging Default

Y-value 0.200

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing No

Designed AP_{50} 4.00 $m^3/(h.m^2)$ @ 50 Pa

Property Tested? Yes

Test Method Blower Door

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

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	2
Number of passive vents	0
Number of flueless gas fires	0

Comments

Fixed Cooling System No

Comments

Lighting

No Fixed Lighting	No

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
LED	66.00	8.00	528.00	15

Comments

Main Heating 1

Fuel Type	Mains gas	
Winter Efficiency	84.00	%
Summer Efficiency	78.90	%
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Flue Type	Open	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Programmer and room thermostat
Boiler Interlock	No
Delayed Start Stat	No
PCDF Control Description	

Comments

Main Heating 2	None
Secondary Heating	None

Water Heating System

Water Heating	Main Heating 1
Supplementary Immersion	No
SAP Code	901
Water use <= 125 l/p/day	Yes
Cold Water Source	From mains
Number of baths	0

Comments

Hot Water Cylinder None

Comments

Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.40		No	

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit None

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed .....

Date .....

Full SAP Calculation Printout

Property Reference	Flat 2 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Ground Floor Maisonette	**Prop Type Ref**	Ground Floor, Maisonette
Property	Flat 2, 99 London Road, Reading, RG1 5BY		

SAP Rating	82 B	**DER**	29.74	**TER**	
Environmental	83 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.92	**DFEE**	87.58	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	159.15	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.2800	(1b)	x 2.4400	(2b) =	88.5232	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	36.2800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	88.5232	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.2259 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9759 (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) =	0.9027 (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	1.1510	1.1284	1.1059	0.9930	0.9704	0.8576	0.8576	0.8350	0.9027	0.9704	1.0156	1.0607	(22b)
Effective ac	1.1510	1.1284	1.1059	0.9930	0.9709	0.8677	0.8677	0.8486	0.9075	0.9709	1.0156	1.0607	(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			2.6300	1.4000	3.6820			(26)
Window			9.9000	1.1450	11.3359			(27)
Heatloss Floor 1			36.2800	0.1000	3.6280	110.0000	3990.8000	(28a)
External Wall 1	49.1700	12.5300	36.6400	0.2100	7.6944	0.0000	0.0000	(29a)
External Roof 1	15.5200		15.5200	0.1400	2.1728	9.0000	139.6800	(30)
Total net area of external elements Aum(A, m2)			100.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.5131			(33)
Main dwelling								
Party Wall 1			15.8800	0.0000	0.0000	180.0000	2858.4000	(32)
Party Ceiling 1			20.7600			20.0000	415.2000	(32b)
Internal Wall - Solid			18.3400			100.0000	1834.0000	(32c)
Internal Wall - Timber			33.4900			9.0000	301.4100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9539.4901 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		262.9407 (35)
Thermal bridges (Default value 0.200 * total exposed area)		20.1940 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	48.7071 (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	33.6234	32.9641	32.3048	29.0091	28.3619	25.3489	25.3489	24.7909	26.5095	28.3619	29.6677	30.9863	(38)
Heat transfer coeff													
	82.3305	81.6712	81.0119	77.7162	77.0690	74.0560	74.0560	73.4980	75.2165	77.0690	78.3748	79.6933	(39)
Average = Sum(39)m / 12 =												77.6469	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2693	2.2511	2.2330	2.1421	2.1243	2.0412	2.0412	2.0259	2.0732	2.1243	2.1603	2.1966	(40)
HLP (average)												2.1402	
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												1.3114	(42)
Hot water usage for mixer showers													
	70.3775	69.3199	67.7787	64.8299	62.6538	60.2270	58.8476	60.3771	62.0538	64.6594	67.6715	70.1079	(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													
	28.0596	27.0393	26.0189	24.9986	23.9782	22.9579	22.9579	23.9782	24.9986	26.0189	27.0393	28.0596	(42c)
Average daily hot water use (litres/day)												90.3944	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	98.4371	96.3591	93.7976	89.8285	86.6320	83.1848	81.8055	84.3553	87.0523	90.6783	94.7108	98.1675	(44)
Energy conte	155.9003	137.2141	144.1634	122.9707	116.6233	102.2855	98.9366	104.4495	107.3442	123.0496	134.9328	153.7065	(45)
Energy content (annual)										Total = Sum(45)m =		1501.5765	
Distribution loss (46)m = 0.15 x (45)m													
	23.3850	20.5821	21.6245	18.4456	17.4935	15.3428	14.8405	15.6674	16.1016	18.4574	20.2399	23.0560	(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	(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	17.8185	16.0763	17.7675	17.1372	17.6717	17.0661	17.6154	17.6355	17.0895	17.7013	17.1857	17.8113	(61)
Total heat required for water heating calculated for each month													
	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(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													
	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(64)
										Total per year (kWh/year) = Sum(64)m =		1710.1526	(64)
12Total per year (kWh/year)												1710	(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													
	56.2915	49.6428	52.3762	45.1720	43.1952	38.2765	37.3003	39.1383	39.9643	45.3393	49.1616	55.5602	(65)

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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	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	56.6446	62.7137	56.6446	58.5328	56.6446	58.5328	56.6446	56.6446	58.5328	56.6446	58.5328	56.6446	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	112.3043	113.4696	110.5329	104.2811	96.3892	88.9720	84.0168	82.8515	85.7882	92.0400	99.9319	107.3491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	(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)													
	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	(71)
Water heating gains (Table 5)													
	75.6606	73.8731	70.3981	62.7390	58.0580	53.1617	50.1348	52.6053	55.5060	60.9399	68.2800	74.6778	(72)
Total internal gains													
	287.2798	292.7268	280.2460	268.2231	253.7622	243.3368	233.4666	234.7717	242.4973	252.2949	269.4150	281.3418	(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	
North	1.9200	10.6334	0.6300	0.7000	0.7700	6.2394	(74)
East	2.7300	19.6403	0.6300	0.7000	0.7700	16.3863	(76)
West	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122	(80)

Solar gains	54.1379	105.6235	174.5716	257.5972	319.6510	329.2738	312.6178	265.6591	203.8299	125.3763	67.4210	44.5909	(83)
Total gains	341.4177	398.3503	454.8175	525.8203	573.4132	572.6106	546.0844	500.4308	446.3271	377.6712	336.8359	325.9327	(84)

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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	32.1856	32.4455	32.7095	34.0966	34.3829	35.7818	35.7818	36.0535	35.2297	34.3829	33.8101	33.2507	
alpha	3.1457	3.1630	3.1806	3.2731	3.2922	3.3855	3.3855	3.4036	3.3486	3.2922	3.2540	3.2167	
util living area													
	0.9906	0.9839	0.9695	0.9283	0.8443	0.6943	0.5499	0.6054	0.8244	0.9538	0.9847	0.9919	(86)
MIT	18.5392	18.8034	19.2490	19.9061	20.4359	20.8124	20.9373	20.9136	20.6308	19.9298	19.1723	18.5635	(87)
Th 2	19.1598	19.1712	19.1825	19.2403	19.2518	19.3060	19.3060	19.3162	19.2850	19.2518	19.2286	19.2055	(88)
util rest of house													

	0.9869	0.9777	0.9568	0.8969	0.7727	0.5586	0.3591	0.4143	0.7156	0.9269	0.9777	0.9888	(89)
MIT 2	17.0557	17.3241	17.7692	18.4373	18.9148	19.2357	19.2954	19.2989	19.1125	18.4837	17.7300	17.1097	(90)
Living area fraction										fLA = Living area / (4) =		0.4278	(91)
MIT	17.6903	17.9569	18.4023	19.0656	19.5655	19.9102	19.9978	19.9896	19.7620	19.1023	18.3470	17.7316	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.5403	17.8069	18.2523	18.9156	19.4155	19.7602	19.8478	19.8396	19.6120	18.9523	18.1970	17.5816	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9820	0.9708	0.9478	0.8895	0.7808	0.5994	0.4247	0.4794	0.7409	0.9205	0.9715	0.9846	(94)
Useful gains	335.2847	386.7365	431.0736	467.6924	447.6942	343.2046	231.8980	239.9266	330.6716	347.6507	327.2444	320.9013	(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	1090.0794	1054.1225	952.0729	778.3772	594.6275	382.1420	240.5172	252.8065	414.5940	643.7028	869.7253	1066.4261	(97)
Space heating kWh	561.5673	448.4834	387.6235	223.6930	109.3184	0.0000	0.0000	0.0000	0.0000	220.2627	390.5863	554.6704	(98a)
Space heating requirement - total per year (kWh/year)												2896.2050	
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	561.5673	448.4834	387.6235	223.6930	109.3184	0.0000	0.0000	0.0000	0.0000	220.2627	390.5863	554.6704	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2896.2050	
Space heating per m2											(98c) / (4) =	79.8292	(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 %)												89.0000	(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	561.5673	448.4834	387.6235	223.6930	109.3184	0.0000	0.0000	0.0000	0.0000	220.2627	390.5863	554.6704	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	630.9745	503.9139	435.5320	251.3405	122.8297	0.0000	0.0000	0.0000	0.0000	247.4862	438.8610	623.2252	(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	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(64)
Efficiency of water heater												78.9000	(216)
(217)m	86.3873	86.1895	85.7650	84.8185	83.1335	78.9000	78.9000	78.9000	78.9000	84.7693	85.9172	86.3881	(217)
Fuel for water heating, kWh/month	201.0930	177.8527	188.8076	165.1855	161.5414	151.2695	147.7212	154.7339	157.7107	166.0398	177.0525	198.5434	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.6371	10.1380	9.1281	6.6876	5.1657	4.2204	4.7124	6.1253	7.9562	10.4389	11.7907	12.9883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.4311	-12.1981	-20.6548	-26.7673	-31.5468	-30.4317	-29.8908	-26.6931	-21.4315	-15.1900	-8.6576	-6.1813	(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	-2.0708	-5.1530	-12.5382	-22.4602	-32.9898	-34.4453	-33.5329	-26.3146	-16.7007	-8.0129	-2.9160	-1.5615	(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												3254.1629	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												78.9000	
Water heating fuel used												2047.5512	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												45.0000	(231)
Electricity for lighting (calculated in Appendix L)												101.9888	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-435.7700	(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												5012.9328	(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	3254.1629	0.2100	683.3742	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2047.5512	0.2100	429.9857	(264)
Space and water heating			1113.3600	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	101.9888	0.1443	14.7201	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-237.0742	0.1319	-31.2697	
PV Unit electricity exported	-198.6959	0.1218	-24.1980	
Total			-55.4677	(269)
Total CO2, kg/year			1078.8545	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			29.7400	(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	3254.1629	1.1300	3677.2041	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2047.5512	1.1300	2313.7328	(278)
Space and water heating			5990.9369	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	101.9888	1.5338	156.4338	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-237.0742	1.4873	-352.6059	
PV Unit electricity exported	-198.6959	0.4468	-88.7825	
Total			-441.3884	(283)
Total Primary energy kWh/year			5774.0584	(286)
Dwelling Primary energy Rate (DPER)			159.1500	(287)

SAP 10 WORKSHEET FOR Conversion (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						
Ground floor	36.2800 (1b)	x	2.4400 (2b)	=	88.5232	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	36.2800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	88.5232	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2259	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9759	(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) =	0.9027	(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	1.1510	1.1284	1.1059	0.9930	0.9704	0.8576	0.8576	0.8350	0.9027	0.9704	1.0156	1.0607	(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	1.1510	1.1284	1.1059	0.9930	0.9709	0.8677	0.8677	0.8486	0.9075	0.9709	1.0156	1.0607	(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			2.6300	1.4000	3.6820			(26)
Window			9.9000	1.1450	11.3359			(27)
Heatloss Floor 1			36.2800	0.1000	3.6280	110.0000	3990.8000	(28a)
External Wall 1	49.1700	12.5300	36.6400	0.2100	7.6944	0.0000	0.0000	(29a)
External Roof 1	15.5200		15.5200	0.1400	2.1728	9.0000	139.6800	(30)
Total net area of external elements Aum(A, m2)			100.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.5131			(33)

Main dwelling

Party Wall 1	15.8800	0.0000	0.0000	180.0000	2858.4000 (32)
Party Ceiling 1	20.7600			30.0000	622.8000 (32b)
Internal Wall - Solid	18.3400			100.0000	1834.0000 (32c)
Internal Wall - Timber	33.4900			9.0000	301.4100 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9747.0901 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 268.6629 (35)
Thermal bridges (Default value 0.200 * total exposed area) 20.1940 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.7071 (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	33.6234	32.9641	32.3048	29.0091	28.3619	25.3489	25.3489	24.7909	26.5095	28.3619	29.6677	30.9863	(38)
Heat transfer coeff	82.3305	81.6712	81.0119	77.7162	77.0690	74.0560	74.0560	73.4980	75.2165	77.0690	78.3748	79.6933	(39)
Average = Sum(39)m / 12 =												77.6469	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2693	2.2511	2.2330	2.1421	2.1243	2.0412	2.0412	2.0259	2.0732	2.1243	2.1603	2.1966	(40)
HLP (average)												2.1402	
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 1.3114 (42)
Hot water usage for mixer showers

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

19.9935	19.6966	19.2785	18.5075	17.9302	17.2901	16.9443	17.3595	17.8116	18.4966	19.2834	19.9260	(42b)

Hot water usage for other uses

28.0596	27.0393	26.0189	24.9986	23.9782	22.9579	22.9579	23.9782	24.9986	26.0189	27.0393	28.0596	(42c)

Average daily hot water use (litres/day) 44.0459 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	48.0531	46.7359	45.2974	43.5060	41.9084	40.2479	39.9021	41.3377	42.8102	44.5155	46.3227	47.9856	(44)
Energy conte	76.1044	66.5513	69.6204	59.5576	56.4168	49.4895	48.2582	51.1847	52.7892	60.4071	65.9951	75.1338	(45)
Energy content (annual)										Total = Sum(45)m =		731.5081	
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	(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	64.6888	56.5686	59.1773	50.6240	47.9542	42.0661	41.0195	43.5070	44.8708	51.3460	56.0959	63.8637	(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	64.6888	56.5686	59.1773	50.6240	47.9542	42.0661	41.0195	43.5070	44.8708	51.3460	56.0959	63.8637	(64)
										Total per year (kWh/year) = Sum(64)m =		621.7818	(64)
12Total per year (kWh/year)												622	(64)
Electric shower(s)	37.0037	32.9706	36.0027	34.3569	35.0016	33.3881	34.5011	35.0016	34.3569	36.0027	35.3257	37.0037	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		420.9151	(64a)
Heat gains from water heating, kWh/month	25.4231	22.3848	23.7950	21.2452	20.7390	18.8635	18.8801	19.6271	19.8069	21.8372	22.8554	25.2169	(65)

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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	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	65.5678	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	56.6446	62.7137	56.6446	58.5328	56.6446	58.5328	56.6446	56.6446	58.5328	56.6446	58.5328	56.6446	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	112.3043	113.4696	110.5329	104.2811	96.3892	88.9720	84.0168	82.8515	85.7882	92.0400	99.9319	107.3491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	29.5568	(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)	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	(71)
Water heating gains (Table 5)	34.1709	33.3107	31.9825	29.5072	27.8749	26.1994	25.3765	26.3806	27.5096	29.3510	31.7436	33.8936	(72)
Total internal gains	245.7901	252.1643	241.8304	234.9914	223.5791	216.3745	208.7083	208.5470	214.5009	220.7060	232.8786	240.5577	(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	
North	1.9200	10.6334	0.6300	0.7000	0.7700	6.2394	(74)
East	2.7300	19.6403	0.6300	0.7000	0.7700	16.3863	(76)
West	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122	(80)

Solar gains	54.1379	105.6235	174.5716	257.5972	319.6510	329.2738	312.6178	265.6591	203.8299	125.3763	67.4210	44.5909	(83)
Total gains	299.9280	357.7879	416.4019	492.5886	543.2301	545.6482	521.3262	474.2061	418.3307	346.0823	300.2995	285.1486	(84)

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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	32.8861	33.1515	33.4213	34.8386	35.1312	36.5605	36.5605	36.8381	35.9964	35.1312	34.5459	33.9743	
alpha	3.1924	3.2101	3.2281	3.3226	3.3421	3.4374	3.4374	3.4559	3.3998	3.3421	3.3031	3.2650	
util living area	0.9939	0.9888	0.9770	0.9408	0.8630	0.7173	0.5718	0.6313	0.8479	0.9648	0.9897	0.9949	(86)
MIT	18.4806	18.7454	19.1941	19.8633	20.4076	20.8003	20.9329	20.9061	20.6045	19.8825	19.1169	18.5052	(87)
Th 2	19.1598	19.1712	19.1825	19.2403	19.2518	19.3060	19.3060	19.3162	19.2850	19.2518	19.2286	19.2055	(88)
util rest of house	0.9915	0.9842	0.9671	0.9134	0.7955	0.5815	0.3754	0.4356	0.7449	0.9430	0.9847	0.9929	(89)
MIT 2	16.9932	17.2631	17.7131	18.3974	18.8936	19.2304	19.2947	19.2973	19.0962	18.4382	17.6720	17.0474	(90)
Living area fraction									fLA = Living area / (4) =			0.4278	(91)
MIT	17.6295	17.8972	18.3467	19.0245	19.5413	19.9020	19.9955	19.9855	19.7414	19.0561	18.2901	17.6710	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6295	17.8972	18.3467	19.0245	19.5413	19.9020	19.9955	19.9855	19.7414	19.0561	18.2901	17.6710	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9884	0.9796	0.9606	0.9091	0.8089	0.6348	0.4611	0.5208	0.7782	0.9396	0.9807	0.9903	(94)
Useful gains	296.4463	350.4853	400.0064	447.8158	439.4090	346.3743	240.4016	246.9461	325.5381	325.1691	294.5129	282.3771	(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	1097.4251	1061.4972	959.7196	786.8361	604.3177	392.6424	251.4551	263.5289	424.3287	651.7014	877.0200	1073.5518	(97)
Space heating kWh	595.9282	477.8000	416.4267	244.0946	122.6921	0.0000	0.0000	0.0000	0.0000	242.9401	419.4051	588.6340	(98a)
Space heating requirement - total per year (kWh/year)												3107.9207	
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	595.9282	477.8000	416.4267	244.0946	122.6921	0.0000	0.0000	0.0000	0.0000	242.9401	419.4051	588.6340	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3107.9207	
Space heating per m2										(98c) / (4) =		85.6649	(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	696.1263	548.0143	558.5850	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7273	0.8035	0.7607	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	506.3161	440.3395	424.9365	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	619.2216	591.9342	537.9178	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	81.2920	112.7865	84.0580	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	20.3230	28.1966	21.0145	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												69.5341	(107)
Energy for space heating												85.6649	(99)
Energy for space cooling												1.9166	(108)
Total												87.5814	(109)
Fabric Energy Efficiency (DFEE)												87.6	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		36.2800	(1b)	x 2.4400	(2b) =	88.5232	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	36.2800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		88.5232	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2259	(8)

Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.9759	(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) = 0.9027	(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	1.1510	1.1284	1.1059	0.9930	0.9704	0.8576	0.8576	0.8350	0.9027	0.9704	1.0156	1.0607	(22b)
Effective ac	1.1510	1.1284	1.1059	0.9930	0.9709	0.8677	0.8677	0.8486	0.9075	0.9709	1.0156	1.0607	(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			2.6300	1.4000	3.6820			(26)
Window			9.9000	1.1450	11.3359			(27)
Heatloss Floor 1			36.2800	0.1000	3.6280	110.0000	3990.8000	(28a)
External Wall 1	49.1700	12.5300	36.6400	0.2100	7.6944	0.0000	0.0000	(29a)
External Roof 1	15.5200		15.5200	0.1400	2.1728	9.0000	139.6800	(30)
Total net area of external elements Aum(A, m2)			100.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.5131			(33)
Main dwelling								
Party Wall 1			15.8800	0.0000	0.0000	180.0000	2858.4000	(32)
Party Ceiling 1			20.7600			30.0000	622.8000	(32b)
Internal Wall - Solid			18.3400			100.0000	1834.0000	(32c)
Internal Wall - Timber			33.4900			9.0000	301.4100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 9747.0901	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	268.6629	(35)
Thermal bridges (Default value 0.200 * total exposed area)	20.1940	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 48.7071	(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	33.6234	32.9641	32.3048	29.0091	28.3619	25.3489	25.3489	24.7909	26.5095	28.3619	29.6677	30.9863	(38)
Heat transfer coeff	82.3305	81.6712	81.0119	77.7162	77.0690	74.0560	74.0560	73.4980	75.2165	77.0690	78.3748	79.6933	(39)
Average = Sum(39)m / 12 =												77.6469	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2693	2.2511	2.2330	2.1421	2.1243	2.0412	2.0412	2.0259	2.0732	2.1243	2.1603	2.1966	(40)
HLP (average)												2.1402	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.3114	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	70.3775	69.3199	67.7787	64.8299	62.6538	60.2270	58.8476	60.3771	62.0538	64.6594	67.6715	70.1079	(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	28.0596	27.0393	26.0189	24.9986	23.9782	22.9579	22.9579	23.9782	24.9986	26.0189	27.0393	28.0596	(42c)
Average daily hot water use (litres/day)												90.3944	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.4371	96.3591	93.7976	89.8285	86.6320	83.1848	81.8055	84.3553	87.0523	90.6783	94.7108	98.1675	(44)
Energy conte	155.9003	137.2141	144.1634	122.9707	116.6233	102.2855	98.9366	104.4495	107.3442	123.0496	134.9328	153.7065	(45)
Energy content (annual)										Total = Sum(45)m =		1501.5765	
Distribution loss (46)m = 0.15 x (45)m	23.3850	20.5821	21.6245	18.4456	17.4935	15.3428	14.8405	15.6674	16.1016	18.4574	20.2399	23.0560	(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	(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	17.8185	16.0763	17.7675	17.1372	17.6717	17.0661	17.6154	17.6355	17.0895	17.7013	17.1857	17.8113	(61)
Total heat required for water heating calculated for each month	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(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	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(64)
										Total per year (kWh/year) = Sum(64)m =		1710.1526	(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	56.2915	49.6428	52.3762	45.1720	43.1952	38.2765	37.3003	39.1383	39.9643	45.3393	49.1616	55.5602	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.4376	12.8233	10.4286	7.8951	5.9017	4.9825	5.3837	6.9980	9.3927	11.9262	13.9196	14.8388	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.6183	169.3576	164.9745	155.6434	143.8645	132.7940	125.3983	123.6589	128.0420	137.3732	149.1520	160.2225	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	(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)													
	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	(71)
Water heating gains (Table 5)													
	75.6606	73.8731	70.3981	62.7390	58.0580	53.1617	50.1348	52.6053	55.5060	60.9399	68.2800	74.6778	(72)
Total internal gains													
	328.1231	326.4607	316.2079	296.6841	278.2309	261.3449	251.3234	253.6688	263.3474	280.6459	301.7583	320.1457	(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	
North	1.9200	10.6334	0.6300	0.7000	0.7700	6.2394	(74)
East	2.7300	19.6403	0.6300	0.7000	0.7700	16.3863	(76)
West	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122	(80)

Solar gains	54.1379	105.6235	174.5716	257.5972	319.6510	329.2738	312.6178	265.6591	203.8299	125.3763	67.4210	44.5909	(83)
Total gains	382.2610	432.0843	490.7794	554.2813	597.8819	590.6186	563.9413	519.3279	467.1772	406.0222	369.1792	364.7366	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.8861	33.1515	33.4213	34.8386	35.1312	36.5605	36.5605	36.8381	35.9964	35.1312	34.5459	33.9743	
alpha	3.1924	3.2101	3.2281	3.3226	3.3421	3.4374	3.4374	3.4559	3.3998	3.3421	3.3031	3.2650	
util living area													
	0.9878	0.9810	0.9643	0.9211	0.8340	0.6831	0.5372	0.5905	0.8115	0.9464	0.9813	0.9895	(86)
MIT	18.6666	18.9098	19.3503	19.9755	20.4788	20.8295	20.9446	20.9238	20.6632	20.0029	19.2716	18.6877	(87)
Th 2	19.1598	19.1712	19.1825	19.2403	19.2518	19.3060	19.3060	19.3162	19.2850	19.2518	19.2286	19.2055	(88)
util rest of house													
	0.9831	0.9736	0.9497	0.8870	0.7592	0.5464	0.3487	0.4011	0.6986	0.9157	0.9726	0.9855	(89)
MIT 2	17.1767	17.4238	17.8623	18.4968	18.9457	19.2436	19.2970	19.3015	19.1318	18.5469	17.8226	17.2279	(90)
Living area fraction									fLA = Living area / (4) =			0.4278	(91)
MIT	17.8141	18.0595	18.4988	19.1294	19.6015	19.9220	20.0018	19.9955	19.7869	19.1697	18.4424	17.8524	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.6641	17.9095	18.3488	18.9794	19.4515	19.7720	19.8518	19.8455	19.6369	19.0197	18.2924	17.7024	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9774	0.9662	0.9405	0.8806	0.7694	0.5882	0.4136	0.4659	0.7265	0.9102	0.9660	0.9805	(94)
Useful gains	373.6228	417.4817	461.5565	488.0779	460.0025	347.4279	233.2375	241.9349	339.3861	369.5482	356.6151	357.6166	(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													
	1100.2704	1062.5008	959.8954	783.3292	597.4027	383.0184	240.8167	253.2398	416.4682	648.8990	877.2054	1076.0509	(97)
Space heating kWh													
	540.6258	433.4529	370.7642	212.5809	102.2257	0.0000	0.0000	0.0000	0.0000	207.8370	374.8250	534.5151	(98a)
Space heating requirement - total per year (kWh/year)												2776.8267	
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													
	540.6258	433.4529	370.7642	212.5809	102.2257	0.0000	0.0000	0.0000	0.0000	207.8370	374.8250	534.5151	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2776.8267	
Space heating per m2											(98c) / (4) =	76.5388	(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 %)												89.0000	(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													
	540.6258	433.4529	370.7642	212.5809	102.2257	0.0000	0.0000	0.0000	0.0000	207.8370	374.8250	534.5151	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	607.4448	487.0257	416.5889	238.8550	114.8604	0.0000	0.0000	0.0000	0.0000	233.5247	421.1517	600.5788	(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													
	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(64)
Efficiency of water heater												78.9000	(216)
(217)m	86.3130	86.1199	85.6665	84.6931	82.9695	78.9000	78.9000	78.9000	78.9000	84.6259	85.8283	86.3158	(217)
Fuel for water heating, kWh/month													
	201.2660	177.9965	189.0248	165.4300	161.8607	151.2695	147.7212	154.7339	157.7107	166.3212	177.2359	198.7097	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.6371	10.1380	9.1281	6.6876	5.1657	4.2204	4.7124	6.1253	7.9562	10.4389	11.7907	12.9883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.4311	-12.1981	-20.6548	-26.7673	-31.5468	-30.4317	-29.8908	-26.6931	-21.4315	-15.1900	-8.6576	-6.1813	(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	-2.0708	-5.1530	-12.5382	-22.4602	-32.9898	-34.4453	-33.5329	-26.3146	-16.7007	-8.0129	-2.9160	-1.5615	(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	3120.0300	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2049.2802	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	101.9888	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-435.7700	(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	4880.5290	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3120.0300	3.6400	113.5691	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2049.2802	3.6400	74.5938	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	101.9888	16.4900	16.8180	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-237.0742	16.4900	-39.0935	
PV Unit electricity exported	-198.6959	5.5900	-11.1071	
Total			-50.2006	(252)
Total energy cost			254.2007	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1259	(257)
SAP value		81.7493	
SAP rating (Section 12)		82	(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	3120.0300	0.2100	655.2063	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2049.2802	0.2100	430.3489	(264)
Space and water heating			1085.5551	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	101.9888	0.1443	14.7201	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-237.0742	0.1319	-31.2697	
PV Unit electricity exported	-198.6959	0.1218	-24.1980	
Total			-55.4677	(269)
Total CO2, kg/year			1051.0496	(272)
CO2 emissions per m2			28.9700	(273)
EI value			82.6722	
EI rating			83	(274)
EI band			B	

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

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1. Overall dwelling characteristics

	Area	Storey height	Volume

Main dwelling	(m2)		(m)		(m3)
Ground floor	36.2800 (1b)	x	2.4400 (2b)	=	88.5232 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	36.2800				(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	88.5232 (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	2 * 10	=	20.0000 (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) =	20.0000 / (5)	=	0.2259 (8)
Pressure test			No
Pressure Test Method			Blower Door
Measured/design AP50			15.0000 (17)
Infiltration rate			0.9759 (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)	=	0.9027 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.9704	0.9253	0.9253	0.8576	0.8802	0.7673	0.7673	0.7448	0.7673	0.8576	0.8350	0.9027	(22b)
Effective ac	0.9709	0.9281	0.9281	0.8677	0.8873	0.7944	0.7944	0.7773	0.7944	0.8677	0.8486	0.9075	(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			2.6300	1.4000	3.6820			(26)
Window			9.9000	1.1450	11.3359			(27)
Heatloss Floor 1			36.2800	0.1000	3.6280	110.0000	3990.8000	(28a)
External Wall 1	49.1700	12.5300	36.6400	0.2100	7.6944	0.0000	0.0000	(29a)
External Roof 1	15.5200		15.5200	0.1400	2.1728	9.0000	139.6800	(30)
Total net area of external elements Aum(A, m2)			100.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.5131			(33)
Main dwelling								
Party Wall 1			15.8800	0.0000	0.0000	180.0000	2858.4000	(32)
Party Ceiling 1			20.7600			30.0000	622.8000	(32b)
Internal Wall - Solid			18.3400			100.0000	1834.0000	(32c)
Internal Wall - Timber			33.4900			9.0000	301.4100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9747.0901	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		268.6629	(35)
Thermal bridges (Default value 0.200 * total exposed area)		20.1940	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	48.7071	(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	28.3619	27.1121	27.1121	25.3489	25.9217	23.2063	23.2063	22.7079	23.2063	25.3489	24.7909	26.5095	(38)
Heat transfer coeff	77.0690	75.8191	75.8191	74.0560	74.6288	71.9134	71.9134	71.4150	71.9134	74.0560	73.4980	75.2165	(39)
Average = Sum(39)m / 12 =												73.9432	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1243	2.0898	2.0898	2.0412	2.0570	1.9822	1.9822	1.9684	1.9822	2.0412	2.0259	2.0732	(40)
HLP (average)												2.0381	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy			1.3114 (42)
Hot water usage for mixer showers	70.3775 69.3199 67.7787 64.8299 62.6538 60.2270 58.8476 60.3771 62.0538 64.6594 67.6715		70.1079 (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	28.0596 27.0393 26.0189 24.9986 23.9782 22.9579 22.9579 23.9782 24.9986 26.0189 27.0393		28.0596 (42c)
Average daily hot water use (litres/day)			90.3944 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.4371	96.3591	93.7976	89.8285	86.6320	83.1848	81.8055	84.3553	87.0523	90.6783	94.7108	98.1675	(44)
Energy conte	155.9003	137.2141	144.1634	122.9707	116.6233	102.2855	98.9366	104.4495	107.3442	123.0496	134.9328	153.7065	(45)
Energy content (annual)										Total = Sum(45)m =		1501.5765	
Distribution loss (46)m = 0.15 x (45)m	23.3850	20.5821	21.6245	18.4456	17.4935	15.3428	14.8405	15.6674	16.1016	18.4574	20.2399	23.0560	(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	(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	17.8185	16.0763	17.7675	17.1372	17.6717	17.0661	17.6154	17.6355	17.0895	17.7013	17.1857	17.8113	(61)
Total heat required for water heating calculated for each month	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(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													
	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(64)
									Total per year (kWh/year) = Sum(64)m =			1710.1526	(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													
	56.2915	49.6428	52.3762	45.1720	43.1952	38.2765	37.3003	39.1383	39.9643	45.3393	49.1616	55.5602	(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	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.4376	12.8233	10.4286	7.8951	5.9017	4.9825	5.3837	6.9980	9.3927	11.9262	13.9196	14.8388	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	167.6183	169.3576	164.9745	155.6434	143.8645	132.7940	125.3983	123.6589	128.0420	137.3732	149.1520	160.2225	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	(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)													
	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	(71)
Water heating gains (Table 5)													
	75.6606	73.8731	70.3981	62.7390	58.0580	53.1617	50.1348	52.6053	55.5060	60.9399	68.2800	74.6778	(72)
Total internal gains													
	328.1231	326.4607	316.2079	296.6841	278.2309	261.3449	251.3234	253.6688	263.3474	280.6459	301.7583	320.1457	(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	
North	1.9200	12.7650	0.6300	0.7000	0.7700	7.4902	(74)
East	2.7300	23.8018	0.6300	0.7000	0.7700	19.8584	(76)
West	5.2500	23.8018	0.6300	0.7000	0.7700	38.1892	(80)

Solar gains	65.5378	111.8084	183.3946	274.3247	331.1552	360.5861	339.0726	295.7987	228.1490	142.4527	80.4245	54.2746	(83)
Total gains	393.6609	438.2691	499.6025	571.0088	609.3860	621.9310	590.3961	549.4675	491.4964	423.0986	382.1828	374.4203	(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	35.1312	35.7103	35.7103	36.5605	36.2799	37.6498	37.6498	37.9126	37.6498	36.5605	36.8381	35.9964	
alpha	3.3421	3.3807	3.3807	3.4374	3.4187	3.5100	3.5100	3.5275	3.5100	3.4374	3.4559	3.3998	
util living area													
	0.9846	0.9765	0.9536	0.8911	0.7706	0.5566	0.3920	0.4277	0.7251	0.9225	0.9743	0.9867	(86)
MIT	18.9980	19.2417	19.6676	20.2423	20.6743	20.9321	20.9856	20.9809	20.8167	20.2422	19.5861	19.0100	(87)
Th 2	19.2518	19.2741	19.2741	19.3060	19.2956	19.3452	19.3452	19.3545	19.3452	19.3060	19.3162	19.2850	(88)
util rest of house													
	0.9785	0.9672	0.9342	0.8447	0.6717	0.3992	0.1998	0.2271	0.5815	0.8777	0.9620	0.9814	(89)
MIT 2	17.5660	17.8203	18.2328	18.7877	19.1315	19.3289	19.3444	19.3532	19.2801	18.8058	18.1909	17.6007	(90)
Living area fraction										fLA = Living area / (4) =		0.4278	(91)
MIT	18.1786	18.4284	18.8466	19.4099	19.7915	20.0147	20.0465	20.0495	19.9375	19.4203	18.7877	18.2036	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.0286	18.2784	18.6966	19.2599	19.6415	19.8647	19.8965	19.8995	19.7875	19.2703	18.6377	18.0536	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9724	0.9596	0.9256	0.8431	0.6947	0.4518	0.2656	0.2959	0.6252	0.8764	0.9551	0.9758	(94)
Useful gains	382.7791	420.5838	462.4468	481.4327	423.3355	280.9886	156.8241	162.5865	307.2982	370.8233	365.0098	365.3593	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	996.3925	953.6811	856.4989	693.1594	503.1123	292.3088	157.9582	164.2189	344.2825	575.4371	781.8532	974.3237	(97)
Space heating kWh													
	456.5284	358.2414	293.1748	152.4433	59.3540	0.0000	0.0000	0.0000	0.0000	152.2327	300.1272	453.0695	(98a)
Space heating requirement - total per year (kWh/year)												2225.1711	
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													
	456.5284	358.2414	293.1748	152.4433	59.3540	0.0000	0.0000	0.0000	0.0000	152.2327	300.1272	453.0695	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2225.1711	
Space heating per m2											(98c) / (4) =	61.3333	(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 %)												89.0000	(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													

	456.5284	358.2414	293.1748	152.4433	59.3540	0.0000	0.0000	0.0000	0.0000	152.2327	300.1272	453.0695 (98)
Space heating efficiency (main heating system 1)												
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)												
	512.9532	402.5184	329.4098	171.2846	66.6899	0.0000	0.0000	0.0000	0.0000	171.0479	337.2216	509.0669 (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												
	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178 (64)
Efficiency of water heater												78.9000 (216)
(217)m	85.9667	85.7120	85.1229	83.8589	81.7433	78.9000	78.9000	78.9000	78.9000	83.8439	85.3260	85.9776 (217)
Fuel for water heating, kWh/month												
	202.0768	178.8435	190.2318	167.0757	164.2888	151.2695	147.7212	154.7339	157.7107	167.8725	178.2792	199.4912 (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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219 (231)
Lighting	12.6371	10.1380	9.1281	6.6876	5.1657	4.2204	4.7124	6.1253	7.9562	10.4389	11.7907	12.9883 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-8.8418	-12.8686	-21.5545	-28.0475	-32.3410	-32.2141	-31.4728	-28.6801	-23.2875	-16.8782	-10.1251	-7.4069 (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	-2.7675	-5.6571	-13.5695	-24.6643	-34.7912	-39.0774	-37.5742	-30.6290	-19.6747	-9.7006	-3.8065	-2.1058 (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	2500.1923 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	78.9000
Water heating fuel used	2059.5948 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	45.0000 (231)
Electricity for lighting (calculated in Appendix L)	101.9888 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-477.7360 (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	4229.0399 (238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2500.1923	5.6000	140.0108	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2059.5948	5.6000	115.3373	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	101.9888	26.0600	26.5783	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-253.7182	26.0600	-66.1190	
PV Unit electricity exported	-224.0178	5.8100	-13.0154	
Total			-79.1344	(252)
Total energy cost			313.5190	(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	2500.1923	0.2100	525.0404	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2059.5948	0.2100	432.5149	(264)
Space and water heating			957.5553	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	101.9888	0.1443	14.7201	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-253.7182	0.1321	-33.5219	
PV Unit electricity exported	-224.0178	0.1217	-27.2622	
Total			-60.7841	(269)
Total CO2, kg/year			917.7334	(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	2500.1923	1.1300	2825.2173	(275)

Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2059.5948	1.1300	2327.3421	(278)
Space and water heating			5152.5594	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	101.9888	1.5338	156.4338	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-253.7182	1.4882	-377.5717	
PV Unit electricity exported	-224.0178	0.4464	-100.0090	
Total			-477.5807	(283)
Total Primary energy kWh/year			4899.4886	(286)

SAP 10 EPC IMPROVEMENTS

Ground Floor Maisonette

Current energy efficiency rating: B 82
Current environmental impact rating: B 83

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

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

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

Potential energy efficiency rating: B 82
Potential environmental impact rating: B 83

Fuel prices for cost data on this page from database revision number 561 TEST (31 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£38	£38	£0
Mains gas	£354	£354	£0
Space heating	£251	£251	£0
Water heating	£115	£115	£0
Lighting	£27	£27	£0
Generated (PV)	-£79	-£79	£0
Total cost of fuels	£313	£313	£0
Total cost of uses	£314	£314	£0
Delivered energy	117 kWh/m²	117 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	25 kg/m²	25 kg/m²	0 kg/m²
Primary energy	135 kWh/m²	135 kWh/m²	0 kWh/m²

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.2800	(1b)	x 2.4400	(2b) =	88.5232	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	36.2800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		88.5232	(5)

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2. Ventilation rate

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	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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2259	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9759	(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) = 0.9027 (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	1.1510	1.1284	1.1059	0.9930	0.9704	0.8576	0.8576	0.8350	0.9027	0.9704	1.0156	1.0607	(22b)
Effective ac	1.1510	1.1284	1.1059	0.9930	0.9709	0.8677	0.8677	0.8486	0.9075	0.9709	1.0156	1.0607	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			2.6300	1.4000	3.6820			(26)
Window			9.9000	1.1450	11.3359			(27)
Heatloss Floor 1			36.2800	0.1000	3.6280	110.0000	3990.8000	(28a)
External Wall 1	49.1700	12.5300	36.6400	0.2100	7.6944	0.0000	0.0000	(29a)
External Roof 1	15.5200		15.5200	0.1400	2.1728	9.0000	139.6800	(30)
Total net area of external elements Aum(A, m2)			100.9700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.5131			(33)
Main dwelling								
Party Wall 1			15.8800	0.0000	0.0000	180.0000	2858.4000	(32)
Party Ceiling 1			20.7600			30.0000	622.8000	(32b)
Internal Wall - Solid			18.3400			100.0000	1834.0000	(32c)
Internal Wall - Timber			33.4900			9.0000	301.4100	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9747.0901 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 268.6629 (35)
Thermal bridges (Default value 0.200 * total exposed area) 20.1940 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.7071 (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	33.6234	32.9641	32.3048	29.0091	28.3619	25.3489	25.3489	24.7909	26.5095	28.3619	29.6677	30.9863	(38)
Heat transfer coeff	82.3305	81.6712	81.0119	77.7162	77.0690	74.0560	74.0560	73.4980	75.2165	77.0690	78.3748	79.6933	(39)
Average = Sum(39)m / 12 =												77.6469	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2693	2.2511	2.2330	2.1421	2.1243	2.0412	2.0412	2.0259	2.0732	2.1243	2.1603	2.1966	(40)
HLP (average)												2.1402	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3114 (42)
Hot water usage for mixer showers

	70.3775	69.3199	67.7787	64.8299	62.6538	60.2270	58.8476	60.3771	62.0538	64.6594	67.6715	70.1079	(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

	28.0596	27.0393	26.0189	24.9986	23.9782	22.9579	22.9579	23.9782	24.9986	26.0189	27.0393	28.0596	(42c)

Average daily hot water use (litres/day) 90.3944 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.4371	96.3591	93.7976	89.8285	86.6320	83.1848	81.8055	84.3553	87.0523	90.6783	94.7108	98.1675	(44)
Energy conte	155.9003	137.2141	144.1634	122.9707	116.6233	102.2855	98.9366	104.4495	107.3442	123.0496	134.9328	153.7065	(45)
Energy content (annual)										Total = Sum(45)m =		1501.5765	
Distribution loss (46)m = 0.15 x (45)m	23.3850	20.5821	21.6245	18.4456	17.4935	15.3428	14.8405	15.6674	16.1016	18.4574	20.2399	23.0560	(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	(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	17.8185	16.0763	17.7675	17.1372	17.6717	17.0661	17.6154	17.6355	17.0895	17.7013	17.1857	17.8113	(61)
Total heat required for water heating calculated for each month	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(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	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(64)
										Total per year (kWh/year) = Sum(64)m =		1710.1526	(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	56.2915	49.6428	52.3762	45.1720	43.1952	38.2765	37.3003	39.1383	39.9643	45.3393	49.1616	55.5602	(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	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.4376	12.8233	10.4286	7.8951	5.9017	4.9825	5.3837	6.9980	9.3927	11.9262	13.9196	14.8388	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	167.6183	169.3576	164.9745	155.6434	143.8645	132.7940	125.3983	123.6589	128.0420	137.3732	149.1520	160.2225	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	(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)	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	(71)

Water heating gains (Table 5)

	75.6606	73.8731	70.3981	62.7390	58.0580	53.1617	50.1348	52.6053	55.5060	60.9399	68.2800	74.6778 (72)
Total internal gains												
	328.1231	326.4607	316.2079	296.6841	278.2309	261.3449	251.3234	253.6688	263.3474	280.6459	301.7583	320.1457 (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	
North	1.9200	10.6334	0.6300	0.7000	0.7700	6.2394	(74)
East	2.7300	19.6403	0.6300	0.7000	0.7700	16.3863	(76)
West	5.2500	19.6403	0.6300	0.7000	0.7700	31.5122	(80)

Solar gains	54.1379	105.6235	174.5716	257.5972	319.6510	329.2738	312.6178	265.6591	203.8299	125.3763	67.4210	44.5909	(83)
Total gains	382.2610	432.0843	490.7794	554.2813	597.8819	590.6186	563.9413	519.3279	467.1772	406.0222	369.1792	364.7366	(84)

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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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.8861	33.1515	33.4213	34.8386	35.1312	36.5605	36.5605	36.8381	35.9964	35.1312	34.5459	33.9743	
alpha	3.1924	3.2101	3.2281	3.3226	3.3421	3.4374	3.4374	3.4559	3.3998	3.3421	3.3031	3.2650	
util living area													
	0.9878	0.9810	0.9643	0.9211	0.8340	0.6831	0.5372	0.5905	0.8115	0.9464	0.9813	0.9895	(86)
MIT	18.6666	18.9098	19.3503	19.9755	20.4788	20.8295	20.9446	20.9238	20.6632	20.0029	19.2716	18.6877	(87)
Th 2	19.1598	19.1712	19.1825	19.2403	19.2518	19.3060	19.3060	19.3162	19.2850	19.2518	19.2286	19.2055	(88)
util rest of house													
	0.9831	0.9736	0.9497	0.8870	0.7592	0.5464	0.3487	0.4011	0.6986	0.9157	0.9726	0.9855	(89)
MIT 2	17.1767	17.4238	17.8623	18.4968	18.9457	19.2436	19.2970	19.3015	19.1318	18.5469	17.8226	17.2279	(90)
Living area fraction									fLA = Living area / (4) =			0.4278	(91)
MIT	17.8141	18.0595	18.4988	19.1294	19.6015	19.9220	20.0018	19.9955	19.7869	19.1697	18.4424	17.8524	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.6641	17.9095	18.3488	18.9794	19.4515	19.7720	19.8518	19.8455	19.6369	19.0197	18.2924	17.7024	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9774	0.9662	0.9405	0.8806	0.7694	0.5882	0.4136	0.4659	0.7265	0.9102	0.9660	0.9805	(94)
Useful gains	373.6228	417.4817	461.5565	488.0779	460.0025	347.4279	233.2375	241.9349	339.3861	369.5482	356.6151	357.6166	(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													
	1100.2704	1062.5008	959.8954	783.3292	597.4027	383.0184	240.8167	253.2398	416.4682	648.8990	877.2054	1076.0509	(97)
Space heating kWh													
	540.6258	433.4529	370.7642	212.5809	102.2257	0.0000	0.0000	0.0000	0.0000	207.8370	374.8250	534.5151	(98a)
Space heating requirement - total per year (kWh/year)												2776.8267	
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													
	540.6258	433.4529	370.7642	212.5809	102.2257	0.0000	0.0000	0.0000	0.0000	207.8370	374.8250	534.5151	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2776.8267	
Space heating per m2											(98c) / (4) =	76.5388	(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 %)	89.0000	(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													
	540.6258	433.4529	370.7642	212.5809	102.2257	0.0000	0.0000	0.0000	0.0000	207.8370	374.8250	534.5151	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	607.4448	487.0257	416.5889	238.8550	114.8604	0.0000	0.0000	0.0000	0.0000	233.5247	421.1517	600.5788	(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													
	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(64)
Efficiency of water heater												78.9000	(216)
(217)m	86.3130	86.1199	85.6665	84.6931	82.9695	78.9000	78.9000	78.9000	78.9000	84.6259	85.8283	86.3158	(217)
Fuel for water heating, kWh/month													
	201.2660	177.9965	189.0248	165.4300	161.8607	151.2695	147.7212	154.7339	157.7107	166.3212	177.2359	198.7097	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.6371	10.1380	9.1281	6.6876	5.1657	4.2204	4.7124	6.1253	7.9562	10.4389	11.7907	12.9883	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.4311	-12.1981	-20.6548	-26.7673	-31.5468	-30.4317	-29.8908	-26.6931	-21.4315	-15.1900	-8.6576	-6.1813	(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	-2.0708	-5.1530	-12.5382	-22.4602	-32.9898	-34.4453	-33.5329	-26.3146	-16.7007	-8.0129	-2.9160	-1.5615	(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	3120.0300	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2049.2802	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	101.9888	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-435.7700	(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	4880.5290	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3120.0300	3.6400	113.5691	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2049.2802	3.6400	74.5938	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	101.9888	16.4900	16.8180	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-237.0742	16.4900	-39.0935	
PV Unit electricity exported	-198.6959	5.5900	-11.1071	
Total			-50.2006	(252)
Total energy cost			254.2007	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1259	(257)
SAP value		81.7493	
SAP rating (Section 12)		82	(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	3120.0300	0.2100	655.2063	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2049.2802	0.2100	430.3489	(264)
Space and water heating			1085.5551	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	101.9888	0.1443	14.7201	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-237.0742	0.1319	-31.2697	
PV Unit electricity exported	-198.6959	0.1218	-24.1980	
Total			-55.4677	(269)
Total CO2, kg/year			1051.0496	(272)
CO2 emissions per m2			28.9700	(273)
EI value			82.6722	
EI rating			83	(274)
EI band			B	

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		36.2800	(1b)	x 2.4400	(2b) =	88.5232	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	36.2800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		88.5232	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2259	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9759	(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) =	0.9027	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.9704	0.9253	0.9253	0.8576	0.8802	0.7673	0.7673	0.7448	0.7673	0.8576	0.8350	0.9027	(22b)
Effective ac	0.9709	0.9281	0.9281	0.8677	0.8873	0.7944	0.7944	0.7773	0.7944	0.8677	0.8486	0.9075	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Door			2.6300	1.4000	3.6820			(26)
Window			9.9000	1.1450	11.3359			(27)
Heatloss Floor 1			36.2800	0.1000	3.6280	110.0000	3990.8000	(28a)
External Wall 1	49.1700	12.5300	36.6400	0.2100	7.6944	0.0000	0.0000	(29a)
External Roof 1	15.5200		15.5200	0.1400	2.1728	9.0000	139.6800	(30)
Total net area of external elements Aum(A, m2)			100.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.5131			(33)
Main dwelling								
Party Wall 1			15.8800	0.0000	0.0000	180.0000	2858.4000	(32)
Party Ceiling 1			20.7600			30.0000	622.8000	(32b)
Internal Wall - Solid			18.3400			100.0000	1834.0000	(32c)
Internal Wall - Timber			33.4900			9.0000	301.4100	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9747.0901 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		268.6629 (35)
Thermal bridges (Default value 0.200 * total exposed area)		20.1940 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	48.7071 (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	28.3619	27.1121	27.1121	25.3489	25.9217	23.2063	23.2063	22.7079	23.2063	25.3489	24.7909	26.5095	(38)
Heat transfer coeff	77.0690	75.8191	75.8191	74.0560	74.6288	71.9134	71.9134	71.4150	71.9134	74.0560	73.4980	75.2165	(39)
Average = Sum(39)m / 12 =												73.9432	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1243	2.0898	2.0898	2.0412	2.0570	1.9822	1.9822	1.9684	1.9822	2.0412	2.0259	2.0732	(40)
HLP (average)												2.0381	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.3114	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
70.3775	69.3199	67.7787	64.8299	62.6538	60.2270	58.8476	60.3771	62.0538	64.6594	67.6715	70.1079	(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

28.0596	27.0393	26.0189	24.9986	23.9782	22.9579	22.9579	23.9782	24.9986	26.0189	27.0393	28.0596	(42c)

Average daily hot water use (litres/day)	90.3944	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.4371	96.3591	93.7976	89.8285	86.6320	83.1848	81.8055	84.3553	87.0523	90.6783	94.7108	98.1675	(44)
Energy conte	155.9003	137.2141	144.1634	122.9707	116.6233	102.2855	98.9366	104.4495	107.3442	123.0496	134.9328	153.7065	(45)
Energy content (annual)										Total = Sum(45)m =		1501.5765	
Distribution loss (46)m = 0.15 x (45)m	23.3850	20.5821	21.6245	18.4456	17.4935	15.3428	14.8405	15.6674	16.1016	18.4574	20.2399	23.0560	(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	(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	17.8185	16.0763	17.7675	17.1372	17.6717	17.0661	17.6154	17.6355	17.0895	17.7013	17.1857	17.8113	(61)
Total heat required for water heating calculated for each month	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(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													

	173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(64)
										Total per year (kWh/year) = Sum(64)m =		1710.1526	(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													
	56.2915	49.6428	52.3762	45.1720	43.1952	38.2765	37.3003	39.1383	39.9643	45.3393	49.1616	55.5602	(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	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	78.6814	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.4376	12.8233	10.4286	7.8951	5.9017	4.9825	5.3837	6.9980	9.3927	11.9262	13.9196	14.8388	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	167.6183	169.3576	164.9745	155.6434	143.8645	132.7940	125.3983	123.6589	128.0420	137.3732	149.1520	160.2225	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	44.1795	(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)													
	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	-52.4543	(71)
Water heating gains (Table 5)													
	75.6606	73.8731	70.3981	62.7390	58.0580	53.1617	50.1348	52.6053	55.5060	60.9399	68.2800	74.6778	(72)
Total internal gains													
	328.1231	326.4607	316.2079	296.6841	278.2309	261.3449	251.3234	253.6688	263.3474	280.6459	301.7583	320.1457	(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	
North	1.9200	12.7650	0.6300	0.7000	0.7700	7.4902	(74)
East	2.7300	23.8018	0.6300	0.7000	0.7700	19.8584	(76)
West	5.2500	23.8018	0.6300	0.7000	0.7700	38.1892	(80)

Solar gains	65.5378	111.8084	183.3946	274.3247	331.1552	360.5861	339.0726	295.7987	228.1490	142.4527	80.4245	54.2746	(83)
Total gains	393.6609	438.2691	499.6025	571.0088	609.3860	621.9310	590.3961	549.4675	491.4964	423.0986	382.1828	374.4203	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.1312	35.7103	35.7103	36.5605	36.2799	37.6498	37.6498	37.9126	37.6498	36.5605	36.8381	35.9964	
alpha	3.3421	3.3807	3.3807	3.4374	3.4187	3.5100	3.5100	3.5275	3.5100	3.4374	3.4559	3.3998	
util living area													
	0.9846	0.9765	0.9536	0.8911	0.7706	0.5566	0.3920	0.4277	0.7251	0.9225	0.9743	0.9867	(86)
MIT	18.9980	19.2417	19.6676	20.2423	20.6743	20.9321	20.9856	20.9809	20.8167	20.2422	19.5861	19.0100	(87)
Th 2	19.2518	19.2741	19.2741	19.3060	19.2956	19.3452	19.3452	19.3545	19.3452	19.3060	19.3162	19.2850	(88)
util rest of house													
	0.9785	0.9672	0.9342	0.8447	0.6717	0.3992	0.1998	0.2271	0.5815	0.8777	0.9620	0.9814	(89)
MIT 2	17.5660	17.8203	18.2328	18.7877	19.1315	19.3289	19.3444	19.3532	19.2801	18.8058	18.1909	17.6007	(90)
Living area fraction										fLA = Living area / (4) =		0.4278	(91)
MIT	18.1786	18.4284	18.8466	19.4099	19.7915	20.0147	20.0465	20.0495	19.9375	19.4203	18.7877	18.2036	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.0286	18.2784	18.6966	19.2599	19.6415	19.8647	19.8965	19.8995	19.7875	19.2703	18.6377	18.0536	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9724	0.9596	0.9256	0.8431	0.6947	0.4518	0.2656	0.2959	0.6252	0.8764	0.9551	0.9758	(94)
Useful gains	382.7791	420.5838	462.4468	481.4327	423.3355	280.9886	156.8241	162.5865	307.2982	370.8233	365.0098	365.3593	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	996.3925	953.6811	856.4989	693.1594	503.1123	292.3088	157.9582	164.2189	344.2825	575.4371	781.8532	974.3237	(97)
Space heating kWh													
	456.5284	358.2414	293.1748	152.4433	59.3540	0.0000	0.0000	0.0000	0.0000	152.2327	300.1272	453.0695	(98a)
Space heating requirement - total per year (kWh/year)												2225.1711	
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													
	456.5284	358.2414	293.1748	152.4433	59.3540	0.0000	0.0000	0.0000	0.0000	152.2327	300.1272	453.0695	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2225.1711	
Space heating per m2											(98c) / (4) =	61.3333	(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 %)												89.0000	(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													
	456.5284	358.2414	293.1748	152.4433	59.3540	0.0000	0.0000	0.0000	0.0000	152.2327	300.1272	453.0695	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	512.9532	402.5184	329.4098	171.2846	66.6899	0.0000	0.0000	0.0000	0.0000	171.0479	337.2216	509.0669	(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

173.7188	153.2904	161.9308	140.1079	134.2950	119.3516	116.5521	122.0850	124.4337	140.7508	152.1186	171.5178	(64)

Efficiency of water heater

											78.9000	(216)
(217)m 85.9667	85.7120	85.1229	83.8589	81.7433	78.9000	78.9000	78.9000	78.9000	83.8439	85.3260	85.9776	(217)

Fuel for water heating, kWh/month

202.0768	178.8435	190.2318	167.0757	164.2888	151.2695	147.7212	154.7339	157.7107	167.8725	178.2792	199.4912	(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 3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting 12.6371	10.1380	9.1281	6.6876	5.1657	4.2204	4.7124	6.1253	7.9562	10.4389	11.7907	12.9883	(232)

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

(233a)m -8.8418	-12.8686	-21.5545	-28.0475	-32.3410	-32.2141	-31.4728	-28.6801	-23.2875	-16.8782	-10.1251	-7.4069	(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 -2.7675	-5.6571	-13.5695	-24.6643	-34.7912	-39.0774	-37.5742	-30.6290	-19.6747	-9.7006	-3.8065	-2.1058	(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	2500.1923	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2059.5948	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	101.9888	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-477.7360	(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	4229.0399	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2500.1923	5.6000	140.0108	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2059.5948	5.6000	115.3373	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	101.9888	26.0600	26.5783	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-253.7182	26.0600	-66.1190	
PV Unit electricity exported	-224.0178	5.8100	-13.0154	
Total			-79.1344	(252)
Total energy cost			313.5190	(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	2500.1923	0.2100	525.0404	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2059.5948	0.2100	432.5149	(264)
Space and water heating			957.5553	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	101.9888	0.1443	14.7201	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-253.7182	0.1321	-33.5219	
PV Unit electricity exported	-224.0178	0.1217	-27.2622	
Total			-60.7841	(269)
Total CO2, kg/year			917.7334	(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	2500.1923	1.1300	2825.2173	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2059.5948	1.1300	2327.3421	(278)
Space and water heating			5152.5594	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	101.9888	1.5338	156.4338	(282)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-253.7182	1.4882	-377.5717
PV Unit electricity exported	-224.0178	0.4464	-100.0090
Total			-477.5807 (283)
Total Primary energy kWh/year			4899.4886 (286)

Predicted Energy Assessment

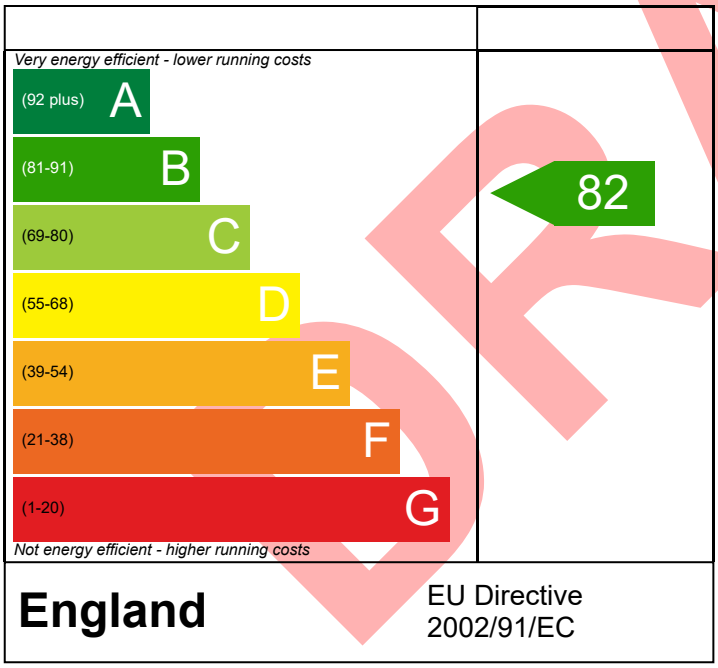
Flat 2, 99 London Road, Reading, RG1 5BY

Dwelling type:	Maisonette, Semi-Detached
Date of assessment:	17/02/2025
Produced by:	Sammit Pancholi
Total floor area:	36.28 m²
DRRN:	

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.

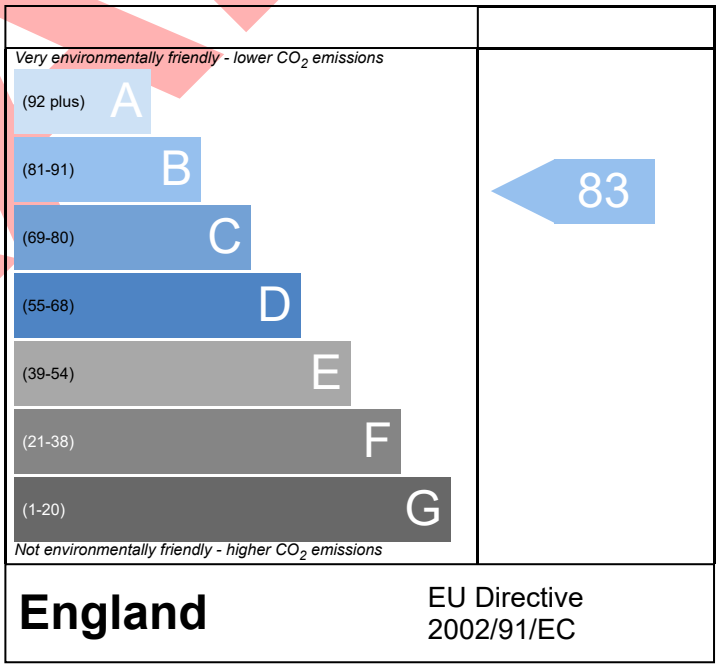
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

elmhurst energy

Property Reference	Flat 2 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Ground Floor Maisonette	**Prop Type Ref**	Ground Floor, Maisonette
Property	Flat 2, 99 London Road, Reading, RG1 5BY		

SAP Rating	82 B	**DER**	29.74	**TER**	
Environmental	83 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.92	**DFEE**	87.58	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	159.15	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	East	
Property Tenture	ND	
Transaction Type	5	
Terrain Type	Suburban	
1.0 Property Type	Maisonette, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	0	
2.0 Number of Storeys	1	
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	268.66	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	20.32 m	36.28 m²	2.44 m

8.0 Living Area	15.52	m²

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
External Wall 1	Solid Wall	Other	0.21	0.00	49.17	36.64	0.00	None	12.53	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, dense blocks, cavity or cavity fill	0.00	180.00	15.88		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall - Solid	Dense block, dense plaster	100.00	18.34
Internal Wall - Timber	Plasterboard on timber frame	9.00	33.49

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
External Roof 1	External Plane Roof	Plasterboard, insulated at ceiling level	0.14	9.00	15.52	15.52	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Timber I-joists, carpeted	20.00	20.76

Summary for Input Data

elmhurst energy

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.10	None	0.00	110.00	36.28

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			1.40
Window	Manufacturer	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 1	Window	External Wall 1	East	0.91	
Opening 2	Window	External Wall 1	East	0.91	
Opening 4	Window	External Wall 1	East	0.91	
Opening 3	Door	External Wall 1	East	2.63	
Opening 5	Window	External Wall 1	North	0.96	
Opening 6	Window	External Wall 1	North	0.96	
Opening 7	Window	External Wall 1	West	5.25	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.20	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	2
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No
22.0 Pressure Testing	No
Test Method	Blower Door

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
LED	66.00	8.00	528.00	15

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18830	
Fuel Type	Mains gas	
In Winter	89.00	
In Summer	78.90	
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Controls SAP Code	2106	

Summary for Input Data

Delayed Start Stat	Yes
Flue Type	Open
Fan Assisted Flue	Yes
Is MHS Pumped	No pump
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	Yes
Combi boiler type	Standard Combi
Combi keep hot type	None

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	0

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.50		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder — None

In Airing Cupboard	No

32.0 Photovoltaic Unit — One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.60	West	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro — None

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

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
			0	0
			0	0
			0	0

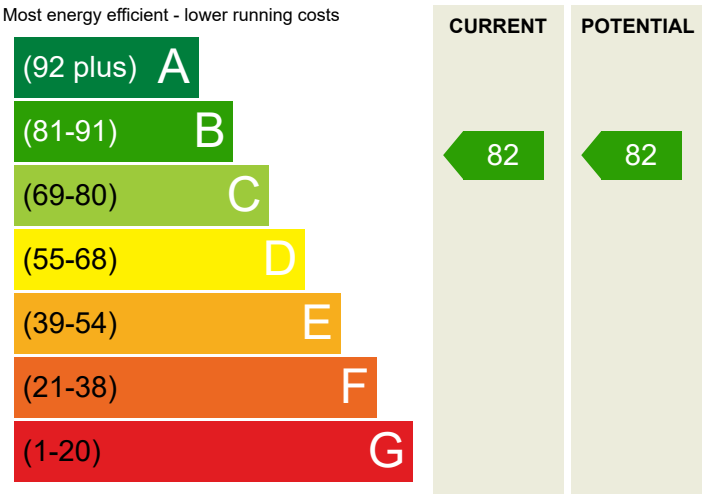
Energy Report

Dwelling Address	Flat 2, 99 London Road, Reading, RG1 5BY
Reference	Flat 2 - Gas + Solar-Ground Floor Maisonette
Assessment Date	29/01/2025
Submission Date	
Property Type	Maisonette, Semi-Detached
Total Floor Area	36

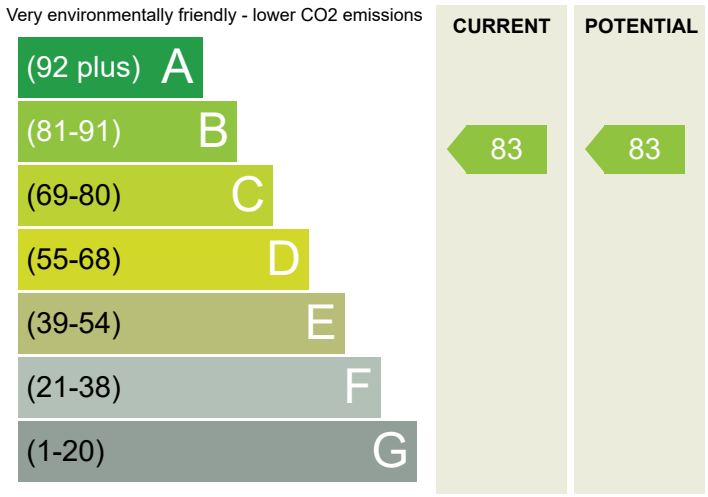
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

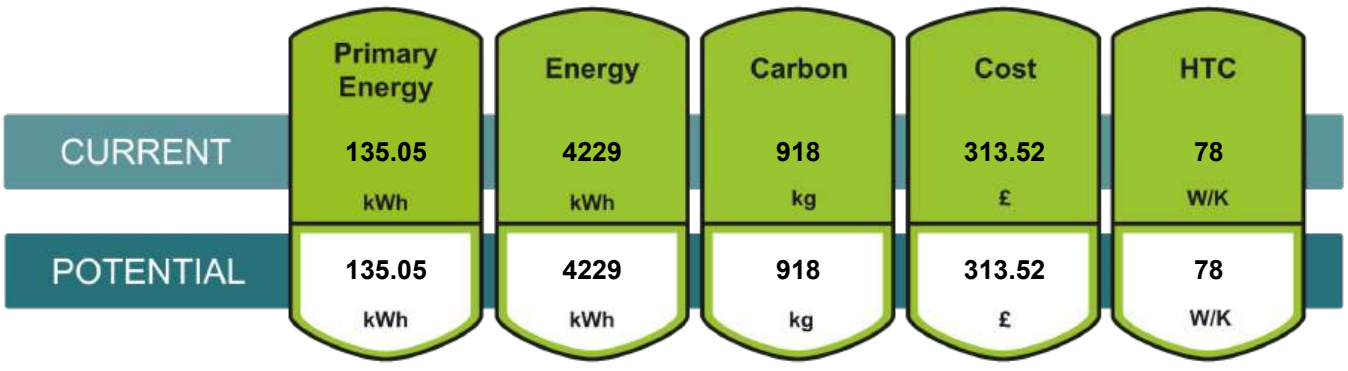
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.21 W/m²K	Very Good
Roof	Average thermal transmittance 0.14 W/m²K	Very Good
Floor	Average thermal transmittance 0.1 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Energy Report

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£27	£27	
Heating	£251	£251	
Hot Water	£115	£115	
New Technologies e.g. Impact of PV	-(£79)	-(£79)	
TOTAL	£314	£314	

Estimated energy use and potential savings

Space Heating
2500
kWh per year

Water Heating
2060
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report

Property Reference	Flat 2 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Ground Floor Maisonette	**Prop Type Ref**	Semi-Detached Maisonette
Property	Flat 2, 99 London Road, Reading, RG1 5BY		

SAP Rating	82 B	**DER**	29.74	**TER**	
Environmental	83 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.92	**DFEE**	87.58	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	159.15	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	Flat 2, 99 London Road	
House Number		
Postcode	RG1 5BY	
Street		
Town	Reading	
County		

Dwelling Orientation East (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Suburban

Property Type Maisonette, Semi-Detached

Comments

Electricity Tariff Standard

Smart electricity meter fitted: No

Smart gas meter fitted: No

Comments

Section 2: Dwelling Construction Details

External Walls

Description	External Wall 1	
Type	Solid Wall	
Construction	Other	
U-value	0.21	W/m²K U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	49.17	m²

Comments

Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	15.88

Comments

External Roofs

Description: External Roof 1
Type: External Plane Roof
Construction: Plasterboard, insulated at ceiling level
U-value: 0.14 W/m²K U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area: 15.52 m²
Comments

Heat Loss Floors

Description: Heatloss Floor 1
Type: Ground Floor - Solid
Construction: Slab on ground, screed over insulation
U-value: 0.10 W/m²K U-value calculations should be provided to verify the u-value entered into the Assessment
Area: 36.28 m²
Comments

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
Door	Manufacturer	Solid Door		0.00		1.40
Window	Manufacturer	Window	Double Low-E Soft 0.05	0.63		1.20

Comments

Openings

Name	Opening Type	Location	Orientation	Area (m²)
Opening 1	Window	External Wall 1	East	0.91
Opening 2	Window	External Wall 1	East	0.91
Opening 4	Window	External Wall 1	East	0.91
Opening 3	Door	External Wall 1	East	2.63
Opening 5	Window	External Wall 1	North	0.96
Opening 6	Window	External Wall 1	North	0.96
Opening 7	Window	External Wall 1	West	5.25

Comments

Thermal Bridging Default

Y-value 0.200

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing No

Designed AP_{50} 8.00 $m^3/(h.m^2)$ @ 50 Pa

Property Tested? Yes

Test Method Blower Door

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

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	2
Number of passive vents	0
Number of flueless gas fires	0

Comments

Fixed Cooling System No

Comments

Lighting

No Fixed Lighting	No

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
LED	66.00	8.00	528.00	15

Comments

Main Heating 1 Database

Fuel Type	Mains gas	
Winter Efficiency	89.00	%
Summer Efficiency	78.90	%
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Flue Type	Open	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Programmer, room thermostat and TRVs
Boiler Interlock	Yes
Delayed Start Stat	Yes
PCDF Control Description	

Comments

Main Heating 2 None

Secondary Heating None

Water Heating System

Water Heating	Main Heating 1
Supplementary Immersion	No
SAP Code	901
Water use <= 125 l/p/day	Yes
Cold Water Source	From mains
Number of baths	0

Comments

Hot Water Cylinder None

Comments

Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.50		No	

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit One Dwelling

Export Capable Meter? Yes

Connected To Dwelling Yes

Diverter No

Battery Capacity [kWh] 0.00

PV Cells kWp	Orientation	Elevation	Overshading	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.60	West	30°	None Or Little	No	1.00		

Comments

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed .....

Date .....

Full SAP Calculation Printout

Property Reference	Flat 3 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Mid-floor flat	**Prop Type Ref**	Ground Floor, Flat
Property	Flat 3, 99 London Road, Reading, RG1 5BY		

SAP Rating	78 C	**DER**	28.21	**TER**	
Environmental	81 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	1.15	**DFEE**	67.63	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	154.57	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800	(1b)	x 2.3500	(2b) =	109.2280	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4800					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	109.2280	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1831	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9331	(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) =	0.8631	(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	1.1005	1.0789	1.0573	0.9494	0.9279	0.8200	0.8200	0.7984	0.8631	0.9279	0.9710	1.0142	(22b)
Effective ac	1.1005	1.0789	1.0573	0.9507	0.9305	0.8362	0.8362	0.8187	0.8725	0.9305	0.9714	1.0142	(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								
Window			7.4200	1.5918	11.8109			(27)
Rooflight			1.9400	2.0221	3.9228			(27a)
External Wall Upgraded	26.6100	2.6700	23.9400	0.3000	7.1820	0.0000	0.0000	(29a)
External New Wall	31.9400	4.7500	27.1900	0.2100	5.7099	9.0000	244.7100	(29a)
External Roof 1	15.4300		15.4300	0.1600	2.4688	9.0000	138.8700	(30)
External Roof 2	5.1100	1.9400	3.1700	0.1600	0.5072	9.0000	28.5300	(30)
Total net area of external elements Aum(A, m2)			79.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6016			(33)
Main dwelling								
Party Wall 1			9.6600	0.0000	0.0000	180.0000	1738.8000	(32)
Party Wall 2			9.6600	0.0000	0.0000	20.0000	193.2000	(32)
Party Floor 1			46.4800			30.0000	1394.4000	(32d)
Party Ceiling 1			25.4700			20.0000	509.4000	(32b)
Internal Wall - Timber			79.1600			9.0000	712.4400	(32c)
Internal Wall - Solid			18.0400			75.0000	1353.0001	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		6313.3501	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							135.8294	(35)
Thermal bridges (Default value 0.200 * total exposed area)							15.8180	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 47.4196 (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	39.6670	38.8892	38.1114	34.2686	33.5385	30.1400	30.1400	29.5106	31.4491	33.5385	35.0155	36.5559	(38)
Heat transfer coeff	87.0866	86.3088	85.5310	81.6882	80.9581	77.5595	77.5595	76.9302	78.8686	80.9581	82.4350	83.9754	(39)
Average = Sum(39)m / 12 =												81.6549	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8736	1.8569	1.8402	1.7575	1.7418	1.6687	1.6687	1.6551	1.6968	1.7418	1.7736	1.8067	(40)
HLP (average)												1.7568	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.5872 (42)

Hot water usage for mixer showers	92.9479	91.5511	89.5156	85.6212	82.7471	79.5421	77.7203	79.7403	81.9547	85.3960	89.3741	92.5918	(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	30.8846	29.7615	28.6384	27.5154	26.3923	25.2692	25.2692	26.3923	27.5154	28.6384	29.7615	30.8846	(42c)
Average daily hot water use (litres/day)												113.7717	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.8325	121.3126	118.1541	113.1365	109.1394	104.8113	102.9895	106.1326	109.4700	114.0344	119.1356	123.4764	(44)
Energy conte	196.1204	172.7475	181.5984	154.8782	146.9226	128.8777	124.5569	131.4144	134.9875	154.7436	169.7305	193.3341	(45)
Energy content (annual)										Total = Sum(45)m =		1889.9118	
Distribution loss (46)m = 0.15 x (45)m	29.4181	25.9121	27.2398	23.2317	22.0384	19.3317	18.6835	19.7122	20.2481	23.2115	25.4596	29.0001	(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	(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	17.7989	16.0803	17.7995	17.2015	17.7608	17.1709	17.7272	17.7334	17.1683	17.7579	17.2067	17.7952	(61)
Total heat required for water heating calculated for each month	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293	(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	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293	(64)
									Total per year (kWh/year) = Sum(64)m =			2099.1124	(64)
12Total per year (kWh/year)												2099	(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	69.6598	61.4586	64.8313	55.7974	53.2920	47.1446	45.8470	48.1286	49.1754	55.8917	60.7371	68.7324	(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	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.8499	77.3338	69.8499	72.1783	69.8499	72.1783	69.8499	69.8499	72.1783	69.8499	72.1783	69.8499	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.1031	139.5361	135.9248	128.2368	118.5320	109.4109	103.3174	101.8843	105.4956	113.1837	122.8885	132.0096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	(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)	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	(71)
Water heating gains (Table 5)	93.6287	91.4563	87.1389	77.4964	71.6290	65.4786	61.6222	64.6890	68.2992	75.1233	84.3570	92.3823	(72)
Total internal gains	348.3898	355.1344	339.7217	324.7195	306.8190	293.8758	281.5977	283.2313	292.7812	304.9650	326.2319	341.0499	(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	
North	6.1000	10.6334	0.6300	0.7000	0.7700	19.8232	(74)
East	1.3200	19.6403	0.6300	0.7000	0.7700	7.9231	(76)
East	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)
West	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)

Solar gains	48.1966	94.6649	161.0920	249.5446	322.9492	339.1473	319.3036	262.0865	191.5355	113.3118	60.0612	39.7128	(83)
Total gains	396.5864	449.7993	500.8137	574.2641	629.7682	633.0231	600.9013	545.3179	484.3167	418.2767	386.2931	380.7627	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.1375	20.3190	20.5038	21.4683	21.6619	22.6111	22.6111	22.7961	22.2358	21.6619	21.2738	20.8836	
alpha	2.3425	2.3546	2.3669	2.4312	2.4441	2.5074	2.5074	2.5197	2.4824	2.4441	2.4183	2.3922	
util living area	0.9649	0.9514	0.9268	0.8675	0.7699	0.6238	0.4991	0.5509	0.7531	0.9000	0.9510	0.9678	(86)

MIT	17.7933	18.1112	18.6595	19.4917	20.1722	20.6809	20.8699	20.8313	20.4396	19.5623	18.6142	17.8312	(87)
Th 2	20.0632	20.0715	20.0799	20.1213	20.1291	20.1657	20.1657	20.1724	20.1516	20.1291	20.1132	20.0966	(88)
util rest of house													
	0.9606	0.9455	0.9175	0.8500	0.7375	0.5695	0.4222	0.4752	0.7076	0.8833	0.9442	0.9639	(89)
MIT 2	17.0955	17.4154	17.9626	18.8029	19.4561	19.9419	20.0939	20.0744	19.7314	18.8876	17.9434	17.1540	(90)
Living area fraction										fLA = Living area / (4) =		0.3087	(91)
MIT	17.3110	17.6302	18.1778	19.0156	19.6772	20.1701	20.3335	20.3081	19.9500	19.0959	18.1505	17.3631	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3110	17.6302	18.1778	19.0156	19.6772	20.1701	20.3335	20.3081	19.9500	19.0959	18.1505	17.3631	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9427	0.9241	0.8921	0.8234	0.7185	0.5698	0.4385	0.4884	0.6954	0.8582	0.9236	0.9474	(94)
Useful gains	373.8646	415.6556	446.7975	472.8521	452.5035	360.7085	263.4980	266.3409	336.7704	358.9812	356.7754	360.7255	(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													
	1133.0800	1098.7319	998.8101	826.3236	645.8160	432.0111	289.5658	300.6493	461.3825	687.8096	910.9480	1105.3735	(97)
Space heating kWh													
	564.8562	459.0272	410.6974	254.4995	143.8245	0.0000	0.0000	0.0000	0.0000	244.6483	399.0043	554.0181	(98a)
Space heating requirement - total per year (kWh/year)												3030.5755	
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													
	564.8562	459.0272	410.6974	254.4995	143.8245	0.0000	0.0000	0.0000	0.0000	244.6483	399.0043	554.0181	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3030.5755	
Space heating per m2											(98c) / (4) =	65.2017	(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 %)	84.0000 (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													
	564.8562	459.0272	410.6974	254.4995	143.8245	0.0000	0.0000	0.0000	0.0000	244.6483	399.0043	554.0181	(98)
Space heating efficiency (main heating system 1)													
	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)													
	672.4479	546.4610	488.9254	302.9756	171.2196	0.0000	0.0000	0.0000	0.0000	291.2480	475.0051	659.5453	(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													
	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.9768	85.7988	85.4260	84.6298	83.3074	78.9000	78.9000	78.9000	78.9000	84.5256	85.5079	85.9636	(217)
Fuel for water heating, kWh/month													
	248.8104	220.0821	233.4160	203.3322	197.6817	185.1060	180.3347	189.0339	192.8464	204.0819	218.6199	245.6032	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	15.5832	12.5014	11.2561	8.2467	6.3700	5.2043	5.8109	7.5533	9.8109	12.8725	14.5394	16.0163	(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)
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	3607.8280 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	78.9000
Water heating fuel used	2518.9485 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	45.0000 (231)
Electricity for lighting (calculated in Appendix L)	125.7650 (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	6297.5415 (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	3607.8280	0.2100	757.6439	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2518.9485	0.2100	528.9792	(264)
Space and water heating			1286.6230	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	125.7650	0.1443	18.1518	(268)
Total CO2, kg/year			1311.0169	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			28.2100	(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	3607.8280	1.1300	4076.8456	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2518.9485	1.1300	2846.4118	(278)
Space and water heating			6923.2574	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	125.7650	1.5338	192.9026	(282)
Total Primary energy kWh/year			7184.2360	(286)
Dwelling Primary energy Rate (DPER)			154.5700	(287)

SAP 10 WORKSHEET FOR Conversion (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						
Ground floor	46.4800	(1b)	x 2.3500	(2b) =	109.2280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	109.2280	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1831 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9331 (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) =	0.8631 (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	1.1005	1.0789	1.0573	0.9494	0.9279	0.8200	0.8200	0.7984	0.8631	0.9279	0.9710	1.0142	(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	1.1005	1.0789	1.0573	0.9507	0.9305	0.8362	0.8362	0.8187	0.8725	0.9305	0.9714	1.0142	(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								
Window			7.4200	1.5918	11.8109			(27)
Rooflight			1.9400	2.0221	3.9228			(27a)
External Wall Upgraded	26.6100	2.6700	23.9400	0.3000	7.1820	0.0000	0.0000	(29a)
External New Wall	31.9400	4.7500	27.1900	0.2100	5.7099	9.0000	244.7100	(29a)
External Roof 1	15.4300		15.4300	0.1600	2.4688	9.0000	138.8700	(30)
External Roof 2	5.1100	1.9400	3.1700	0.1600	0.5072	9.0000	28.5300	(30)
Total net area of external elements Aum(A, m2)			79.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6016			(33)
Main dwelling								
Party Wall 1			9.6600	0.0000	0.0000	180.0000	1738.8000	(32)
Party Wall 2			9.6600	0.0000	0.0000	20.0000	193.2000	(32)
Party Floor 1			46.4800			30.0000	1394.4000	(32d)
Party Ceiling 1			25.4700			30.0000	764.1000	(32b)

Internal Wall - Timber	79.1600	9.0000	712.4400 (32c)
Internal Wall - Solid	18.0400	75.0000	1353.0001 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6568.0501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		141.3092 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.8180 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	47.4196 (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	39.6670	38.8892	38.1114	34.2686	33.5385	30.1400	30.1400	29.5106	31.4491	33.5385	35.0155	36.5559	(38)
Heat transfer coeff	87.0866	86.3088	85.5310	81.6882	80.9581	77.5595	77.5595	76.9302	78.8686	80.9581	82.4350	83.9754	(39)
Average = Sum(39)m / 12 =												81.6549	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8736	1.8569	1.8402	1.7575	1.7418	1.6687	1.6687	1.6551	1.6968	1.7418	1.7736	1.8067	(40)
HLP (average)												1.7568	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.5872 (42)

Hot water usage for mixer showers

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

21.9825	21.6560	21.1963	20.3486	19.7139	19.0101	18.6299	19.0864	19.5835	20.3366	21.2018	21.9082	(42b)

Hot water usage for other uses

30.8846	29.7615	28.6384	27.5154	26.3923	25.2692	25.2692	26.3923	27.5154	28.6384	29.7615	30.8846	(42c)

Average daily hot water use (litres/day)		48.4582 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	52.8671	51.4176	49.8347	47.8640	46.1062	44.2793	43.8991	45.4787	47.0989	48.9751	50.9633	52.7928	(44)
Energy conte	83.7286	73.2179	76.5941	65.5234	62.0678	54.4465	53.0922	56.3122	58.0776	66.4587	72.6065	82.6607	(45)
Energy content (annual)										Total = Sum(45)m =		804.7862	
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	(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	71.1693	62.2352	65.1050	55.6949	52.7576	46.2796	45.1284	47.8653	49.3660	56.4899	61.7155	70.2616	(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	71.1693	62.2352	65.1050	55.6949	52.7576	46.2796	45.1284	47.8653	49.3660	56.4899	61.7155	70.2616	(64)
									Total per year (kWh/year) = Sum(64)m =			684.0683	(64)
12Total per year (kWh/year)												684	(64)
Electric shower(s)	40.7077	36.2709	39.6064	37.7959	38.5052	36.7302	37.9545	38.5052	37.7959	39.6064	38.8617	40.7077	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							463.0478	(64a)
Heat gains from water heating, kWh/month	27.9692	24.6265	26.1779	23.3727	22.8157	20.7524	20.7707	21.5926	21.7905	24.0241	25.1443	27.7423	(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	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.8499	77.3338	69.8499	72.1783	69.8499	72.1783	69.8499	69.8499	72.1783	69.8499	72.1783	69.8499	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.1031	139.5361	135.9248	128.2368	118.5320	109.4109	103.3174	101.8843	105.4956	113.1837	122.8885	132.0096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	(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)	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	(71)
Water heating gains (Table 5)	37.5931	36.6466	35.1853	32.4621	30.6663	28.8228	27.9176	29.0223	30.2646	32.2904	34.9226	37.2881	(72)
Total internal gains	292.3542	300.3247	287.7682	279.6852	265.8563	257.2201	247.8931	247.5647	254.7465	262.1321	276.7975	285.9557	(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	
North	6.1000	10.6334	0.6300	0.7000	0.7700	19.8232	(74)
East	1.3200	19.6403	0.6300	0.7000	0.7700	7.9231	(76)
East	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)
West	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	48.1966	94.6649	161.0920	249.5446	322.9492	339.1473	319.3036	262.0865	191.5355	113.3118	60.0612	39.7128	(83)
Total gains	340.5507	394.9897	448.8601	529.2298	588.8054	596.3673	567.1967	509.6512	446.2821	375.4439	336.8587	325.6685	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.9499	21.1387	21.3310	22.3344	22.5358	23.5233	23.5233	23.7158	23.1329	22.5358	22.1321	21.7261	
alpha	2.3967	2.4092	2.4221	2.4890	2.5024	2.5682	2.5682	2.5811	2.5422	2.5024	2.4755	2.4484	
util living area	0.9762	0.9650	0.9438	0.8894	0.7959	0.6510	0.5240	0.5808	0.7847	0.9220	0.9654	0.9786	(86)
MIT	17.7169	18.0375	18.5918	19.4431	20.1420	20.6679	20.8647	20.8217	20.4081	19.5034	18.5416	17.7539	(87)
Th 2	19.4189	19.4304	19.4420	19.4999	19.5110	19.5634	19.5634	19.5732	19.5431	19.5110	19.4886	19.4653	(88)
util rest of house	0.9707	0.9568	0.9300	0.8609	0.7395	0.5514	0.3805	0.4388	0.7036	0.8959	0.9560	0.9737	(89)
MIT 2	16.5332	16.8565	17.4086	18.2661	18.9166	19.3910	19.5204	19.5100	19.1914	18.3487	17.3940	16.5976	(90)
Living area fraction										fLA = Living area / (4) =		0.3087	(91)
MIT	16.8987	17.2211	17.7739	18.6295	19.2949	19.7852	19.9354	19.9150	19.5670	18.7052	17.7483	16.9546	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8987	17.2211	17.7739	18.6295	19.2949	19.7852	19.9354	19.9150	19.5670	18.7052	17.7483	16.9546	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9574	0.9401	0.9095	0.8398	0.7298	0.5686	0.4209	0.4765	0.7052	0.8768	0.9403	0.9616	(94)
Useful gains	326.0531	371.3428	408.2466	444.4441	429.6983	339.0915	238.7454	242.8319	314.7303	329.1740	316.7495	313.1764	(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	1097.1760	1063.4177	964.2667	794.7830	614.8685	402.1634	258.6929	270.4067	431.1775	656.1849	877.7930	1071.0712	(97)
Space heating kWh	573.7155	465.0743	413.6789	252.2440	137.7666	0.0000	0.0000	0.0000	0.0000	243.2961	403.9513	563.8737	(98a)
Space heating requirement - total per year (kWh/year)												3053.6005	
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	573.7155	465.0743	413.6789	252.2440	137.7666	0.0000	0.0000	0.0000	0.0000	243.2961	403.9513	563.8737	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3053.6005	
Space heating per m2											(98c) / (4) =	65.6971	(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	729.0596	573.9406	584.6693	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6763	0.7452	0.7015	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	493.0847	427.7026	410.1714	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	648.2957	616.8953	554.7089	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	111.7520	140.7593	107.5359	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	27.9380	35.1898	26.8840	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												90.0118	(107)
Energy for space heating												65.6971	(99)
Energy for space cooling												1.9366	(108)
Total												67.6337	(109)
Fabric Energy Efficiency (DFEE)												67.6	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800	(1b)	x 2.3500	(2b) =	109.2280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	109.2280	(5)

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2. Ventilation rate

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	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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1831	(8)
Pressure test		No	
Pressure Test Method		Blower Door	

Measured/design AP50	15.0000	(17)
Infiltration rate	0.9331	(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) =	0.8631	(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	1.1005	1.0789	1.0573	0.9494	0.9279	0.8200	0.8200	0.7984	0.8631	0.9279	0.9710	1.0142	(22b)
Effective ac	1.1005	1.0789	1.0573	0.9507	0.9305	0.8362	0.8362	0.8187	0.8725	0.9305	0.9714	1.0142	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			7.4200	1.5918	11.8109			(27)
Rooflight			1.9400	2.0221	3.9228			(27a)
External Wall Upgraded	26.6100	2.6700	23.9400	0.3000	7.1820	0.0000	0.0000	(29a)
External New Wall	31.9400	4.7500	27.1900	0.2100	5.7099	9.0000	244.7100	(29a)
External Roof 1	15.4300		15.4300	0.1600	2.4688	9.0000	138.8700	(30)
External Roof 2	5.1100	1.9400	3.1700	0.1600	0.5072	9.0000	28.5300	(30)
Total net area of external elements Aum(A, m2)			79.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6016			(33)
Main dwelling								
Party Wall 1			9.6600	0.0000	0.0000	180.0000	1738.8000	(32)
Party Wall 2			9.6600	0.0000	0.0000	20.0000	193.2000	(32)
Party Floor 1			46.4800			30.0000	1394.4000	(32d)
Party Ceiling 1			25.4700			30.0000	764.1000	(32b)
Internal Wall - Timber			79.1600			9.0000	712.4400	(32c)
Internal Wall - Solid			18.0400			75.0000	1353.0001	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	6568.0501	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	141.3092	(35)
Thermal bridges (Default value 0.200 * total exposed area)	15.8180	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	47.4196	(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	39.6670	38.8892	38.1114	34.2686	33.5385	30.1400	30.1400	29.5106	31.4491	33.5385	35.0155	36.5559	(38)
Heat transfer coeff	87.0866	86.3088	85.5310	81.6882	80.9581	77.5595	77.5595	76.9302	78.8686	80.9581	82.4350	83.9754	(39)
Average = Sum(39)m / 12 =												81.6549	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8736	1.8569	1.8402	1.7575	1.7418	1.6687	1.6687	1.6551	1.6968	1.7418	1.7736	1.8067	(40)
HLP (average)												1.7568	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.5872	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	92.9479	91.5511	89.5156	85.6212	82.7471	79.5421	77.7203	79.7403	81.9547	85.3960	89.3741	92.5918	(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	30.8846	29.7615	28.6384	27.5154	26.3923	25.2692	25.2692	26.3923	27.5154	28.6384	29.7615	30.8846	(42c)
Average daily hot water use (litres/day)												113.7717	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.8325	121.3126	118.1541	113.1365	109.1394	104.8113	102.9895	106.1326	109.4700	114.0344	119.1356	123.4764	(44)
Energy conte	196.1204	172.7475	181.5984	154.8782	146.9226	128.8777	124.5569	131.4144	134.9875	154.7436	169.7305	193.3341	(45)
Energy content (annual)										Total = Sum(45)m =		1889.9118	
Distribution loss (46)m = 0.15 x (45)m	29.4181	25.9121	27.2398	23.2317	22.0384	19.3317	18.6835	19.7122	20.2481	23.2115	25.4596	29.0001	(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	(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	17.7989	16.0803	17.7995	17.2015	17.7608	17.1709	17.7272	17.7334	17.1683	17.7579	17.2067	17.7952	(61)
Total heat required for water heating calculated for each month	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293	(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	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293	(64)
									Total per year (kWh/year) = Sum(64)m =			2099.1124	(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	69.6598	61.4586	64.8313	55.7974	53.2920	47.1446	45.8470	48.1286	49.1754	55.8917	60.7371	68.7324	(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	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8033	15.8128	12.8598	9.7357	7.2776	6.1440	6.6388	8.6294	11.5824	14.7065	17.1646	18.2982	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	206.1240	208.2629	202.8729	191.3982	176.9134	163.2998	154.2051	152.0661	157.4562	168.9309	183.4156	197.0292	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	(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)													
	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	(71)
Water heating gains (Table 5)													
	93.6287	91.4563	87.1389	77.4964	71.6290	65.4786	61.6222	64.6890	68.2992	75.1233	84.3570	92.3823	(72)
Total internal gains													
	395.4106	393.3865	380.7262	356.4848	333.6746	312.7770	300.3207	303.2391	315.1923	336.6152	362.7918	385.5642	(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	
North	6.1000	10.6334	0.6300	0.7000	0.7700	19.8232	(74)
East	1.3200	19.6403	0.6300	0.7000	0.7700	7.9231	(76)
East	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)
West	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)

Solar gains	48.1966	94.6649	161.0920	249.5446	322.9492	339.1473	319.3036	262.0865	191.5355	113.3118	60.0612	39.7128	(83)
Total gains	443.6072	488.0515	541.8181	606.0294	656.6237	651.9242	619.6244	565.3256	506.7278	449.9270	422.8531	425.2771	(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	20.9499	21.1387	21.3310	22.3344	22.5358	23.5233	23.5233	23.7158	23.1329	22.5358	22.1321	21.7261	
alpha	2.3967	2.4092	2.4221	2.4890	2.5024	2.5682	2.5682	2.5811	2.5422	2.5024	2.4755	2.4484	
util living area													
	0.9589	0.9463	0.9195	0.8601	0.7615	0.6164	0.4901	0.5400	0.7428	0.8908	0.9448	0.9623	(86)
MIT	17.9888	18.2746	18.8117	19.5952	20.2367	20.7095	20.8845	20.8503	20.4880	19.6684	18.7642	18.0231	(87)
Th 2	20.0632	20.0715	20.0799	20.1213	20.1291	20.1657	20.1657	20.1724	20.1516	20.1291	20.1132	20.0966	(88)
util rest of house													
	0.9539	0.9397	0.9092	0.8416	0.7281	0.5614	0.4133	0.4641	0.6959	0.8726	0.9371	0.9578	(89)
MIT 2	17.2842	17.5721	18.1072	18.8986	19.5124	19.9639	20.1029	20.0867	19.7713	18.9856	18.0866	17.3395	(90)
Living area fraction										fLA = Living area / (4) =		0.3087	(91)
MIT	17.5017	17.7890	18.3247	19.1137	19.7360	20.1941	20.3442	20.3224	19.9926	19.1964	18.2958	17.5505	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5017	17.7890	18.3247	19.1137	19.7360	20.1941	20.3442	20.3224	19.9926	19.1964	18.2958	17.5505	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9348	0.9179	0.8839	0.8163	0.7112	0.5634	0.4306	0.4787	0.6860	0.8484	0.9159	0.9401	(94)
Useful gains	414.6672	448.0024	478.9097	494.7108	466.9713	367.3047	266.7847	270.6363	347.6199	381.7315	387.3108	399.7835	(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													
	1149.6948	1112.4334	1011.3781	834.3344	650.5811	433.8773	290.3975	301.7539	464.7374	695.9473	922.9272	1121.1148	(97)
Space heating kWh													
	546.8606	446.4976	396.1566	244.5290	136.6057	0.0000	0.0000	0.0000	0.0000	233.7765	385.6438	536.6705	(98a)
Space heating requirement - total per year (kWh/year)												2926.7403	
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													
	546.8606	446.4976	396.1566	244.5290	136.6057	0.0000	0.0000	0.0000	0.0000	233.7765	385.6438	536.6705	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2926.7403	
Space heating per m2											(98c) / (4) =	62.9677	(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 %)	84.0000	(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													
	546.8606	446.4976	396.1566	244.5290	136.6057	0.0000	0.0000	0.0000	0.0000	233.7765	385.6438	536.6705	(98)
Space heating efficiency (main heating system 1)													
	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)													
	651.0245	531.5448	471.6149	291.1060	162.6258	0.0000	0.0000	0.0000	0.0000	278.3054	459.0998	638.8934	(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													
	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.9078	85.7380	85.3423	84.5305	83.1799	78.9000	78.9000	78.9000	78.9000	84.4121	85.4296	85.8956	(217)
Fuel for water heating, kWh/month													
	249.0104	220.2383	233.6448	203.5711	197.9846	185.1060	180.3347	189.0339	192.8464	204.3565	218.8201	245.7976	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	15.5832	12.5014	11.2561	8.2467	6.3700	5.2043	5.8109	7.5533	9.8109	12.8725	14.5394	16.0163	(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)
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	3484.2147	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2520.7443	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	125.7650	(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	6175.7241	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3484.2147	3.6400	126.8254	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2520.7443	3.6400	91.7551	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	125.7650	16.4900	20.7387	(250)
Additional standing charges			92.0000	(251)
Total energy cost			338.7397	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3330	(257)
SAP value		78.3915	
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 CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3484.2147	0.2100	731.6851	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2520.7443	0.2100	529.3563	(264)
Space and water heating			1261.0414	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	125.7650	0.1443	18.1518	(268)
Total CO2, kg/year			1285.4352	(272)
CO2 emissions per m2			27.6600	(273)
EI value			81.1709	
EI rating			81	(274)
EI band			B	

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		46.4800	(1b)	x 2.3500	(2b) =	109.2280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		109.2280	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1831	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9331	(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) =	0.8631	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.9279	0.8847	0.8847	0.8200	0.8415	0.7337	0.7337	0.7121	0.7337	0.8200	0.7984	0.8631	(22b)
Effective ac	0.9305	0.8913	0.8913	0.8362	0.8541	0.7691	0.7691	0.7535	0.7691	0.8362	0.8187	0.8725	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4200	1.5918	11.8109			(27)
Rooflight			1.9400	2.0221	3.9228			(27a)
External Wall Upgraded	26.6100	2.6700	23.9400	0.3000	7.1820	0.0000	0.0000	(29a)
External New Wall	31.9400	4.7500	27.1900	0.2100	5.7099	9.0000	244.7100	(29a)
External Roof 1	15.4300		15.4300	0.1600	2.4688	9.0000	138.8700	(30)
External Roof 2	5.1100	1.9400	3.1700	0.1600	0.5072	9.0000	28.5300	(30)
Total net area of external elements Aum(A, m2)			79.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6016			(33)
Main dwelling								
Party Wall 1			9.6600	0.0000	0.0000	180.0000	1738.8000	(32)
Party Wall 2			9.6600	0.0000	0.0000	20.0000	193.2000	(32)
Party Floor 1			46.4800			30.0000	1394.4000	(32d)
Party Ceiling 1			25.4700			30.0000	764.1000	(32b)
Internal Wall - Timber			79.1600			9.0000	712.4400	(32c)
Internal Wall - Solid			18.0400			75.0000	1353.0001	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6568.0501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		141.3092 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.8180 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	47.4196 (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	33.5385	32.1288	32.1288	30.1400	30.7861	27.7232	27.7232	27.1610	27.7232	30.1400	29.5106	31.4491	(38)
Heat transfer coeff	80.9581	79.5483	79.5483	77.5595	78.2057	75.1428	75.1428	74.5805	75.1428	77.5595	76.9302	78.8686	(39)
Average = Sum(39)m / 12 =												77.4323	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7418	1.7115	1.7115	1.6687	1.6826	1.6167	1.6167	1.6046	1.6167	1.6687	1.6551	1.6968	(40)
HLP (average)												1.6659	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.5872 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
92.9479	91.5511	89.5156	85.6212	82.7471	79.5421	77.7203	79.7403	81.9547	85.3960	89.3741	92.5918	(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

30.8846	29.7615	28.6384	27.5154	26.3923	25.2692	25.2692	26.3923	27.5154	28.6384	29.7615	30.8846	(42c)

Average daily hot water use (litres/day)		113.7717 (43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
123.8325	121.3126	118.1541	113.1365	109.1394	104.8113	102.9895	106.1326	109.4700	114.0344	119.1356	123.4764	(44)
196.1204	172.7475	181.5984	154.8782	146.9226	128.8777	124.5569	131.4144	134.9875	154.7436	169.7305	193.3341	(45)

Energy content (annual)	Total = Sum(45)m =	1889.9118

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

29.4181	25.9121	27.2398	23.2317	22.0384	19.3317	18.6835	19.7122	20.2481	23.2115	25.4596	29.0001	(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	(57)
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)
17.7989	16.0803	17.7995	17.2015	17.7608	17.1709	17.7272	17.7334	17.1683	17.7579	17.2067	17.7952	(61)

Total heat required for water heating calculated for each month

213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293	(62)
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)
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)
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)
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

	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293 (64)
										Total per year (kWh/year) = Sum(64)m =		2099.1124 (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												
	69.6598	61.4586	64.8313	55.7974	53.2920	47.1446	45.8470	48.1286	49.1754	55.8917	60.7371	68.7324 (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	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8033	15.8128	12.8598	9.7357	7.2776	6.1440	6.6388	8.6294	11.5824	14.7065	17.1646	18.2982	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.1240	208.2629	202.8729	191.3982	176.9134	163.2998	154.2051	152.0661	157.4562	168.9309	183.4156	197.0292	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	(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)													
	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	(71)
Water heating gains (Table 5)													
	93.6287	91.4563	87.1389	77.4964	71.6290	65.4786	61.6222	64.6890	68.2992	75.1233	84.3570	92.3823	(72)
Total internal gains													
	395.4106	393.3865	380.7262	356.4848	333.6746	312.7770	300.3207	303.2391	315.1923	336.6152	362.7918	385.5642	(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	
North	6.1000	12.7650	0.6300	0.7000	0.7700	23.7971	(74)
East	1.3200	23.8018	0.6300	0.7000	0.7700	9.6019	(76)
East	0.9700	32.4372	0.6300	0.7000	1.0000	12.4881	(82)
West	0.9700	32.4372	0.6300	0.7000	1.0000	12.4881	(82)

Solar gains	58.3751	100.5772	170.4889	268.2336	337.6309	374.5816	349.3917	294.5747	216.2089	129.4179	71.7483	48.3178	(83)
Total gains	453.7857	493.9637	551.2151	624.7185	671.3055	687.3586	649.7124	597.8138	531.4012	466.0331	434.5402	433.8820	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.5358	22.9352	22.9352	23.5233	23.3290	24.2799	24.2799	24.4629	24.2799	23.5233	23.7158	23.1329	
alpha	2.5024	2.5290	2.5290	2.5682	2.5553	2.6187	2.6187	2.6309	2.6187	2.5682	2.5811	2.5422	
util living area													
	0.9511	0.9366	0.9018	0.8233	0.6976	0.5043	0.3621	0.3974	0.6619	0.8592	0.9307	0.9549	(86)
MIT	18.4173	18.7063	19.2221	19.9354	20.4943	20.8627	20.9605	20.9501	20.6916	19.9666	19.1642	18.4380	(87)
Th 2	20.1291	20.1443	20.1443	20.1657	20.1587	20.1917	20.1917	20.1977	20.1917	20.1657	20.1724	20.1516	(88)
util rest of house													
	0.9451	0.9290	0.8894	0.8005	0.6562	0.4408	0.2802	0.3126	0.6051	0.8358	0.9211	0.9495	(89)
MIT 2	17.7511	18.0460	18.5525	19.2561	19.7695	20.1076	20.1755	20.1763	19.9783	19.2976	18.5199	17.7866	(90)
Living area fraction										fLA = Living area / (4) =		0.3087	(91)
MIT	17.9568	18.2499	18.7592	19.4658	19.9932	20.3407	20.4179	20.4152	20.1985	19.5042	18.7188	17.9877	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9568	18.2499	18.7592	19.4658	19.9932	20.3407	20.4179	20.4152	20.1985	19.5042	18.7188	17.9877	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9253	0.9070	0.8646	0.7785	0.6474	0.4530	0.3038	0.3364	0.6056	0.8136	0.8993	0.9308	(94)
Useful gains	419.8761	448.0205	476.5845	486.3337	434.5764	311.3859	197.3630	201.0747	321.8111	379.1861	390.7874	403.8497	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	1040.8617	998.3207	903.6089	741.9211	554.7322	341.2032	204.2293	209.9567	390.6318	620.7982	824.6000	1016.4352	(97)
Space heating kWh													
	462.0133	369.8017	317.7061	184.0229	89.3959	0.0000	0.0000	0.0000	0.0000	179.7594	312.3451	455.7637	(98a)
Space heating requirement - total per year (kWh/year)												2370.8080	
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													
	462.0133	369.8017	317.7061	184.0229	89.3959	0.0000	0.0000	0.0000	0.0000	179.7594	312.3451	455.7637	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2370.8080	
Space heating per m2											(98c) / (4) =	51.0071	(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 %)	84.0000	(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													
	462.0133	369.8017	317.7061	184.0229	89.3959	0.0000	0.0000	0.0000	0.0000	179.7594	312.3451	455.7637	(98)
Space heating efficiency (main heating system 1)													
	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)													

	550.0158	440.2401	378.2215	219.0749	106.4237	0.0000	0.0000	0.0000	0.0000	213.9993	371.8394	542.5758 (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												
	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293 (64)
Efficiency of water heater												78.9000 (216)
(217)m	85.5348	85.3087	84.8135	83.8153	82.1814	78.9000	78.9000	78.9000	78.9000	83.7500	84.9295	85.5336 (217)
Fuel for water heating, kWh/month												
	250.0964	221.3465	235.1016	205.3082	200.3903	185.1060	180.3347	189.0339	192.8464	205.9719	220.1088	246.8377 (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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219 (231)
Lighting	15.5832	12.5014	11.2561	8.2467	6.3700	5.2043	5.8109	7.5533	9.8109	12.8725	14.5394	16.0163 (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)
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	2822.3904 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	78.9000
Water heating fuel used	2532.4823 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	45.0000 (231)
Electricity for lighting (calculated in Appendix L)	125.7650 (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	5525.6378 (238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2822.3904	5.6000	158.0539	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2532.4823	5.6000	141.8190	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	125.7650	26.0600	32.7744	(250)
Additional standing charges			99.0000	(251)
Total energy cost			443.3742	(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	2822.3904	0.2100	592.7020	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2532.4823	0.2100	531.8213	(264)
Space and water heating			1124.5233	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	125.7650	0.1443	18.1518	(268)
Total CO2, kg/year			1148.9171	(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	2822.3904	1.1300	3189.3012	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2532.4823	1.1300	2861.7050	(278)
Space and water heating			6051.0063	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	125.7650	1.5338	192.9026	(282)
Total Primary energy kWh/year			6311.9849	(286)

SAP 10 EPC IMPROVEMENTS

Mid-floor flat

Current energy efficiency rating: C 78
Current environmental impact rating: B 81

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

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

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

Potential energy efficiency rating: C 78
Potential environmental impact rating: B 81

Fuel prices for cost data on this page from database revision number 561 TEST (31 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£45	£45	£0
Mains gas	£399	£399	£0
Space heating	£269	£269	£0
Water heating	£142	£142	£0
Lighting	£33	£33	£0
Total cost of fuels	£444	£444	£0
Total cost of uses	£444	£444	£0
Delivered energy	119 kWh/m²	119 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	25 kg/m²	25 kg/m²	0 kg/m²
Primary energy	136 kWh/m²	136 kWh/m²	0 kWh/m²

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800 (1b)	x	2.3500 (2b)	=	109.2280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	109.2280	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1831	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9331	(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) =	0.8631	(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	1.1005	1.0789	1.0573	0.9494	0.9279	0.8200	0.8200	0.7984	0.8631	0.9279	0.9710	1.0142	(22b)
Effective ac	1.1005	1.0789	1.0573	0.9507	0.9305	0.8362	0.8362	0.8187	0.8725	0.9305	0.9714	1.0142	(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							

Window			7.4200	1.5918	11.8109			(27)
Rooflight			1.9400	2.0221	3.9228			(27a)
External Wall Upgraded	26.6100	2.6700	23.9400	0.3000	7.1820	0.0000	0.0000	(29a)
External New Wall	31.9400	4.7500	27.1900	0.2100	5.7099	9.0000	244.7100	(29a)
External Roof 1	15.4300		15.4300	0.1600	2.4688	9.0000	138.8700	(30)
External Roof 2	5.1100	1.9400	3.1700	0.1600	0.5072	9.0000	28.5300	(30)
Total net area of external elements Aum(A, m2)			79.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6016			(33)
Main dwelling								
Party Wall 1			9.6600	0.0000	0.0000	180.0000	1738.8000	(32)
Party Wall 2			9.6600	0.0000	0.0000	20.0000	193.2000	(32)
Party Floor 1			46.4800			30.0000	1394.4000	(32d)
Party Ceiling 1			25.4700			30.0000	764.1000	(32b)
Internal Wall - Timber			79.1600			9.0000	712.4400	(32c)
Internal Wall - Solid			18.0400			75.0000	1353.0001	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6568.0501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		141.3092 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.8180 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	47.4196 (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	39.6670	38.8892	38.1114	34.2686	33.5385	30.1400	30.1400	29.5106	31.4491	33.5385	35.0155	36.5559	(38)
Heat transfer coeff	87.0866	86.3088	85.5310	81.6882	80.9581	77.5595	77.5595	76.9302	78.8686	80.9581	82.4350	83.9754	(39)
Average = Sum(39)m / 12 =												81.6549	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8736	1.8569	1.8402	1.7575	1.7418	1.6687	1.6687	1.6551	1.6968	1.7418	1.7736	1.8067	(40)
HLP (average)												1.7568	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.5872 (42)
Hot water usage for mixer showers	92.9479	91.5511	89.5156	85.6212	82.7471	79.5421	77.7203	79.7403	81.9547	85.3960	89.3741	92.5918 (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	30.8846	29.7615	28.6384	27.5154	26.3923	25.2692	25.2692	26.3923	27.5154	28.6384	29.7615	30.8846 (42c)
Average daily hot water use (litres/day)												113.7717 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.8325	121.3126	118.1541	113.1365	109.1394	104.8113	102.9895	106.1326	109.4700	114.0344	119.1356	123.4764	(44)
Energy conte	196.1204	172.7475	181.5984	154.8782	146.9226	128.8777	124.5569	131.4144	134.9875	154.7436	169.7305	193.3341	(45)
Energy content (annual)										Total = Sum(45)m =		1889.9118	
Distribution loss (46)m = 0.15 x (45)m	29.4181	25.9121	27.2398	23.2317	22.0384	19.3317	18.6835	19.7122	20.2481	23.2115	25.4596	29.0001	(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	(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	17.7989	16.0803	17.7995	17.2015	17.7608	17.1709	17.7272	17.7334	17.1683	17.7579	17.2067	17.7952	(61)
Total heat required for water heating calculated for each month	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293	(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	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293	(64)
									Total per year (kWh/year) = Sum(64)m =			2099.1124	(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	69.6598	61.4586	64.8313	55.7974	53.2920	47.1446	45.8470	48.1286	49.1754	55.8917	60.7371	68.7324	(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	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8033	15.8128	12.8598	9.7357	7.2776	6.1440	6.6388	8.6294	11.5824	14.7065	17.1646	18.2982	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.1240	208.2629	202.8729	191.3982	176.9134	163.2998	154.2051	152.0661	157.4562	168.9309	183.4156	197.0292	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	(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)	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	(71)
Water heating gains (Table 5)	93.6287	91.4563	87.1389	77.4964	71.6290	65.4786	61.6222	64.6890	68.2992	75.1233	84.3570	92.3823	(72)
Total internal gains	395.4106	393.3865	380.7262	356.4848	333.6746	312.7770	300.3207	303.2391	315.1923	336.6152	362.7918	385.5642	(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	
North	6.1000	10.6334	0.6300	0.7000	0.7700	19.8232	(74)
East	1.3200	19.6403	0.6300	0.7000	0.7700	7.9231	(76)

East				0.9700		26.5593		0.6300	0.7000		1.0000		10.2252 (82)
West				0.9700		26.5593		0.6300	0.7000		1.0000		10.2252 (82)
Solar gains	48.1966	94.6649	161.0920	249.5446	322.9492	339.1473	319.3036	262.0865	191.5355	113.3118	60.0612	39.7128 (83)	
Total gains	443.6072	488.0515	541.8181	606.0294	656.6237	651.9242	619.6244	565.3256	506.7278	449.9270	422.8531	425.2771 (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	20.9499	21.1387	21.3310	22.3344	22.5358	23.5233	23.5233	23.7158	23.1329	22.5358	22.1321	21.7261	
alpha	2.3967	2.4092	2.4221	2.4890	2.5024	2.5682	2.5682	2.5811	2.5422	2.5024	2.4755	2.4484	
util living area	0.9589	0.9463	0.9195	0.8601	0.7615	0.6164	0.4901	0.5400	0.7428	0.8908	0.9448	0.9623 (86)	
MIT	17.9888	18.2746	18.8117	19.5952	20.2367	20.7095	20.8845	20.8503	20.4880	19.6684	18.7642	18.0231 (87)	
Th 2	20.0632	20.0715	20.0799	20.1213	20.1291	20.1657	20.1657	20.1724	20.1516	20.1291	20.1132	20.0966 (88)	
util rest of house	0.9539	0.9397	0.9092	0.8416	0.7281	0.5614	0.4133	0.4641	0.6959	0.8726	0.9371	0.9578 (89)	
MIT 2	17.2842	17.5721	18.1072	18.8986	19.5124	19.9639	20.1029	20.0867	19.7713	18.9856	18.0866	17.3395 (90)	
Living area fraction										fLA = Living area / (4) =		0.3087 (91)	
MIT	17.5017	17.7890	18.3247	19.1137	19.7360	20.1941	20.3442	20.3224	19.9926	19.1964	18.2958	17.5505 (92)	
Temperature adjustment												0.0000	
adjusted MIT	17.5017	17.7890	18.3247	19.1137	19.7360	20.1941	20.3442	20.3224	19.9926	19.1964	18.2958	17.5505 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9348	0.9179	0.8839	0.8163	0.7112	0.5634	0.4306	0.4787	0.6860	0.8484	0.9159	0.9401 (94)	
Useful gains	414.6672	448.0024	478.9097	494.7108	466.9713	367.3047	266.7847	270.6363	347.6199	381.7315	387.3108	399.7835 (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	1149.6948	1112.4334	1011.3781	834.3344	650.5811	433.8773	290.3975	301.7539	464.7374	695.9473	922.9272	1121.1148 (97)	
Space heating kWh	546.8606	446.4976	396.1566	244.5290	136.6057	0.0000	0.0000	0.0000	0.0000	233.7765	385.6438	536.6705 (98a)	
Space heating requirement - total per year (kWh/year)												2926.7403	
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	546.8606	446.4976	396.1566	244.5290	136.6057	0.0000	0.0000	0.0000	0.0000	233.7765	385.6438	536.6705 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2926.7403	
Space heating per m2											(98c) / (4) =	62.9677 (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 %)												84.0000 (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	546.8606	446.4976	396.1566	244.5290	136.6057	0.0000	0.0000	0.0000	0.0000	233.7765	385.6438	536.6705 (98)	
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)	
Space heating fuel (main heating system)	651.0245	531.5448	471.6149	291.1060	162.6258	0.0000	0.0000	0.0000	0.0000	278.3054	459.0998	638.8934 (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	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293 (64)	
Efficiency of water heater												78.9000 (216)	
(217)m	85.9078	85.7380	85.3423	84.5305	83.1799	78.9000	78.9000	78.9000	78.9000	84.4121	85.4296	85.8956 (217)	
Fuel for water heating, kWh/month	249.0104	220.2383	233.6448	203.5711	197.9846	185.1060	180.3347	189.0339	192.8464	204.3565	218.8201	245.7976 (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)	
(221)m													
Pumps and Fa	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219 (231)	
Lighting	15.5832	12.5014	11.2561	8.2467	6.3700	5.2043	5.8109	7.5533	9.8109	12.8725	14.5394	16.0163 (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)	
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												3484.2147 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												78.9000	
Water heating fuel used												2520.7443 (219)	
Space cooling fuel												0.0000 (221)	

Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	125.7650	(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	6175.7241	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3484.2147	3.6400	126.8254	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2520.7443	3.6400	91.7551	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	125.7650	16.4900	20.7387	(250)
Additional standing charges			92.0000	(251)
Total energy cost			338.7397	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3330	(257)
SAP value		78.3915	
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 CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3484.2147	0.2100	731.6851	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2520.7443	0.2100	529.3563	(264)
Space and water heating			1261.0414	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	125.7650	0.1443	18.1518	(268)
Total CO2, kg/year			1285.4352	(272)
CO2 emissions per m2			27.6600	(273)
EI value			81.1709	
EI rating			81	(274)
EI band			B	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800	(1b)	x 2.3500	(2b) =	109.2280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		109.2280	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1831	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9331	(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) = 0.8631 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.9279	0.8847	0.8847	0.8200	0.8415	0.7337	0.7337	0.7121	0.7337	0.8200	0.7984	0.8631	(22b)
Effective ac	0.9305	0.8913	0.8913	0.8362	0.8541	0.7691	0.7691	0.7535	0.7691	0.8362	0.8187	0.8725	(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								
Window			7.4200	1.5918	11.8109			(27)
Rooflight			1.9400	2.0221	3.9228			(27a)
External Wall Upgraded	26.6100	2.6700	23.9400	0.3000	7.1820	0.0000	0.0000	(29a)
External New Wall	31.9400	4.7500	27.1900	0.2100	5.7099	9.0000	244.7100	(29a)
External Roof 1	15.4300		15.4300	0.1600	2.4688	9.0000	138.8700	(30)
External Roof 2	5.1100	1.9400	3.1700	0.1600	0.5072	9.0000	28.5300	(30)
Total net area of external elements Aum(A, m2)			79.0900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6016			(33)
Main dwelling								
Party Wall 1			9.6600	0.0000	0.0000	180.0000	1738.8000	(32)
Party Wall 2			9.6600	0.0000	0.0000	20.0000	193.2000	(32)
Party Floor 1			46.4800			30.0000	1394.4000	(32d)
Party Ceiling 1			25.4700			30.0000	764.1000	(32b)
Internal Wall - Timber			79.1600			9.0000	712.4400	(32c)
Internal Wall - Solid			18.0400			75.0000	1353.0001	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 6568.0501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 141.3092 (35)
Thermal bridges (Default value 0.200 * total exposed area) 15.8180 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.4196 (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	33.5385	32.1288	32.1288	30.1400	30.7861	27.7232	27.7232	27.1610	27.7232	30.1400	29.5106	31.4491	(38)
Heat transfer coeff	80.9581	79.5483	79.5483	77.5595	78.2057	75.1428	75.1428	74.5805	75.1428	77.5595	76.9302	78.8686	(39)
Average = Sum(39)m / 12 =												77.4323	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7418	1.7115	1.7115	1.6687	1.6826	1.6167	1.6167	1.6046	1.6167	1.6687	1.6551	1.6968	(40)
HLP (average)												1.6659	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.5872 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	92.9479	91.5511	89.5156	85.6212	82.7471	79.5421	77.7203	79.7403	81.9547	85.3960	89.3741	92.5918	(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	30.8846	29.7615	28.6384	27.5154	26.3923	25.2692	25.2692	26.3923	27.5154	28.6384	29.7615	30.8846	(42c)
Average daily hot water use (litres/day)												113.7717	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.8325	121.3126	118.1541	113.1365	109.1394	104.8113	102.9895	106.1326	109.4700	114.0344	119.1356	123.4764	(44)
Energy conte	196.1204	172.7475	181.5984	154.8782	146.9226	128.8777	124.5569	131.4144	134.9875	154.7436	169.7305	193.3341	(45)
Energy content (annual)										Total = Sum(45)m =		1889.9118	
Distribution loss (46)m = 0.15 x (45)m	29.4181	25.9121	27.2398	23.2317	22.0384	19.3317	18.6835	19.7122	20.2481	23.2115	25.4596	29.0001	(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	(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	17.7989	16.0803	17.7995	17.2015	17.7608	17.1709	17.7272	17.7334	17.1683	17.7579	17.2067	17.7952	(61)
Total heat required for water heating calculated for each month	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293	(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	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293	(64)
									Total per year (kWh/year) = Sum(64)m =			2099.1124	(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	69.6598	61.4586	64.8313	55.7974	53.2920	47.1446	45.8470	48.1286	49.1754	55.8917	60.7371	68.7324	(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	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8033	15.8128	12.8598	9.7357	7.2776	6.1440	6.6388	8.6294	11.5824	14.7065	17.1646	18.2982	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.1240	208.2629	202.8729	191.3982	176.9134	163.2998	154.2051	152.0661	157.4562	168.9309	183.4156	197.0292	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	(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)

-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	(71)

Water heating gains (Table 5)

93.6287	91.4563	87.1389	77.4964	71.6290	65.4786	61.6222	64.6890	68.2992	75.1233	84.3570	92.3823	(72)

Total internal gains

395.4106	393.3865	380.7262	356.4848	333.6746	312.7770	300.3207	303.2391	315.1923	336.6152	362.7918	385.5642	(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	
North	6.1000	12.7650	0.6300	0.7000	0.7700	23.7971	(74)
East	1.3200	23.8018	0.6300	0.7000	0.7700	9.6019	(76)
East	0.9700	32.4372	0.6300	0.7000	1.0000	12.4881	(82)
West	0.9700	32.4372	0.6300	0.7000	1.0000	12.4881	(82)

Solar gains	58.3751	100.5772	170.4889	268.2336	337.6309	374.5816	349.3917	294.5747	216.2089	129.4179	71.7483	48.3178	(83)
Total gains	453.7857	493.9637	551.2151	624.7185	671.3055	687.3586	649.7124	597.8138	531.4012	466.0331	434.5402	433.8820	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.5358	22.9352	22.9352	23.5233	23.3290	24.2799	24.2799	24.4629	24.2799	23.5233	23.7158	23.1329	
alpha	2.5024	2.5290	2.5290	2.5682	2.5553	2.6187	2.6187	2.6309	2.6187	2.5682	2.5811	2.5422	
util living area	0.9511	0.9366	0.9018	0.8233	0.6976	0.5043	0.3621	0.3974	0.6619	0.8592	0.9307	0.9549	(86)
MIT	18.4173	18.7063	19.2221	19.9354	20.4943	20.8627	20.9605	20.9501	20.6916	19.9666	19.1642	18.4380	(87)
Th 2	20.1291	20.1443	20.1443	20.1657	20.1587	20.1917	20.1917	20.1977	20.1917	20.1657	20.1724	20.1516	(88)
util rest of house	0.9451	0.9290	0.8894	0.8005	0.6562	0.4408	0.2802	0.3126	0.6051	0.8358	0.9211	0.9495	(89)
MIT 2	17.7511	18.0460	18.5525	19.2561	19.7695	20.1076	20.1755	20.1763	19.9783	19.2976	18.5199	17.7866	(90)
Living area fraction									fLA = Living area / (4) =			0.3087	(91)
MIT	17.9568	18.2499	18.7592	19.4658	19.9932	20.3407	20.4179	20.4152	20.1985	19.5042	18.7188	17.9877	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9568	18.2499	18.7592	19.4658	19.9932	20.3407	20.4179	20.4152	20.1985	19.5042	18.7188	17.9877	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9253	0.9070	0.8646	0.7785	0.6474	0.4530	0.3038	0.3364	0.6056	0.8136	0.8993	0.9308	(94)
Useful gains	419.8761	448.0205	476.5845	486.3337	434.5764	311.3859	197.3630	201.0747	321.8111	379.1861	390.7874	403.8497	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1040.8617	998.3207	903.6089	741.9211	554.7322	341.2032	204.2293	209.9567	390.6318	620.7982	824.6000	1016.4352	(97)
Space heating kWh	462.0133	369.8017	317.7061	184.0229	89.3959	0.0000	0.0000	0.0000	0.0000	179.7594	312.3451	455.7637	(98a)
Space heating requirement - total per year (kWh/year)												2370.8080	
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	462.0133	369.8017	317.7061	184.0229	89.3959	0.0000	0.0000	0.0000	0.0000	179.7594	312.3451	455.7637	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2370.8080	
Space heating per m2											(98c) / (4) =	51.0071	(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 %) 84.0000 (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	462.0133	369.8017	317.7061	184.0229	89.3959	0.0000	0.0000	0.0000	0.0000	179.7594	312.3451	455.7637	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	550.0158	440.2401	378.2215	219.0749	106.4237	0.0000	0.0000	0.0000	0.0000	213.9993	371.8394	542.5758	(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	213.9193	188.8278	199.3979	172.0797	164.6835	146.0486	142.2840	149.1478	152.1558	172.5015	186.9372	211.1293	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.5348	85.3087	84.8135	83.8153	82.1814	78.9000	78.9000	78.9000	78.9000	83.7500	84.9295	85.5336	(217)
Fuel for water heating, kWh/month	250.0964	221.3465	235.1016	205.3082	200.3903	185.1060	180.3347	189.0339	192.8464	205.9719	220.1088	246.8377	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	15.5832	12.5014	11.2561	8.2467	6.3700	5.2043	5.8109	7.5533	9.8109	12.8725	14.5394	16.0163	(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	(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	(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	(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	(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	(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	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	2822.3904	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2532.4823	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	125.7650	(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	5525.6378	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2822.3904	5.6000	158.0539	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2532.4823	5.6000	141.8190	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	125.7650	26.0600	32.7744	(250)
Additional standing charges			99.0000	(251)
Total energy cost			443.3742	(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	2822.3904	0.2100	592.7020	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2532.4823	0.2100	531.8213	(264)
Space and water heating			1124.5233	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	125.7650	0.1443	18.1518	(268)
Total CO2, kg/year			1148.9171	(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	2822.3904	1.1300	3189.3012	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2532.4823	1.1300	2861.7050	(278)
Space and water heating			6051.0063	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	125.7650	1.5338	192.9026	(282)
Total Primary energy kWh/year			6311.9849	(286)

Predicted Energy Assessment

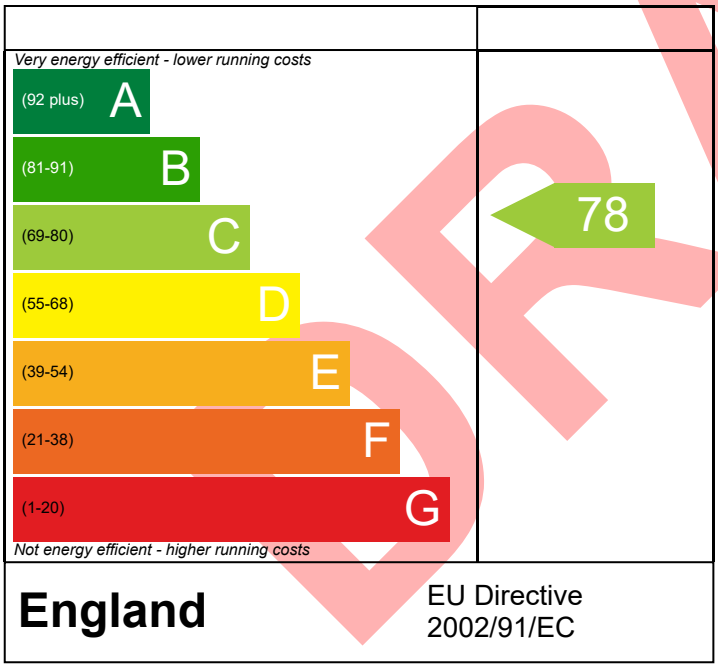
Flat 3, 99 London Road, Reading, RG1 5BY

Dwelling type:	Flat, Semi-Detached
Date of assessment:	17/02/2025
Produced by:	Sammit Pancholi
Total floor area:	46.48 m²
DRRN:	

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.

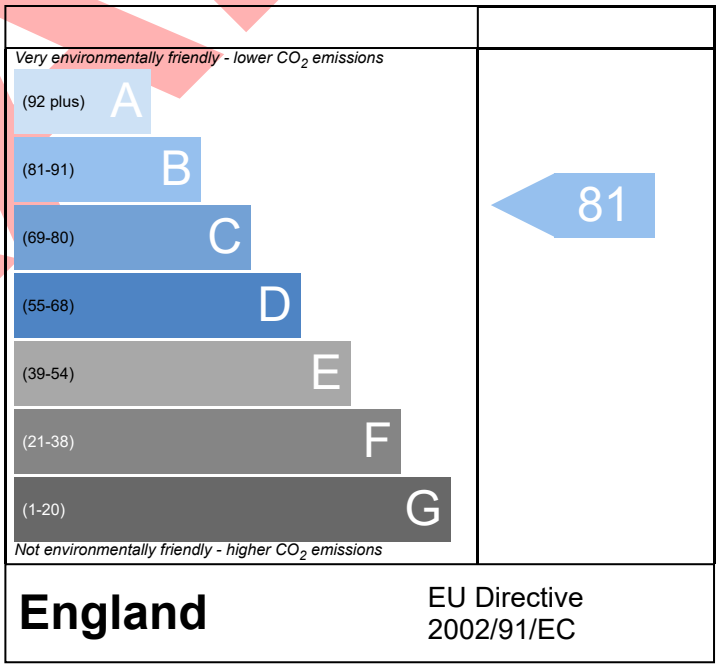
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

Property Reference	Flat 3 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Mid-floor flat	**Prop Type Ref**	Ground Floor, Flat
Property	Flat 3, 99 London Road, Reading, RG1 5BY		

SAP Rating	78 C	**DER**	28.21	**TER**	
Environmental	81 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	1.15	**DFEE**	67.63	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	154.57	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	5	
Terrain Type	Suburban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Mid-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
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	141.31	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	25.41 m	46.48 m²	2.35 m

8.0 Living Area	14.35	m²

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
External Wall Upgraded	Solid Wall	Other	0.30	0.00	26.61	23.94	0.00	None	2.67	Enter Gross Area
External New Wall	Solid Wall	Solid wall : plasterboard on dabs, insulation, any outside structure	0.21	9.00	31.94	27.19	0.00	None	4.75	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, dense blocks, cavity or cavity fill	0.00	180.00	9.66		None
Party Wall 2	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	20.00	9.66		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall - Timber	Plasterboard on timber frame	9.00	79.16
Internal Wall - Solid	Dense block, plasterboard on dabs	75.00	18.04

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
External Roof 1	External Plane Roof	Plasterboard, insulated at ceiling level	0.16	9.00	15.43	15.43	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

External Roof 2	External Slope Roof	Plasterboard, insulated slope	0.16	9.00	5.11	3.17	None	0.00	Enter Gross Area	1.94

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Timber I-joists, carpeted	20.00	25.47

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Timber I-joists, carpeted	20.00	46.48

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	SAP table	Solid Door				0.00			3.00
Window	SAP table	Window	Double Low-E Soft 0.05	≥ 16 mm	Argon Filled	0.63	PVC	0.70	1.70
Rooflight	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	2.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening 1	Window	External Wall Upgraded	East	1.32	
Opening 2	Window	External New Wall	North	4.75	
Opening 3	Window	External Wall Upgraded	North	1.35	
Opening 4	Rooflight	External Roof 2	East	0.97	32
Opening 5	Rooflight	External Roof 2	West	0.97	32

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.20	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	2
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	No	
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting	No				
	Name	**Efficacy**	**Power**	**Capacity**	**Count**
	LED	66.00	8.00	528.00	15

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18830	
Fuel Type	Mains gas	
In Winter	84.00	

Summary for Input Data

In Summer	78.90
Model Name	Energy7
Manufacturer	Vaillant Group UK
System Type	Combi boiler
Controls SAP Code	2104
Delayed Start Stat	No
Flue Type	Open
Fan Assisted Flue	Yes
Is MHS Pumped	No pump
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	No
Combi boiler type	Standard Combi
Combi keep hot type	None

25.0 Main Heating 2 None

26.0 Heat Networks None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	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	0

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.40		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder None

In Airing Cupboard	No

34.0 Small-scale Hydro None

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

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
			0	0
			0	0
			0	0

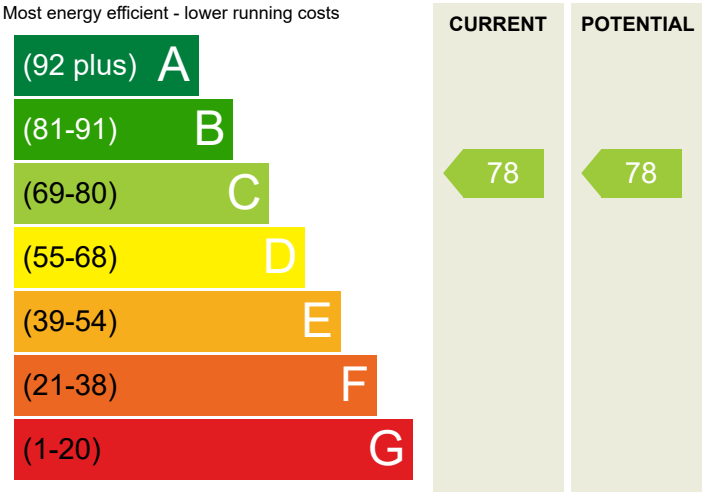
Energy Report

Dwelling Address	Flat 3, 99 London Road, Reading, RG1 5BY
Reference	Flat 3 - Baseline-Mid-floor flat
Assessment Date	17/02/2025
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	46

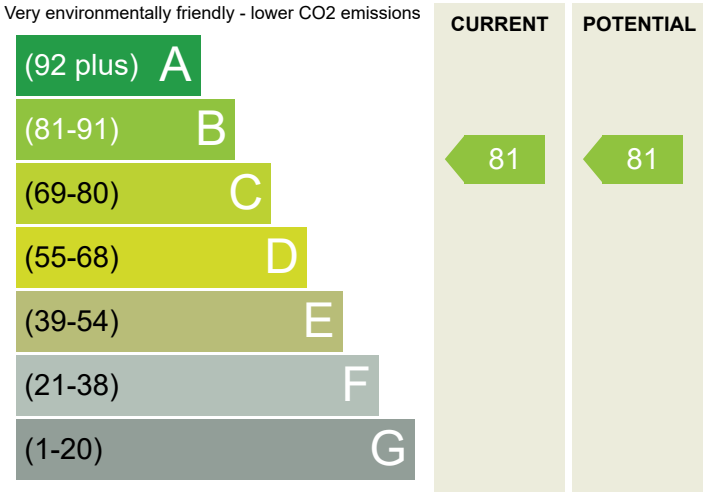
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

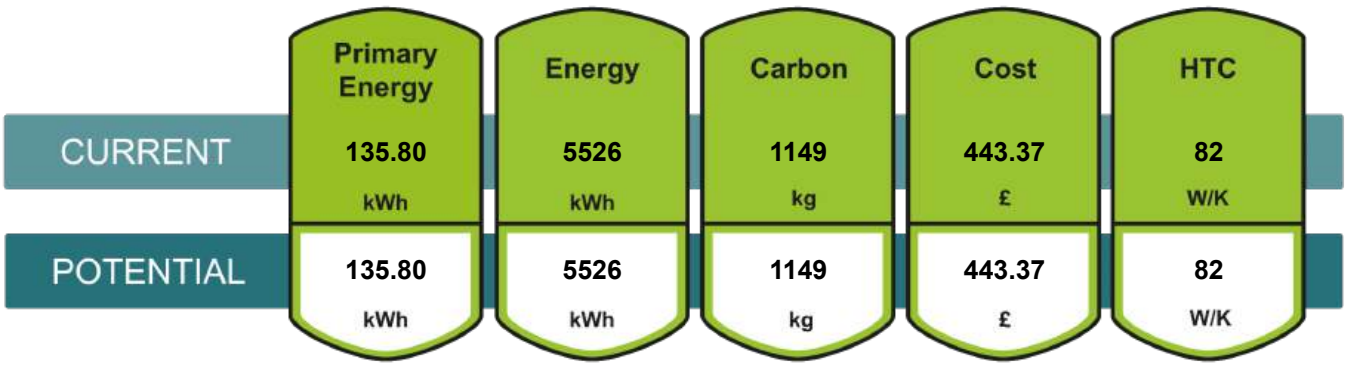
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.25 W/m²K	Very Good
Roof	Average thermal transmittance 0.16 W/m²K	Very Good
Windows	Fully double glazed	Average
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer and room thermostat	Average
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total

energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£33	£33	You could save £0
Heating	£269	£269	
Hot Water	£142	£142	
New Technologies e.g. Impact of PV	£0	£0	
TOTAL	£443	£443	

Estimated energy use and potential savings

Space Heating
2822
kWh per year

Water Heating
2532
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report

Property Reference	Flat 3 - Baseline	Issued on Date	17/02/2025
Assessment Reference	Mid-floor flat	Prop Type Ref	Semi-Detached Flat
Property	Flat 3, 99 London Road, Reading, RG1 5BY		

SAP Rating	78 C	DER	28.21	TER	
Environmental	81 B	% DER < TER			N/A
CO_2 Emissions (t/year)	1.15	DFEE	67.63	TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER	154.57	TPER	

Assessor Details	Mr. Sammit Pancholi	Assessor ID	DB55-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	Flat 3, 99 London Road	
House Number		
Postcode	RG1 5BY	
Street		
Town	Reading	
County		

Dwelling Orientation South (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Suburban

Property Type Flat, Semi-Detached

Comments

Electricity Tariff Standard

Smart electricity meter fitted: No

Smart gas meter fitted: No

Comments

Section 2: Dwelling Construction Details

External Walls

Description	External Wall Upgraded		
Type	Solid Wall		
Construction	Other		
U-value	0.30	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	26.61	m²	

Description	External New Wall		
Type	Solid Wall		
Construction	Solid wall : plasterboard on dabs, insulation, any outside structure		
U-value	0.21	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	31.94	m²	

Comments

Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	9.66
Party Wall 2	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	9.66

Comments

External Roofs

Description	External Roof 1		
Type	External Plane Roof		
Construction	Plasterboard, insulated at ceiling level		
U-value	0.16	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	15.43	m²	

Description	External Roof 2		
Type	External Slope Roof		
Construction	Plasterboard, insulated slope		
U-value	0.16	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	5.11	m²	

Comments

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
Door	SAP table	Solid Door		0.00	Wood	3.00
Window	SAP table	Window	Double Low-E Soft 0.05	0.63	PVC	1.70
Rooflight	Manufacturer	Roof Window	Double Low-E Soft 0.05	0.63		2.20

Comments

Openings

Name	Opening Type	Location	Orientation	Area (m²)
Opening 1	Window	External Wall Upgraded	East	1.32
Opening 2	Window	External New Wall	North	4.75
Opening 3	Window	External Wall Upgraded	North	1.35

Opening 4	Rooflight	External Roof 2	East	0.97
Opening 5	Rooflight	External Roof 2	West	0.97

Comments

Thermal Bridging Default

Y-value 0.200

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing No

Designed AP_{50} 8.00 $m^3/(h.m^2)$ @ 50 Pa

Property Tested? Yes

Test Method Blower Door

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

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	2
Number of passive vents	0
Number of flueless gas fires	0

Comments

Fixed Cooling System No

Comments

Lighting

No Fixed Lighting	No

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
LED	66.00	8.00	528.00	15

Comments

Main Heating 1

Database		
Fuel Type	Mains gas	
Winter Efficiency	84.00	%
Summer Efficiency	78.90	%
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Flue Type	Open	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Programmer and room thermostat
Boiler Interlock	No
Delayed Start Stat	No
PCDF Control Description	

Comments

Main Heating 2

None

Secondary Heating

None

Water Heating System

Water Heating	Main Heating 1
Supplementary Immersion	No
SAP Code	901
Water use <= 125 l/p/day	Yes
Cold Water Source	From mains
Number of baths	0

Comments

Hot Water Cylinder None

Comments

Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.40		No	

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit None

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed .....

Date .....

Full SAP Calculation Printout

Property Reference	Flat 3 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Mid-floor flat	**Prop Type Ref**	Ground Floor, Flat
Property	Flat 3, 99 London Road, Reading, RG1 5BY		

SAP Rating	84 B	**DER**	22.30	**TER**	
Environmental	85 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.89	**DFEE**	60.71	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	119.42	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800	(1b)	x 2.3500	(2b) =	109.2280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	109.2280	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1831	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9331	(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) =	0.8631	(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	1.1005	1.0789	1.0573	0.9494	0.9279	0.8200	0.8200	0.7984	0.8631	0.9279	0.9710	1.0142	(22b)
Effective ac	1.1005	1.0789	1.0573	0.9507	0.9305	0.8362	0.8362	0.8187	0.8725	0.9305	0.9714	1.0142	(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								
Window			7.4200	1.1450	8.4962			(27)
Rooflight			1.9400	1.2357	2.3973			(27a)
External Wall Upgraded	26.6100	2.6700	23.9400	0.2100	5.0274	0.0000	0.0000	(29a)
External New Wall	31.9400	4.7500	27.1900	0.2100	5.7099	9.0000	244.7100	(29a)
External Roof 1	15.4300		15.4300	0.1400	2.1602	9.0000	138.8700	(30)
External Roof 2	5.1100	1.9400	3.1700	0.1400	0.4438	9.0000	28.5300	(30)
Total net area of external elements Aum(A, m2)			79.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2348			(33)
Main dwelling								
Party Wall 1			9.6600	0.0000	0.0000	180.0000	1738.8000	(32)
Party Wall 2			9.6600	0.0000	0.0000	20.0000	193.2000	(32)
Party Floor 1			46.4800			30.0000	1394.4000	(32d)
Party Ceiling 1			25.4700			20.0000	509.4000	(32b)
Internal Wall - Timber			79.1600			9.0000	712.4400	(32c)
Internal Wall - Solid			18.0400			75.0000	1353.0001	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		6313.3501	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							135.8294	(35)
Thermal bridges (Default value 0.200 * total exposed area)							15.8180	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 40.0528 (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	39.6670	38.8892	38.1114	34.2686	33.5385	30.1400	30.1400	29.5106	31.4491	33.5385	35.0155	36.5559	(38)
Heat transfer coeff	79.7198	78.9421	78.1643	74.3214	73.5914	70.1928	70.1928	69.5634	71.5019	73.5914	75.0683	76.6087	(39)
Average = Sum(39)m / 12 =												74.2882	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7151	1.6984	1.6817	1.5990	1.5833	1.5102	1.5102	1.4966	1.5383	1.5833	1.6151	1.6482	(40)
HLP (average)												1.5983	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.5872 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
77.4566	76.2926	74.5964	71.3510	68.9560	66.2851	64.7669	66.4503	68.2956	71.1633	74.4784	77.1598	(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

30.8846	29.7615	28.6384	27.5154	26.3923	25.2692	25.2692	26.3923	27.5154	28.6384	29.7615	30.8846	(42c)

Average daily hot water use (litres/day) 99.4893 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.3412	106.0541	103.2348	98.8663	95.3482	91.5543	90.0361	92.8426	95.8109	99.8017	104.2399	108.0444	(44)
Energy conte	171.5859	151.0196	158.6680	135.3431	128.3570	112.5766	108.8909	114.9585	118.1445	135.4300	148.5089	169.1714	(45)
Energy content (annual)										Total = Sum(45)m =		1652.6544	
Distribution loss (46)m = 0.15 x (45)m	25.7379	22.6529	23.8002	20.3015	19.2536	16.8865	16.3336	17.2438	17.7217	20.3145	22.2763	25.3757	(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	(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	17.8274	16.1024	17.8187	17.2026	17.7315	17.1165	17.6633	17.6877	17.1448	17.7673	17.2257	17.8227	(61)
Total heat required for water heating calculated for each month	189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(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	189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(64)
									Total per year (kWh/year) = Sum(64)m =			1861.7649	(64)
12Total per year (kWh/year)												1862	(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	61.5092	54.2396	57.2118	49.3022	47.1116	41.7109	40.6221	42.6456	43.5692	49.4723	53.6856	60.7052	(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	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.8499	77.3338	69.8499	72.1783	69.8499	72.1783	69.8499	69.8499	72.1783	69.8499	72.1783	69.8499	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.1031	139.5361	135.9248	128.2368	118.5320	109.4109	103.3174	101.8843	105.4956	113.1837	122.8885	132.0096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	(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)	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	(71)
Water heating gains (Table 5)	82.6736	80.7137	76.8976	68.4753	63.3220	57.9317	54.5995	57.3194	60.5128	66.4950	74.5634	81.5930	(72)
Total internal gains	337.4347	344.3918	329.4804	315.6984	298.5121	286.3290	274.5750	275.8617	284.9948	296.3367	316.4382	330.2606	(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	
North	6.1000	10.6334	0.6300	0.7000	0.7700	19.8232	(74)
East	1.3200	19.6403	0.6300	0.7000	0.7700	7.9231	(76)
East	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)
West	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	48.1966	94.6649	161.0920	249.5446	322.9492	339.1473	319.3036	262.0865	191.5355	113.3118	60.0612	39.7128	(83)
Total gains	385.6313	439.0567	490.5724	565.2430	621.4612	625.4762	593.8786	537.9482	476.5303	409.6485	376.4994	369.9734	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	21.9984	22.2151	22.4362	23.5963	23.8304	24.9842	24.9842	25.2102	24.5267	23.8304	23.3615	22.8918	
alpha	2.4666	2.4810	2.4957	2.5731	2.5887	2.6656	2.6656	2.6807	2.6351	2.5887	2.5574	2.5261	
util living area	0.9661	0.9520	0.9259	0.8611	0.7552	0.5990	0.4720	0.5246	0.7374	0.8969	0.9516	0.9691	(86)

MIT	18.0196	18.3374	18.8712	19.6799	20.3090	20.7560	20.9066	20.8758	20.5386	19.7216	18.8164	18.0654	(87)
Th 2	19.5300	19.5420	19.5540	19.6141	19.6256	19.6799	19.6799	19.6900	19.6589	19.6256	19.6023	19.5782	(88)
util rest of house	0.9589	0.9418	0.9095	0.8299	0.6981	0.5073	0.3480	0.3996	0.6564	0.8668	0.9397	0.9626	(89)
MIT 2	16.9053	17.2248	17.7543	18.5670	19.1456	19.5513	19.6487	19.6444	19.3837	18.6325	17.7389	16.9803	(90)
Living area fraction									fLA = Living area / (4) =			0.3087	(91)
MIT	17.2493	17.5683	18.0992	18.9106	19.5048	19.9232	20.0370	20.0246	19.7403	18.9688	18.0715	17.3153	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.0993	17.4183	17.9492	18.7606	19.3548	19.7732	19.8870	19.8746	19.5903	18.8188	17.9215	17.1653	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9416	0.9211	0.8852	0.8061	0.6851	0.5144	0.3688	0.4187	0.6516	0.8437	0.9197	0.9466	(94)
Useful gains	363.0973	404.3985	434.2443	455.6352	425.7500	321.7389	219.0101	225.2499	310.4889	345.6213	346.2761	350.2072	(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	1020.3577	988.2194	894.9159	732.8553	563.3266	363.1238	230.7260	241.7027	392.5645	604.8299	812.3544	993.2566	(97)
Space heating kWh	489.0018	392.3276	342.7397	199.5984	102.3570	0.0000	0.0000	0.0000	0.0000	192.8512	335.5764	478.4288	(98a)
Space heating requirement - total per year (kWh/year)												2532.8809	
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	489.0018	392.3276	342.7397	199.5984	102.3570	0.0000	0.0000	0.0000	0.0000	192.8512	335.5764	478.4288	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2532.8809	
Space heating per m2											(98c) / (4) =	54.4940	(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 %)												89.0000	(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	489.0018	392.3276	342.7397	199.5984	102.3570	0.0000	0.0000	0.0000	0.0000	192.8512	335.5764	478.4288	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	549.4402	440.8176	385.1007	224.2679	115.0078	0.0000	0.0000	0.0000	0.0000	216.6867	377.0521	537.5604	(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	189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.9289	85.7220	85.2890	84.3240	82.7698	78.9000	78.9000	78.9000	78.9000	84.2268	85.3864	85.9096	(217)
Fuel for water heating, kWh/month	220.4303	194.9581	206.9279	180.9042	176.4998	164.3766	160.3983	168.1193	171.4693	181.8866	194.0995	217.6638	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	15.5832	12.5014	11.2561	8.2467	6.3700	5.2043	5.8109	7.5533	9.8109	12.8725	14.5394	16.0163	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.6003	-12.5980	-21.5680	-28.2862	-33.6405	-32.5520	-31.9478	-28.3639	-22.5598	-15.7794	-8.8884	-6.3097	(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	-1.9017	-4.7532	-11.6249	-20.9414	-30.8961	-32.3250	-31.4758	-24.6438	-15.5724	-7.4235	-2.6851	-1.4331	(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												2845.9336	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												78.9000	
Water heating fuel used												2237.7338	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												45.0000	(231)
Electricity for lighting (calculated in Appendix L)												125.7650	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-435.7700	(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												4818.6623	(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	2845.9336	0.2100	597.6460	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2237.7338	0.2100	469.9241	(264)
Space and water heating			1067.5701	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	125.7650	0.1443	18.1518	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-250.0941	0.1317	-32.9380	
PV Unit electricity exported	-185.6760	0.1216	-22.5874	
Total			-55.5255	(269)
Total CO2, kg/year			1036.4385	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			22.3000	(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	2845.9336	1.1300	3215.9049	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2237.7338	1.1300	2528.6391	(278)
Space and water heating			5744.5441	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	125.7650	1.5338	192.9026	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-250.0941	1.4866	-371.7866	
PV Unit electricity exported	-185.6760	0.4463	-82.8714	
Total			-454.6581	(283)
Total Primary energy kWh/year			5550.8646	(286)
Dwelling Primary energy Rate (DPER)			119.4200	(287)

SAP 10 WORKSHEET FOR Conversion (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						
Ground floor	46.4800	(1b) x	2.3500	(2b) =	109.2280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	109.2280	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1831	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9331	(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) =	0.8631	(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	1.1005	1.0789	1.0573	0.9494	0.9279	0.8200	0.8200	0.7984	0.8631	0.9279	0.9710	1.0142	(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	1.1005	1.0789	1.0573	0.9507	0.9305	0.8362	0.8362	0.8187	0.8725	0.9305	0.9714	1.0142	(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								
Window			7.4200	1.1450	8.4962			(27)
Rooflight			1.9400	1.2357	2.3973			(27a)
External Wall Upgraded	26.6100	2.6700	23.9400	0.2100	5.0274	0.0000	0.0000	(29a)

External New Wall	31.9400	4.7500	27.1900	0.2100	5.7099	9.0000	244.7100 (29a)
External Roof 1	15.4300		15.4300	0.1400	2.1602	9.0000	138.8700 (30)
External Roof 2	5.1100	1.9400	3.1700	0.1400	0.4438	9.0000	28.5300 (30)
Total net area of external elements Aum(A, m2)			79.0900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2348		(33)
Main dwelling							
Party Wall 1			9.6600	0.0000	0.0000	180.0000	1738.8000 (32)
Party Wall 2			9.6600	0.0000	0.0000	20.0000	193.2000 (32)
Party Floor 1			46.4800			30.0000	1394.4000 (32d)
Party Ceiling 1			25.4700			30.0000	764.1000 (32b)
Internal Wall - Timber			79.1600			9.0000	712.4400 (32c)
Internal Wall - Solid			18.0400			75.0000	1353.0001 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 6568.0501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	141.3092 (35)
Thermal bridges (Default value 0.200 * total exposed area)	15.8180 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 40.0528 (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	39.6670	38.8892	38.1114	34.2686	33.5385	30.1400	30.1400	29.5106	31.4491	33.5385	35.0155	36.5559	(38)
Heat transfer coeff	79.7198	78.9421	78.1643	74.3214	73.5914	70.1928	70.1928	69.5634	71.5019	73.5914	75.0683	76.6087	(39)
Average = Sum(39)m / 12 =												74.2882	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7151	1.6984	1.6817	1.5990	1.5833	1.5102	1.5102	1.4966	1.5383	1.5833	1.6151	1.6482	(40)
HLP (average)												1.5983	
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												1.5872	(42)
Hot water usage for mixer showers	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	21.9825	21.6560	21.1963	20.3486	19.7139	19.0101	18.6299	19.0864	19.5835	20.3366	21.2018	21.9082	(42b)
Hot water usage for other uses	30.8846	29.7615	28.6384	27.5154	26.3923	25.2692	25.2692	26.3923	27.5154	28.6384	29.7615	30.8846	(42c)
Average daily hot water use (litres/day)												48.4582	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	52.8671	51.4176	49.8347	47.8640	46.1062	44.2793	43.8991	45.4787	47.0989	48.9751	50.9633	52.7928	(44)
Energy conte	83.7286	73.2179	76.5941	65.5234	62.0678	54.4465	53.0922	56.3122	58.0776	66.4587	72.6065	82.6607	(45)
Energy content (annual)										Total = Sum(45)m =		804.7862	
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	(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	71.1693	62.2352	65.1050	55.6949	52.7576	46.2796	45.1284	47.8653	49.3660	56.4899	61.7155	70.2616	(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	71.1693	62.2352	65.1050	55.6949	52.7576	46.2796	45.1284	47.8653	49.3660	56.4899	61.7155	70.2616	(64)
									Total per year (kWh/year) = Sum(64)m =			684.0683	(64)
12Total per year (kWh/year)												684	(64)
Electric shower(s)	40.7077	36.2709	39.6064	37.7959	38.5052	36.7302	37.9545	38.5052	37.7959	39.6064	38.8617	40.7077	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												463.0478	(64a)
Heat gains from water heating, kWh/month	27.9692	24.6265	26.1779	23.3727	22.8157	20.7524	20.7707	21.5926	21.7905	24.0241	25.1443	27.7423	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	79.3603	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.8499	77.3338	69.8499	72.1783	69.8499	72.1783	69.8499	69.8499	72.1783	69.8499	72.1783	69.8499	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	138.1031	139.5361	135.9248	128.2368	118.5320	109.4109	103.3174	101.8843	105.4956	113.1837	122.8885	132.0096	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	30.9360	(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)	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	(71)
Water heating gains (Table 5)	37.5931	36.6466	35.1853	32.4621	30.6663	28.8228	27.9176	29.0223	30.2646	32.2904	34.9226	37.2881	(72)
Total internal gains	292.3542	300.3247	287.7682	279.6852	265.8563	257.2201	247.8931	247.5647	254.7465	262.1321	276.7975	285.9557	(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	
North	6.1000	10.6334	0.6300	0.7000	0.7700	19.8232	(74)
East	1.3200	19.6403	0.6300	0.7000	0.7700	7.9231	(76)
East	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)
West	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)

Solar gains	48.1966	94.6649	161.0920	249.5446	322.9492	339.1473	319.3036	262.0865	191.5355	113.3118	60.0612	39.7128	(83)
Total gains	340.5507	394.9897	448.8601	529.2298	588.8054	596.3673	567.1967	509.6512	446.2821	375.4439	336.8587	325.6685	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.8859	23.1114	23.3413	24.5482	24.7917	25.9921	25.9921	26.2273	25.5162	24.7917	24.3040	23.8153	
alpha	2.5257	2.5408	2.5561	2.6365	2.6528	2.7328	2.7328	2.7485	2.7011	2.6528	2.6203	2.5877	
util living area	0.9760	0.9640	0.9412	0.8810	0.7783	0.6220	0.4920	0.5491	0.7653	0.9168	0.9644	0.9785	(86)
MIT	17.9656	18.2850	18.8230	19.6469	20.2907	20.7499	20.9048	20.8713	20.5184	19.6789	18.7635	18.0105	(87)
Th 2	19.5300	19.5420	19.5540	19.6141	19.6256	19.6799	19.6799	19.6900	19.6589	19.6256	19.6023	19.5782	(88)
util rest of house	0.9707	0.9560	0.9274	0.8524	0.7228	0.5288	0.3638	0.4202	0.6863	0.8907	0.9552	0.9738	(89)
MIT 2	16.8460	17.1684	17.7042	18.5354	19.1310	19.5483	19.6484	19.6429	19.3696	18.5910	17.6827	16.9201	(90)
Living area fraction									fLA = Living area / (4) =			0.3087	(91)
MIT	17.1916	17.5131	18.0496	18.8786	19.4891	19.9192	20.0363	20.0222	19.7243	18.9269	18.0164	17.2568	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1916	17.5131	18.0496	18.8786	19.4891	19.9192	20.0363	20.0222	19.7243	18.9269	18.0164	17.2568	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9581	0.9401	0.9081	0.8336	0.7164	0.5472	0.4006	0.4556	0.6908	0.8732	0.9403	0.9624	(94)
Useful gains	326.2706	371.3491	407.5924	441.1403	421.8299	326.3577	227.2311	232.1789	308.2841	327.8483	316.7399	313.4097	(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	1027.7202	995.7060	902.7675	741.6225	573.2072	373.3720	241.2030	251.9698	402.1449	612.7892	819.4725	1000.2616	(97)
Space heating kWh	521.8785	419.5679	368.4103	216.3472	112.6247	0.0000	0.0000	0.0000	0.0000	211.9960	361.9675	511.0178	(98a)
Space heating requirement - total per year (kWh/year)												2723.8098	
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	521.8785	419.5679	368.4103	216.3472	112.6247	0.0000	0.0000	0.0000	0.0000	211.9960	361.9675	511.0178	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2723.8098	
Space heating per m2										(98c) / (4) =		58.6018	(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	659.8123	519.4267	528.6821	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7256	0.7915	0.7506	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	478.7777	411.1489	396.8223	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	648.2957	616.8953	554.7089	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	122.0530	153.0753	117.4677	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	30.5132	38.2688	29.3669	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												98.1490	(107)
Energy for space heating												58.6018	(99)
Energy for space cooling												2.1116	(108)
Total												60.7134	(109)
Fabric Energy Efficiency (DFEE)												60.7	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800	(1b)	x 2.3500	(2b) =	109.2280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		109.2280	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1831	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9331	(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) =	0.8631	(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	1.1005	1.0789	1.0573	0.9494	0.9279	0.8200	0.8200	0.7984	0.8631	0.9279	0.9710	1.0142	(22b)
Effective ac	1.1005	1.0789	1.0573	0.9507	0.9305	0.8362	0.8362	0.8187	0.8725	0.9305	0.9714	1.0142	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			7.4200	1.1450	8.4962			(27)
Rooflight			1.9400	1.2357	2.3973			(27a)
External Wall Upgraded	26.6100	2.6700	23.9400	0.2100	5.0274	0.0000	0.0000	(29a)
External New Wall	31.9400	4.7500	27.1900	0.2100	5.7099	9.0000	244.7100	(29a)
External Roof 1	15.4300		15.4300	0.1400	2.1602	9.0000	138.8700	(30)
External Roof 2	5.1100	1.9400	3.1700	0.1400	0.4438	9.0000	28.5300	(30)
Total net area of external elements Aum(A, m2)			79.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2348			(33)
Main dwelling								
Party Wall 1			9.6600	0.0000	0.0000	180.0000	1738.8000	(32)
Party Wall 2			9.6600	0.0000	0.0000	20.0000	193.2000	(32)
Party Floor 1			46.4800			30.0000	1394.4000	(32d)
Party Ceiling 1			25.4700			30.0000	764.1000	(32b)
Internal Wall - Timber			79.1600			9.0000	712.4400	(32c)
Internal Wall - Solid			18.0400			75.0000	1353.0001	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6568.0501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		141.3092 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.8180 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	40.0528 (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	39.6670	38.8892	38.1114	34.2686	33.5385	30.1400	30.1400	29.5106	31.4491	33.5385	35.0155	36.5559	(38)
Heat transfer coeff	79.7198	78.9421	78.1643	74.3214	73.5914	70.1928	70.1928	69.5634	71.5019	73.5914	75.0683	76.6087	(39)
Average = Sum(39)m / 12 =												74.2882	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7151	1.6984	1.6817	1.5990	1.5833	1.5102	1.5102	1.4966	1.5383	1.5833	1.6151	1.6482	(40)
HLP (average)												1.5983	
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		1.5872 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
77.4566	76.2926	74.5964	71.3510	68.9560	66.2851	64.7669	66.4503	68.2956	71.1633	74.4784	77.1598	(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

30.8846	29.7615	28.6384	27.5154	26.3923	25.2692	25.2692	26.3923	27.5154	28.6384	29.7615	30.8846	(42c)

Average daily hot water use (litres/day)		99.4893 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.3412	106.0541	103.2348	98.8663	95.3482	91.5543	90.0361	92.8426	95.8109	99.8017	104.2399	108.0444	(44)
Energy conte	171.5859	151.0196	158.6680	135.3431	128.3570	112.5766	108.8909	114.9585	118.1445	135.4300	148.5089	169.1714	(45)
Energy content (annual)										Total = Sum(45)m =		1652.6544	
Distribution loss (46)m = 0.15 x (45)m	25.7379	22.6529	23.8002	20.3015	19.2536	16.8865	16.3336	17.2438	17.7217	20.3145	22.2763	25.3757	(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	(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	17.8274	16.1024	17.8187	17.2026	17.7315	17.1165	17.6633	17.6877	17.1448	17.7673	17.2257	17.8227	(61)
Total heat required for water heating calculated for each month	189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(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	189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(64)
										Total per year (kWh/year) = Sum(64)m =		1861.7649	(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	61.5092	54.2396	57.2118	49.3022	47.1116	41.7109	40.6221	42.6456	43.5692	49.4723	53.6856	60.7052	(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	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8033	15.8128	12.8598	9.7357	7.2776	6.1440	6.6388	8.6294	11.5824	14.7065	17.1646	18.2982	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.1240	208.2629	202.8729	191.3982	176.9134	163.2998	154.2051	152.0661	157.4562	168.9309	183.4156	197.0292	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	(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)													
	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	(71)
Water heating gains (Table 5)													
	82.6736	80.7137	76.8976	68.4753	63.3220	57.9317	54.5995	57.3194	60.5128	66.4950	74.5634	81.5930	(72)
Total internal gains													
	384.4555	382.6439	370.4848	347.4637	325.3676	305.2301	293.2980	295.8695	307.4059	327.9869	352.9982	374.7749	(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	
North	6.1000	10.6334	0.6300	0.7000	0.7700	19.8232	(74)
East	1.3200	19.6403	0.6300	0.7000	0.7700	7.9231	(76)
East	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)
West	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)

Solar gains	48.1966	94.6649	161.0920	249.5446	322.9492	339.1473	319.3036	262.0865	191.5355	113.3118	60.0612	39.7128	(83)
Total gains	432.6521	477.3089	531.5768	597.0083	648.3167	644.3774	612.6016	557.9560	498.9415	441.2987	413.0594	414.4878	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.8859	23.1114	23.3413	24.5482	24.7917	25.9921	25.9921	26.2273	25.5162	24.7917	24.3040	23.8153	
alpha	2.5257	2.5408	2.5561	2.6365	2.6528	2.7328	2.7328	2.7485	2.7011	2.6528	2.6203	2.5877	
util living area													
	0.9598	0.9465	0.9178	0.8526	0.7456	0.5907	0.4625	0.5129	0.7257	0.8866	0.9448	0.9632	(86)
MIT	18.2173	18.5015	19.0233	19.7806	20.3694	20.7808	20.9184	20.8916	20.5835	19.8264	18.9670	18.2592	(87)
Th 2	19.5300	19.5420	19.5540	19.6141	19.6256	19.6799	19.6799	19.6900	19.6589	19.6256	19.6023	19.5782	(88)
util rest of house													
	0.9512	0.9351	0.8997	0.8196	0.6868	0.4983	0.3394	0.3885	0.6425	0.8537	0.9313	0.9555	(89)
MIT 2	17.0920	17.3780	17.8939	18.6549	19.1928	19.5664	19.6534	19.6513	19.4150	18.7239	17.8785	17.1638	(90)
Living area fraction										fLA = Living area / (4) =		0.3087	(91)
MIT	17.4394	17.7249	18.2426	19.0024	19.5561	19.9414	20.0439	20.0342	19.7758	19.0643	18.2146	17.5020	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.2894	17.5749	18.0926	18.8524	19.4061	19.7914	19.8939	19.8842	19.6258	18.9143	18.0646	17.3520	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9327	0.9140	0.8756	0.7975	0.6760	0.5068	0.3606	0.4084	0.6402	0.8319	0.9109	0.9383	(94)
Useful gains	403.5178	436.2559	465.4370	476.0856	438.2914	326.5449	220.8988	227.8783	319.4037	367.1135	376.2354	388.9345	(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													
	1035.5132	1000.5787	906.1244	739.6767	567.0989	364.3961	231.2109	242.3740	395.1024	611.8581	823.0918	1007.5582	(97)
Space heating kWh													
	470.2046	379.2250	327.8714	189.7856	95.8328	0.0000	0.0000	0.0000	0.0000	182.0900	321.7366	460.2560	(98a)
Space heating requirement - total per year (kWh/year)												2427.0019	
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													
	470.2046	379.2250	327.8714	189.7856	95.8328	0.0000	0.0000	0.0000	0.0000	182.0900	321.7366	460.2560	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2427.0019	
Space heating per m2											(98c) / (4) =	52.2160	(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 %)	89.0000	(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													
	470.2046	379.2250	327.8714	189.7856	95.8328	0.0000	0.0000	0.0000	0.0000	182.0900	321.7366	460.2560	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	528.3198	426.0955	368.3949	213.2423	107.6773	0.0000	0.0000	0.0000	0.0000	204.5955	361.5018	517.1416	(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

	189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941 (64)
Efficiency of water heater												78.9000 (216)
(217)m	85.8445	85.6463	85.1843	84.1972	82.6138	78.9000	78.9000	78.9000	78.9000	84.0821	85.2881	85.8259 (217)
Fuel for water heating, kWh/month												
	220.6471	195.1303	207.1822	181.1766	176.8330	164.3766	160.3983	168.1193	171.4693	182.1997	194.3232	217.8761 (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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219 (231)
Lighting	15.5832	12.5014	11.2561	8.2467	6.3700	5.2043	5.8109	7.5533	9.8109	12.8725	14.5394	16.0163 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-7.6003	-12.5980	-21.5680	-28.2862	-33.6405	-32.5520	-31.9478	-28.3639	-22.5598	-15.7794	-8.8884	-6.3097 (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	-1.9017	-4.7532	-11.6249	-20.9414	-30.8961	-32.3250	-31.4758	-24.6438	-15.5724	-7.4235	-2.6851	-1.4331 (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	2726.9685 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	78.9000
Water heating fuel used	2239.7318 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	45.0000 (231)
Electricity for lighting (calculated in Appendix L)	125.7650 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-435.7700 (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	4701.6953 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2726.9685	3.6400	99.2617	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2239.7318	3.6400	81.5262	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	125.7650	16.4900	20.7387	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-250.0941	16.4900	-41.2405	
PV Unit electricity exported	-185.6760	5.5900	-10.3793	
Total			-51.6198	(252)
Total energy cost			249.3272	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9812 (257)
SAP value		84.0952
SAP rating (Section 12)		84 (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	2726.9685	0.2100	572.6634	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2239.7318	0.2100	470.3437	(264)
Space and water heating			1043.0071	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	125.7650	0.1443	18.1518	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-250.0941	0.1317	-32.9380	
PV Unit electricity exported	-185.6760	0.1216	-22.5874	
Total			-55.5255	(269)
Total CO2, kg/year			1011.8754	(272)
CO2 emissions per m2			21.7700	(273)
EI value			85.1780	
EI rating			85	(274)
EI band			B	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800	(1b)	x 2.3500	(2b) =	109.2280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	109.2280	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1831 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9331 (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) =	0.8631 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.9279	0.8847	0.8847	0.8200	0.8415	0.7337	0.7337	0.7121	0.7337	0.8200	0.7984	0.8631	(22b)
Effective ac	0.9305	0.8913	0.8913	0.8362	0.8541	0.7691	0.7691	0.7535	0.7691	0.8362	0.8187	0.8725	(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								
Window			7.4200	1.1450	8.4962			(27)
Rooflight			1.9400	1.2357	2.3973			(27a)
External Wall Upgraded	26.6100	2.6700	23.9400	0.2100	5.0274	0.0000	0.0000	(29a)
External New Wall	31.9400	4.7500	27.1900	0.2100	5.7099	9.0000	244.7100	(29a)
External Roof 1	15.4300		15.4300	0.1400	2.1602	9.0000	138.8700	(30)
External Roof 2	5.1100	1.9400	3.1700	0.1400	0.4438	9.0000	28.5300	(30)
Total net area of external elements Aum(A, m2)			79.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2348			(33)
Main dwelling								
Party Wall 1			9.6600	0.0000	0.0000	180.0000	1738.8000	(32)
Party Wall 2			9.6600	0.0000	0.0000	20.0000	193.2000	(32)
Party Floor 1			46.4800			30.0000	1394.4000	(32d)
Party Ceiling 1			25.4700			30.0000	764.1000	(32b)
Internal Wall - Timber			79.1600			9.0000	712.4400	(32c)
Internal Wall - Solid			18.0400			75.0000	1353.0001	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6568.0501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		141.3092 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.8180 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	40.0528 (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	33.5385	32.1288	32.1288	30.1400	30.7861	27.7232	27.7232	27.1610	27.7232	30.1400	29.5106	31.4491	(38)
Heat transfer coeff	73.5914	72.1816	72.1816	70.1928	70.8389	67.7760	67.7760	67.2138	67.7760	70.1928	69.5634	71.5019	(39)
Average = Sum(39)m / 12 =												70.0655	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5833	1.5530	1.5530	1.5102	1.5241	1.4582	1.4582	1.4461	1.4582	1.5102	1.4966	1.5383	(40)
HLP (average)												1.5074	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.5872 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
77.4566	76.2926	74.5964	71.3510	68.9560	66.2851	64.7669	66.4503	68.2956	71.1633	74.4784	77.1598	(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

30.8846	29.7615	28.6384	27.5154	26.3923	25.2692	25.2692	26.3923	27.5154	28.6384	29.7615	30.8846	(42c)

Average daily hot water use (litres/day)		99.4893 (43)

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

Daily hot water use

	108.3412	106.0541	103.2348	98.8663	95.3482	91.5543	90.0361	92.8426	95.8109	99.8017	104.2399	108.0444	(44)
Energy conte	171.5859	151.0196	158.6680	135.3431	128.3570	112.5766	108.8909	114.9585	118.1445	135.4300	148.5089	169.1714	(45)
Energy content (annual)										Total = Sum(45)m =		1652.6544	
Distribution loss (46)m = 0.15 x (45)m													
	25.7379	22.6529	23.8002	20.3015	19.2536	16.8865	16.3336	17.2438	17.7217	20.3145	22.2763	25.3757	(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	(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	17.8274	16.1024	17.8187	17.2026	17.7315	17.1165	17.6633	17.6877	17.1448	17.7673	17.2257	17.8227	(61)
Total heat required for water heating calculated for each month													
	189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(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													
	189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(64)
										Total per year (kWh/year) = Sum(64)m =		1861.7649	(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													
	61.5092	54.2396	57.2118	49.3022	47.1116	41.7109	40.6221	42.6456	43.5692	49.4723	53.6856	60.7052	(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	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8033	15.8128	12.8598	9.7357	7.2776	6.1440	6.6388	8.6294	11.5824	14.7065	17.1646	18.2982	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	206.1240	208.2629	202.8729	191.3982	176.9134	163.2998	154.2051	152.0661	157.4562	168.9309	183.4156	197.0292	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	(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)													
	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	(71)
Water heating gains (Table 5)													
	82.6736	80.7137	76.8976	68.4753	63.3220	57.9317	54.5995	57.3194	60.5128	66.4950	74.5634	81.5930	(72)
Total internal gains													
	384.4555	382.6439	370.4848	347.4637	325.3676	305.2301	293.2980	295.8695	307.4059	327.9869	352.9982	374.7749	(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	
North	6.1000	12.7650	0.6300	0.7000	0.7700	23.7971	(74)
East	1.3200	23.8018	0.6300	0.7000	0.7700	9.6019	(76)
East	0.9700	32.4372	0.6300	0.7000	1.0000	12.4881	(82)
West	0.9700	32.4372	0.6300	0.7000	1.0000	12.4881	(82)

Solar gains	58.3751	100.5772	170.4889	268.2336	337.6309	374.5816	349.3917	294.5747	216.2089	129.4179	71.7483	48.3178	(83)
Total gains	442.8306	483.2211	540.9737	615.6974	662.9985	679.8117	642.6897	590.4442	523.6148	457.4048	424.7465	423.0928	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	24.7917	25.2760	25.2760	25.9921	25.7550	26.9189	26.9189	27.1441	26.9189	25.9921	26.2273	25.5162	
alpha	2.6528	2.6851	2.6851	2.7328	2.7170	2.7946	2.7946	2.8096	2.7946	2.7328	2.7485	2.7011	
util living area													
	0.9514	0.9358	0.8980	0.8115	0.6762	0.4750	0.3359	0.3701	0.6379	0.8516	0.9294	0.9554	(86)
MIT	18.6511	18.9387	19.4327	20.1070	20.6006	20.9045	20.9748	20.9675	20.7648	20.1140	19.3665	18.6758	(87)
Th 2	19.6256	19.6480	19.6480	19.6799	19.6695	19.7190	19.7190	19.7282	19.7190	19.6799	19.6900	19.6589	(88)
util rest of house													
	0.9411	0.9224	0.8759	0.7706	0.6047	0.3730	0.2107	0.2388	0.5400	0.8090	0.9122	0.9459	(89)
MIT 2	17.5797	17.8746	18.3514	19.0025	19.4192	19.6800	19.7144	19.7216	19.5989	19.0277	18.3252	17.6262	(90)
Living area fraction										fLA = Living area / (4) =		0.3087	(91)
MIT	17.9105	18.2032	18.6852	19.3435	19.7840	20.0580	20.1035	20.1063	19.9588	19.3631	18.6466	17.9502	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.7605	18.0532	18.5352	19.1935	19.6340	19.9080	19.9535	19.9563	19.8088	19.2131	18.4966	17.8002	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9219	0.9013	0.8529	0.7529	0.6026	0.3889	0.2344	0.2633	0.5476	0.7905	0.8914	0.9279	(94)
Useful gains	408.2456	435.5031	461.3841	463.5561	399.5233	264.3856	150.6264	155.4807	286.7273	361.5563	378.6167	392.5703	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	931.7019	891.6700	803.7593	652.3367	477.0266	278.4272	152.7348	158.3732	325.9245	541.4050	730.1829	908.0911	(97)
Space heating kWh													
	389.4515	306.5442	254.7271	135.9221	57.6625	0.0000	0.0000	0.0000	0.0000	133.8074	253.1277	383.5475	(98a)
Space heating requirement - total per year (kWh/year)												1914.7900	
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													
	389.4515	306.5442	254.7271	135.9221	57.6625	0.0000	0.0000	0.0000	0.0000	133.8074	253.1277	383.5475	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1914.7900
Space heating per m2 (98c) / (4) = 41.1960 (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 %) 89.0000 (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	389.4515	306.5442	254.7271	135.9221	57.6625	0.0000	0.0000	0.0000	0.0000	133.8074	253.1277	383.5475	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	437.5859	344.4316	286.2102	152.7214	64.7893	0.0000	0.0000	0.0000	0.0000	150.3454	284.4131	430.9523	(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	189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.4219	85.1540	84.5693	83.3573	81.5181	78.9000	78.9000	78.9000	78.9000	83.3077	84.7094	85.4163	(217)
Fuel for water heating, kWh/month	221.7384	196.2585	208.6889	183.0022	179.2101	164.3766	160.3983	168.1193	171.4693	183.8934	195.6508	218.9208	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	15.5832	12.5014	11.2561	8.2467	6.3700	5.2043	5.8109	7.5533	9.8109	12.8725	14.5394	16.0163	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.0651	-13.3051	-22.5361	-29.6973	-34.5325	-34.5733	-33.7382	-30.5847	-24.5927	-17.5812	-10.4223	-7.5780	(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	-2.5443	-5.2207	-12.5879	-23.0146	-32.5997	-36.7181	-35.3088	-28.7244	-18.3695	-8.9976	-3.5092	-1.9347	(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 2151.4494 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 78.9000
Water heating fuel used 2251.7266 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 45.0000 (231)
Electricity for lighting (calculated in Appendix L) 125.7650 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -477.7360 (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 4096.2051 (238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2151.4494	5.6000	120.4812	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2251.7266	5.6000	126.0967	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	125.7650	26.0600	32.7744	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-268.2065	26.0600	-69.8946	
PV Unit electricity exported	-209.5295	5.8100	-12.1737	
Total			-82.0683	(252)
Total energy cost			308.0110	(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	2151.4494	0.2100	451.8044	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2251.7266	0.2100	472.8626	(264)
Space and water heating			924.6670	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)

Energy for lighting	125.7650	0.1443	18.1518	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-268.2065	0.1319	-35.3790	
PV Unit electricity exported	-209.5295	0.1216	-25.4685	
Total			-60.8475	(269)
Total CO2, kg/year			888.2133	(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	2151.4494	1.1300	2431.1378	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2251.7266	1.1300	2544.4511	(278)
Space and water heating			4975.5889	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	125.7650	1.5338	192.9026	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-268.2065	1.4874	-398.9177	
PV Unit electricity exported	-209.5295	0.4459	-93.4266	
Total			-492.3443	(283)
Total Primary energy kWh/year			4744.2233	(286)

SAP 10 EPC IMPROVEMENTS

Mid-floor flat

Current energy efficiency rating: B 84
Current environmental impact rating: B 85

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

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

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

Potential energy efficiency rating: B 84
Potential environmental impact rating: B 85

Fuel prices for cost data on this page from database revision number 561 TEST (31 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£45	£45	£0
Mains gas	£346	£346	£0
Space heating	£231	£231	£0
Water heating	£126	£126	£0
Lighting	£33	£33	£0
Generated (PV)	-£82	-£82	£0
Total cost of fuels	£309	£309	£0
Total cost of uses	£308	£308	£0
Delivered energy	88 kWh/m²	88 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	19 kg/m²	19 kg/m²	0 kg/m²
Primary energy	102 kWh/m²	102 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800	(1b)	x 2.3500	(2b) =	109.2280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		109.2280	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1831	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9331	(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) =	0.8631	(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	1.1005	1.0789	1.0573	0.9494	0.9279	0.8200	0.8200	0.7984	0.8631	0.9279	0.9710	1.0142	(22b)
Effective ac	1.1005	1.0789	1.0573	0.9507	0.9305	0.8362	0.8362	0.8187	0.8725	0.9305	0.9714	1.0142	(25)

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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								
Window			7.4200	1.1450	8.4962			(27)
Rooflight			1.9400	1.2357	2.3973			(27a)
External Wall Upgraded	26.6100	2.6700	23.9400	0.2100	5.0274	0.0000	0.0000	(29a)
External New Wall	31.9400	4.7500	27.1900	0.2100	5.7099	9.0000	244.7100	(29a)
External Roof 1	15.4300		15.4300	0.1400	2.1602	9.0000	138.8700	(30)
External Roof 2	5.1100	1.9400	3.1700	0.1400	0.4438	9.0000	28.5300	(30)
Total net area of external elements Aum(A, m2)			79.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2348			(33)
Main dwelling								
Party Wall 1			9.6600	0.0000	0.0000	180.0000	1738.8000	(32)
Party Wall 2			9.6600	0.0000	0.0000	20.0000	193.2000	(32)
Party Floor 1			46.4800			30.0000	1394.4000	(32d)
Party Ceiling 1			25.4700			30.0000	764.1000	(32b)
Internal Wall - Timber			79.1600			9.0000	712.4400	(32c)
Internal Wall - Solid			18.0400			75.0000	1353.0001	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6568.0501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		141.3092 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.8180 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	40.0528 (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	39.6670	38.8892	38.1114	34.2686	33.5385	30.1400	30.1400	29.5106	31.4491	33.5385	35.0155	36.5559	(38)
Heat transfer coeff	79.7198	78.9421	78.1643	74.3214	73.5914	70.1928	70.1928	69.5634	71.5019	73.5914	75.0683	76.6087	(39)
Average = Sum(39)m / 12 =												74.2882	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7151	1.6984	1.6817	1.5990	1.5833	1.5102	1.5102	1.4966	1.5383	1.5833	1.6151	1.6482	(40)
HLP (average)												1.5983	
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		1.5872 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
77.4566	76.2926	74.5964	71.3510	68.9560	66.2851	64.7669	66.4503	68.2956	71.1633	74.4784	77.1598	(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

30.8846	29.7615	28.6384	27.5154	26.3923	25.2692	25.2692	26.3923	27.5154	28.6384	29.7615	30.8846	(42c)

Average daily hot water use (litres/day)	99.4893 (43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
108.3412	106.0541	103.2348	98.8663	95.3482	91.5543	90.0361	92.8426	95.8109	99.8017	104.2399	108.0444	(44)
171.5859	151.0196	158.6680	135.3431	128.3570	112.5766	108.8909	114.9585	118.1445	135.4300	148.5089	169.1714	(45)

Energy content (annual)	Total = Sum(45)m =	1652.6544

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

25.7379	22.6529	23.8002	20.3015	19.2536	16.8865	16.3336	17.2438	17.7217	20.3145	22.2763	25.3757	(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	(57)
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)
17.8274	16.1024	17.8187	17.2026	17.7315	17.1165	17.6633	17.6877	17.1448	17.7673	17.2257	17.8227	(61)

Total heat required for water heating calculated for each month

189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(62)
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)
-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)
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)
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

189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(64)

Total per year (kWh/year) = Sum(64)m =	1861.7649 (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

	61.5092	54.2396	57.2118	49.3022	47.1116	41.7109	40.6221	42.6456	43.5692	49.4723	53.6856	60.7052 (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	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	(66)

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

	17.8033	15.8128	12.8598	9.7357	7.2776	6.1440	6.6388	8.6294	11.5824	14.7065	17.1646	18.2982	(67)

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

	206.1240	208.2629	202.8729	191.3982	176.9134	163.2998	154.2051	152.0661	157.4562	168.9309	183.4156	197.0292	(68)

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

	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	(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)

	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	(71)

Water heating gains (Table 5)

	82.6736	80.7137	76.8976	68.4753	63.3220	57.9317	54.5995	57.3194	60.5128	66.4950	74.5634	81.5930	(72)

Total internal gains

	384.4555	382.6439	370.4848	347.4637	325.3676	305.2301	293.2980	295.8695	307.4059	327.9869	352.9982	374.7749	(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	
North	6.1000	10.6334	0.6300	0.7000	0.7700	19.8232	(74)
East	1.3200	19.6403	0.6300	0.7000	0.7700	7.9231	(76)
East	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)
West	0.9700	26.5593	0.6300	0.7000	1.0000	10.2252	(82)

Solar gains	48.1966	94.6649	161.0920	249.5446	322.9492	339.1473	319.3036	262.0865	191.5355	113.3118	60.0612	39.7128	(83)
Total gains	432.6521	477.3089	531.5768	597.0083	648.3167	644.3774	612.6016	557.9560	498.9415	441.2987	413.0594	414.4878	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.8859	23.1114	23.3413	24.5482	24.7917	25.9921	25.9921	26.2273	25.5162	24.7917	24.3040	23.8153	
alpha	2.5257	2.5408	2.5561	2.6365	2.6528	2.7328	2.7328	2.7485	2.7011	2.6528	2.6203	2.5877	
util living area	0.9598	0.9465	0.9178	0.8526	0.7456	0.5907	0.4625	0.5129	0.7257	0.8866	0.9448	0.9632	(86)
MIT	18.2173	18.5015	19.0233	19.7806	20.3694	20.7808	20.9184	20.8916	20.5835	19.8264	18.9670	18.2592	(87)
Th 2	19.5300	19.5420	19.5540	19.6141	19.6256	19.6799	19.6799	19.6900	19.6589	19.6256	19.6023	19.5782	(88)
util rest of house	0.9512	0.9351	0.8997	0.8196	0.6868	0.4983	0.3394	0.3885	0.6425	0.8537	0.9313	0.9555	(89)
MIT 2	17.0920	17.3780	17.8939	18.6549	19.1928	19.5664	19.6534	19.6513	19.4150	18.7239	17.8785	17.1638	(90)
Living area fraction									fLA = Living area / (4) =			0.3087	(91)
MIT	17.4394	17.7249	18.2426	19.0024	19.5561	19.9414	20.0439	20.0342	19.7758	19.0643	18.2146	17.5020	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.2894	17.5749	18.0926	18.8524	19.4061	19.7914	19.8939	19.8842	19.6258	18.9143	18.0646	17.3520	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9327	0.9140	0.8756	0.7975	0.6760	0.5068	0.3606	0.4084	0.6402	0.8319	0.9109	0.9383	(94)
Useful gains	403.5178	436.2559	465.4370	476.0856	438.2914	326.5449	220.8988	227.8783	319.4037	367.1135	376.2354	388.9345	(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	1035.5132	1000.5787	906.1244	739.6767	567.0989	364.3961	231.2109	242.3740	395.1024	611.8581	823.0918	1007.5582	(97)
Space heating kWh	470.2046	379.2250	327.8714	189.7856	95.8328	0.0000	0.0000	0.0000	0.0000	182.0900	321.7366	460.2560	(98a)
Space heating requirement - total per year (kWh/year)												2427.0019	
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	470.2046	379.2250	327.8714	189.7856	95.8328	0.0000	0.0000	0.0000	0.0000	182.0900	321.7366	460.2560	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2427.0019	
Space heating per m2											(98c) / (4) =	52.2160	(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 %)	89.0000	(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	470.2046	379.2250	327.8714	189.7856	95.8328	0.0000	0.0000	0.0000	0.0000	182.0900	321.7366	460.2560	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	528.3198	426.0955	368.3949	213.2423	107.6773	0.0000	0.0000	0.0000	0.0000	204.5955	361.5018	517.1416	(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													
	189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.8445	85.6463	85.1843	84.1972	82.6138	78.9000	78.9000	78.9000	78.9000	84.0821	85.2881	85.8259	(217)
Fuel for water heating, kWh/month													
	220.6471	195.1303	207.1822	181.1766	176.8330	164.3766	160.3983	168.1193	171.4693	182.1997	194.3232	217.8761	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	15.5832	12.5014	11.2561	8.2467	6.3700	5.2043	5.8109	7.5533	9.8109	12.8725	14.5394	16.0163	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.6003	-12.5980	-21.5680	-28.2862	-33.6405	-32.5520	-31.9478	-28.3639	-22.5598	-15.7794	-8.8884	-6.3097	(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	-1.9017	-4.7532	-11.6249	-20.9414	-30.8961	-32.3250	-31.4758	-24.6438	-15.5724	-7.4235	-2.6851	-1.4331	(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	2726.9685	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2239.7318	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	125.7650	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-435.7700	(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	4701.6953	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2726.9685	3.6400	99.2617	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2239.7318	3.6400	81.5262	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	125.7650	16.4900	20.7387	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-250.0941	16.4900	-41.2405	
PV Unit electricity exported	-185.6760	5.5900	-10.3793	
Total			-51.6198	(252)
Total energy cost			249.3272	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9812 (257)
SAP value		84.0952
SAP rating (Section 12)		84 (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	2726.9685	0.2100	572.6634	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2239.7318	0.2100	470.3437	(264)
Space and water heating			1043.0071	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	125.7650	0.1443	18.1518	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-250.0941	0.1317	-32.9380	
PV Unit electricity exported	-185.6760	0.1216	-22.5874	
Total			-55.5255	(269)
Total CO2, kg/year			1011.8754	(272)
CO2 emissions per m2			21.7700	(273)
EI value			85.1780	
EI rating			85	(274)
EI band			B	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	46.4800	(1b)	x 2.3500	(2b) =	109.2280	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	109.2280	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1831 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9331 (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) =	0.8631 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.9279	0.8847	0.8847	0.8200	0.8415	0.7337	0.7337	0.7121	0.7337	0.8200	0.7984	0.8631	(22b)
Effective ac	0.9305	0.8913	0.8913	0.8362	0.8541	0.7691	0.7691	0.7535	0.7691	0.8362	0.8187	0.8725	(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								
Window			7.4200	1.1450	8.4962			(27)
Rooflight			1.9400	1.2357	2.3973			(27a)
External Wall Upgraded	26.6100	2.6700	23.9400	0.2100	5.0274	0.0000	0.0000	(29a)
External New Wall	31.9400	4.7500	27.1900	0.2100	5.7099	9.0000	244.7100	(29a)
External Roof 1	15.4300		15.4300	0.1400	2.1602	9.0000	138.8700	(30)
External Roof 2	5.1100	1.9400	3.1700	0.1400	0.4438	9.0000	28.5300	(30)
Total net area of external elements Aum(A, m2)			79.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2348			(33)
Main dwelling								
Party Wall 1			9.6600	0.0000	0.0000	180.0000	1738.8000	(32)
Party Wall 2			9.6600	0.0000	0.0000	20.0000	193.2000	(32)
Party Floor 1			46.4800			30.0000	1394.4000	(32d)
Party Ceiling 1			25.4700			30.0000	764.1000	(32b)
Internal Wall - Timber			79.1600			9.0000	712.4400	(32c)
Internal Wall - Solid			18.0400			75.0000	1353.0001	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6568.0501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		141.3092 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.8180 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	40.0528 (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	33.5385	32.1288	32.1288	30.1400	30.7861	27.7232	27.7232	27.1610	27.7232	30.1400	29.5106	31.4491	(38)
Heat transfer coeff	73.5914	72.1816	72.1816	70.1928	70.8389	67.7760	67.7760	67.2138	67.7760	70.1928	69.5634	71.5019	(39)
Average = Sum(39)m / 12 =												70.0655	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5833	1.5530	1.5530	1.5102	1.5241	1.4582	1.4582	1.4461	1.4582	1.5102	1.4966	1.5383	(40)
HLP (average)												1.5074	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.5872 (42)
Hot water usage for mixer showers		
77.4566 76.2926 74.5964 71.3510 68.9560 66.2851 64.7669 66.4503 68.2956 71.1633 74.4784 77.1598		(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		
30.8846 29.7615 28.6384 27.5154 26.3923 25.2692 25.2692 26.3923 27.5154 28.6384 29.7615 30.8846		(42c)

Average daily hot water use (litres/day) 99.4893 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.3412	106.0541	103.2348	98.8663	95.3482	91.5543	90.0361	92.8426	95.8109	99.8017	104.2399	108.0444	(44)
Energy conte	171.5859	151.0196	158.6680	135.3431	128.3570	112.5766	108.8909	114.9585	118.1445	135.4300	148.5089	169.1714	(45)
Energy content (annual)										Total = Sum(45)m =		1652.6544	
Distribution loss (46)m = 0.15 x (45)m	25.7379	22.6529	23.8002	20.3015	19.2536	16.8865	16.3336	17.2438	17.7217	20.3145	22.2763	25.3757	(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	(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	17.8274	16.1024	17.8187	17.2026	17.7315	17.1165	17.6633	17.6877	17.1448	17.7673	17.2257	17.8227	(61)
Total heat required for water heating calculated for each month	189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(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	189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(64)
										Total per year (kWh/year) = Sum(64)m =		1861.7649	(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	61.5092	54.2396	57.2118	49.3022	47.1116	41.7109	40.6221	42.6456	43.5692	49.4723	53.6856	60.7052	(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	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	95.2324	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8033	15.8128	12.8598	9.7357	7.2776	6.1440	6.6388	8.6294	11.5824	14.7065	17.1646	18.2982	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	206.1240	208.2629	202.8729	191.3982	176.9134	163.2998	154.2051	152.0661	157.4562	168.9309	183.4156	197.0292	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	46.1104	(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)	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	-63.4883	(71)
Water heating gains (Table 5)	82.6736	80.7137	76.8976	68.4753	63.3220	57.9317	54.5995	57.3194	60.5128	66.4950	74.5634	81.5930	(72)
Total internal gains	384.4555	382.6439	370.4848	347.4637	325.3676	305.2301	293.2980	295.8695	307.4059	327.9869	352.9982	374.7749	(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	
North	6.1000	12.7650	0.6300	0.7000	0.7700	23.7971	(74)
East	1.3200	23.8018	0.6300	0.7000	0.7700	9.6019	(76)
East	0.9700	32.4372	0.6300	0.7000	1.0000	12.4881	(82)
West	0.9700	32.4372	0.6300	0.7000	1.0000	12.4881	(82)

Solar gains	58.3751	100.5772	170.4889	268.2336	337.6309	374.5816	349.3917	294.5747	216.2089	129.4179	71.7483	48.3178	(83)
Total gains	442.8306	483.2211	540.9737	615.6974	662.9985	679.8117	642.6897	590.4442	523.6148	457.4048	424.7465	423.0928	(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	24.7917	25.2760	25.2760	25.9921	25.7550	26.9189	26.9189	27.1441	26.9189	25.9921	26.2273	25.5162	
alpha	2.6528	2.6851	2.6851	2.7328	2.7170	2.7946	2.7946	2.8096	2.7946	2.7328	2.7485	2.7011	
util living area	0.9514	0.9358	0.8980	0.8115	0.6762	0.4750	0.3359	0.3701	0.6379	0.8516	0.9294	0.9554	(86)
MIT	18.6511	18.9387	19.4327	20.1070	20.6006	20.9045	20.9748	20.9675	20.7648	20.1140	19.3665	18.6758	(87)
Th 2	19.6256	19.6480	19.6480	19.6799	19.6695	19.7190	19.7190	19.7282	19.7190	19.6799	19.6900	19.6589	(88)
util rest of house	0.9411	0.9224	0.8759	0.7706	0.6047	0.3730	0.2107	0.2388	0.5400	0.8090	0.9122	0.9459	(89)
MIT 2	17.5797	17.8746	18.3514	19.0025	19.4192	19.6800	19.7144	19.7216	19.5989	19.0277	18.3252	17.6262	(90)
Living area fraction									fLA = Living area / (4) =			0.3087	(91)
MIT	17.9105	18.2032	18.6852	19.3435	19.7840	20.0580	20.1035	20.1063	19.9588	19.3631	18.6466	17.9502	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.7605	18.0532	18.5352	19.1935	19.6340	19.9080	19.9535	19.9563	19.8088	19.2131	18.4966	17.8002	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9219	0.9013	0.8529	0.7529	0.6026	0.3889	0.2344	0.2633	0.5476	0.7905	0.8914	0.9279	(94)
Useful gains	408.2456	435.5031	461.3841	463.5561	399.5233	264.3856	150.6264	155.4807	286.7273	361.5563	378.6167	392.5703	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	931.7019	891.6700	803.7593	652.3367	477.0266	278.4272	152.7348	158.3732	325.9245	541.4050	730.1829	908.0911	(97)
Space heating kWh	389.4515	306.5442	254.7271	135.9221	57.6625	0.0000	0.0000	0.0000	0.0000	133.8074	253.1277	383.5475	(98a)
Space heating requirement - total per year (kWh/year)												1914.7900	
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													
	389.4515	306.5442	254.7271	135.9221	57.6625	0.0000	0.0000	0.0000	0.0000	133.8074	253.1277	383.5475	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1914.7900	
Space heating per m2											(98c) / (4) =	41.1960	(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 %)												89.0000	(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													
	389.4515	306.5442	254.7271	135.9221	57.6625	0.0000	0.0000	0.0000	0.0000	133.8074	253.1277	383.5475	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	437.5859	344.4316	286.2102	152.7214	64.7893	0.0000	0.0000	0.0000	0.0000	150.3454	284.4131	430.9523	(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													
	189.4133	167.1220	176.4867	152.5456	146.0886	129.6931	126.5542	132.6462	135.2893	153.1973	165.7346	186.9941	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.4219	85.1540	84.5693	83.3573	81.5181	78.9000	78.9000	78.9000	78.9000	83.3077	84.7094	85.4163	(217)
Fuel for water heating, kWh/month													
	221.7384	196.2585	208.6889	183.0022	179.2101	164.3766	160.3983	168.1193	171.4693	183.8934	195.6508	218.9208	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	15.5832	12.5014	11.2561	8.2467	6.3700	5.2043	5.8109	7.5533	9.8109	12.8725	14.5394	16.0163	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.0651	-13.3051	-22.5361	-29.6973	-34.5325	-34.5733	-33.7382	-30.5847	-24.5927	-17.5812	-10.4223	-7.5780	(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	-2.5443	-5.2207	-12.5879	-23.0146	-32.5997	-36.7181	-35.3088	-28.7244	-18.3695	-8.9976	-3.5092	-1.9347	(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												2151.4494	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												78.9000	
Water heating fuel used												2251.7266	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												45.0000	(231)
Electricity for lighting (calculated in Appendix L)												125.7650	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-477.7360	(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												4096.2051	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2151.4494	5.6000	120.4812	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2251.7266	5.6000	126.0967	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	125.7650	26.0600	32.7744	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-268.2065	26.0600	-69.8946	
PV Unit electricity exported	-209.5295	5.8100	-12.1737	
Total			-82.0683	(252)
Total energy cost			308.0110	(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	2151.4494	0.2100	451.8044	(261)
Total CO2 associated with community systems			0.0000	(373)

Water heating (other fuel)	2251.7266	0.2100	472.8626	(264)
Space and water heating			924.6670	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	125.7650	0.1443	18.1518	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-268.2065	0.1319	-35.3790	
PV Unit electricity exported	-209.5295	0.1216	-25.4685	
Total			-60.8475	(269)
Total CO2, kg/year			888.2133	(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	2151.4494	1.1300	2431.1378	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2251.7266	1.1300	2544.4511	(278)
Space and water heating			4975.5889	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	125.7650	1.5338	192.9026	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-268.2065	1.4874	-398.9177	
PV Unit electricity exported	-209.5295	0.4459	-93.4266	
Total			-492.3443	(283)
Total Primary energy kWh/year			4744.2233	(286)

Predicted Energy Assessment

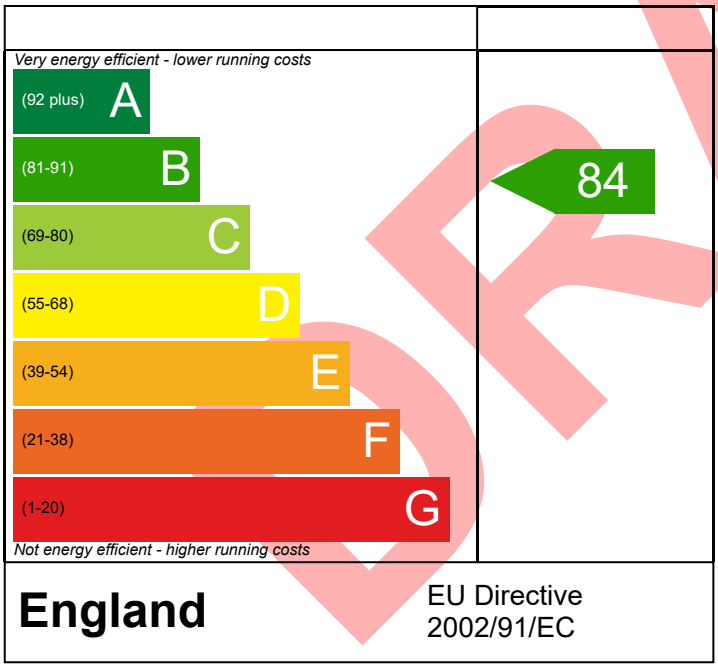
Flat 3, 99 London Road, Reading, RG1 5BY

Dwelling type:	Flat, Semi-Detached
Date of assessment:	17/02/2025
Produced by:	Sammit Pancholi
Total floor area:	46.48 m²
DRRN:	

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.

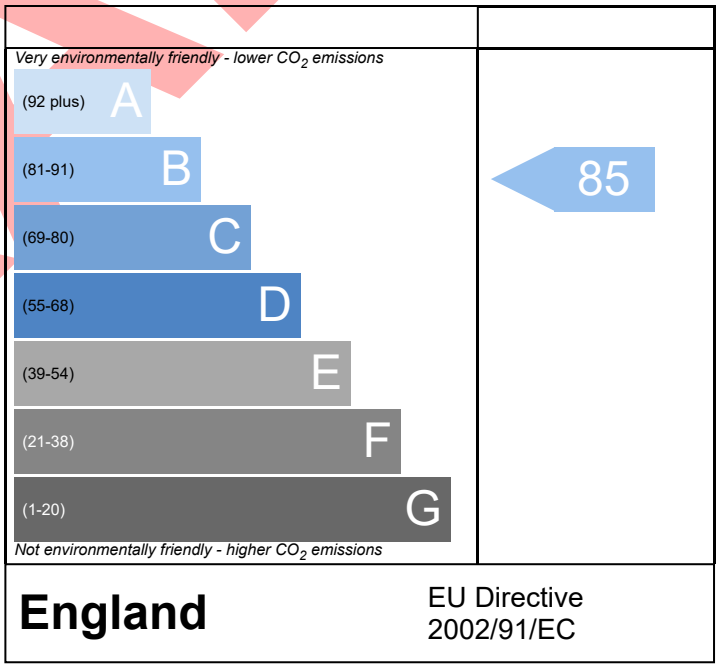
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

Property Reference	Flat 3 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Mid-floor flat	**Prop Type Ref**	Ground Floor, Flat
Property	Flat 3, 99 London Road, Reading, RG1 5BY		

SAP Rating	84 B	**DER**	22.30	**TER**	
Environmental	85 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.89	**DFEE**	60.71	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	119.42	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	5	
Terrain Type	Suburban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Mid-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
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	141.31	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	25.41 m	46.48 m²	2.35 m

8.0 Living Area	14.35	m²

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
External Wall Upgraded	Solid Wall	Other	0.21	0.00	26.61	23.94	0.00	None	2.67	Enter Gross Area
External New Wall	Solid Wall	Solid wall : plasterboard on dabs, insulation, any outside structure	0.21	9.00	31.94	27.19	0.00	None	4.75	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, dense blocks, cavity or cavity fill	0.00	180.00	9.66		None
Party Wall 2	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	20.00	9.66		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall - Timber	Plasterboard on timber frame	9.00	79.16
Internal Wall - Solid	Dense block, plasterboard on dabs	75.00	18.04

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
External Roof 1	External Plane Roof	Plasterboard, insulated at ceiling level	0.14	9.00	15.43	15.43	None	0.00	Enter Gross Area	0.00

External Roof 2	External Slope Roof	Plasterboard, insulated slope	0.14	9.00	5.11	3.17	None	0.00	Enter Gross Area	1.94

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Timber I-joists, carpeted	20.00	25.47

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Timber I-joists, carpeted	20.00	46.48

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			1.40
Window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Rooflight	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening 1	Window	External Wall Upgraded	East	1.32	
Opening 2	Window	External New Wall	North	4.75	
Opening 3	Window	External Wall Upgraded	North	1.35	
Opening 4	Rooflight	External Roof 2	East	0.97	32
Opening 5	Rooflight	External Roof 2	West	0.97	32

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.20	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	2
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	No	
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
LED	66.00	8.00	528.00	15

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18830	
Fuel Type	Mains gas	
In Winter	89.00	
In Summer	78.90	

Summary for Input Data

Model Name	Energy7
Manufacturer	Vaillant Group UK
System Type	Combi boiler
Controls SAP Code	2106
Delayed Start Stat	Yes
Flue Type	Open
Fan Assisted Flue	Yes
Is MHS Pumped	No pump
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	Yes
Combi boiler type	Standard Combi
Combi keep hot type	None

25.0 Main Heating 2 — None

26.0 Heat Networks — None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	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	0

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.50		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder — None

In Airing Cupboard — No

32.0 Photovoltaic Unit — One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.60	West	30°	None Or Little		No	1.00		

Summary for Input Data

34.0 Small-scale Hydro None

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

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
			0	0
			0	0
			0	0

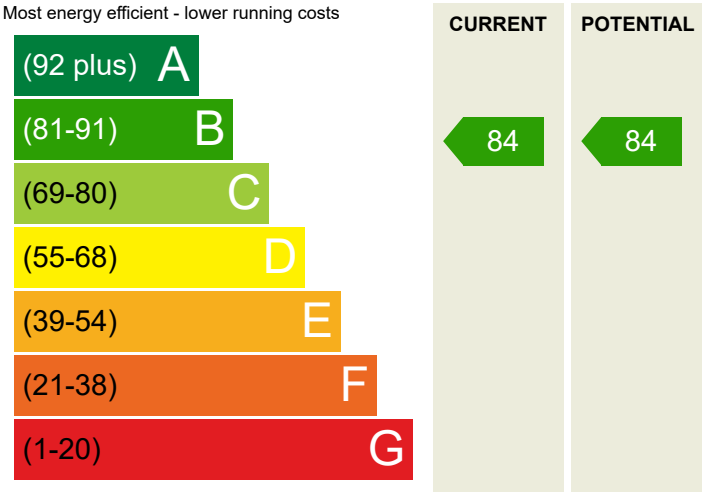
Energy Report

Dwelling Address	Flat 3, 99 London Road, Reading, RG1 5BY
Reference	Flat 3 - Gas + Solar-Mid-floor flat
Assessment Date	17/02/2025
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	46

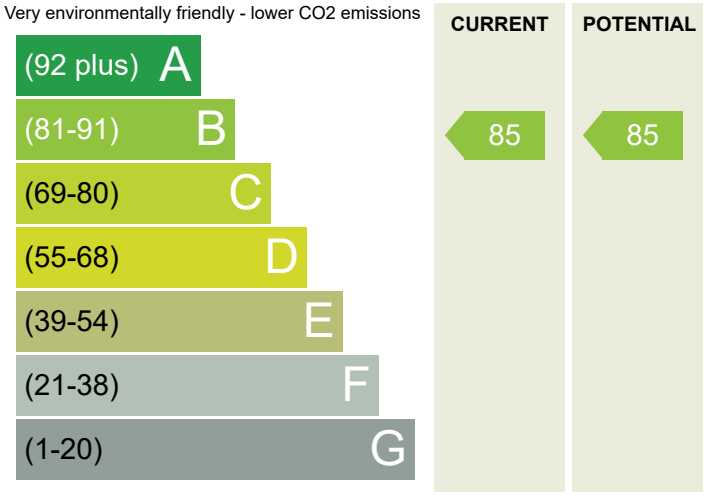
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

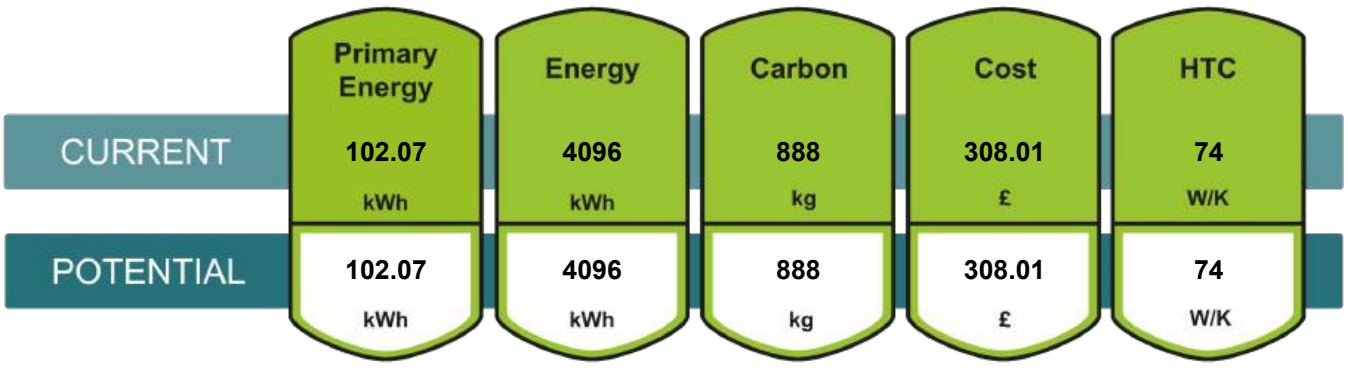
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.21 W/m²K	Very Good
Roof	Average thermal transmittance 0.14 W/m²K	Very Good
Windows	High performance glazing	Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total

energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£33	£33	You could save £0
Heating	£231	£231	
Hot Water	£126	£126	
New Technologies e.g. Impact of PV	-(£82)	-(£82)	
TOTAL	£308	£308	

Estimated energy use and potential savings

Space Heating
2151
kWh per year

Water Heating
2252
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report

Property Reference	Flat 3 - Gas + Solar	Issued on Date	17/02/2025
Assessment Reference	Mid-floor flat	Prop Type Ref	Semi-Detached Flat
Property	Flat 3, 99 London Road, Reading, RG1 5BY		

SAP Rating	84 B	DER	22.30	TER	
Environmental	85 B	% DER < TER			N/A
CO_2 Emissions (t/year)	0.89	DFEE	60.71	TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER	119.42	TPER	

Assessor Details	Mr. Sammit Pancholi	Assessor ID	DB55-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	Flat 3, 99 London Road	
House Number		
Postcode	RG1 5BY	
Street		
Town	Reading	
County		

Dwelling Orientation South (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Suburban

Property Type Flat, Semi-Detached

Comments

Electricity Tariff Standard

Smart electricity meter fitted: No

Smart gas meter fitted: No

Comments

Section 2: Dwelling Construction Details

External Walls

Description	External Wall Upgraded		
Type	Solid Wall		
Construction	Other		
U-value	0.21	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	26.61	m²	

Description	External New Wall		
Type	Solid Wall		
Construction	Solid wall : plasterboard on dabs, insulation, any outside structure		
U-value	0.21	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	31.94	m²	

Comments

Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	9.66
Party Wall 2	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	9.66

Comments

External Roofs

Description	External Roof 1		
Type	External Plane Roof		
Construction	Plasterboard, insulated at ceiling level		
U-value	0.14	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	15.43	m²	

Description	External Roof 2		
Type	External Slope Roof		
Construction	Plasterboard, insulated slope		
U-value	0.14	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	5.11	m²	

Comments

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
Door	Manufacturer	Solid Door		0.00		1.40
Window	Manufacturer	Window	Double Low-E Soft 0.05	0.63		1.20
Rooflight	Manufacturer	Roof Window	Double Low-E Soft 0.05	0.63		1.30

Comments

Openings

Name	Opening Type	Location	Orientation	Area (m²)
Opening 1	Window	External Wall Upgraded	East	1.32
Opening 2	Window	External New Wall	North	4.75
Opening 3	Window	External Wall Upgraded	North	1.35

Opening 4	Rooflight	External Roof 2	East	0.97
Opening 5	Rooflight	External Roof 2	West	0.97

Comments

Thermal Bridging Default

Y-value 0.200

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing No

Designed AP_{50} 15.00 $m^3/(h.m^2)$ @ 50 Pa

Property Tested? Yes

Test Method Blower Door

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

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	2
Number of passive vents	0
Number of flueless gas fires	0

Comments

Fixed Cooling System No

Comments

Lighting

No Fixed Lighting	No

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
LED	66.00	8.00	528.00	15

Comments

Main Heating 1

Database		
Fuel Type	Mains gas	
Winter Efficiency	89.00	%
Summer Efficiency	78.90	%
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Flue Type	Open	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Programmer, room thermostat and TRVs
Boiler Interlock	Yes
Delayed Start Stat	Yes
PCDF Control Description	

Comments

Main Heating 2

None

Secondary Heating

None

Water Heating System

Water Heating	Main Heating 1
Supplementary Immersion	No
SAP Code	901
Water use <= 125 l/p/day	Yes
Cold Water Source	From mains
Number of baths	0

Comments

Hot Water Cylinder None

Comments

Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.50		No	

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit One Dwelling

Export Capable Meter? Yes

Connected To Dwelling Yes

Diverter No

Battery Capacity [kWh] 0.00

PV Cells kWp	Orientation	Elevation	Overshading	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.60	West	30°	None Or Little	No	1.00		

Comments

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed .....

Date .....

Full SAP Calculation Printout

Property Reference	Flat 4 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Mid-floor Flat	**Prop Type Ref**	Ground Floor, Flat
Property	Flat 4, 99 London Road, Reading, RG1 5BY		

SAP Rating	79 C	**DER**	29.21	**TER**	
Environmental	83 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.89	**DFEE**	61.99	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	160.40	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	34.1800	(1b)	x 2.4100	(2b) =	82.3738	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.1800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	82.3738	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2428	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9928	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8439	(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	1.0759	1.0548	1.0337	0.9283	0.9072	0.8017	0.8017	0.7806	0.8439	0.9072	0.9494	0.9916	(22b)
Effective ac	1.0759	1.0548	1.0337	0.9308	0.9115	0.8213	0.8213	0.8047	0.8561	0.9115	0.9506	0.9916	(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								
Window			5.8000	1.5918	9.2322			(27)
External Wall 1	44.0500	5.8000	38.2500	0.3000	11.4750	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			44.0500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.7072			(33)
Main dwelling								
Party Wall 1			7.5400	0.0000	0.0000	180.0000	1357.2000	(32)
Party Wall 2			16.5800	0.0000	0.0000	20.0000	331.6000	(32)
Party Floor 1			34.1800			30.0000	1025.4000	(32d)
Party Ceiling 1			34.1800			20.0000	683.6000	(32b)
Internal Wall - Timber			58.4200			9.0000	525.7800	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		3923.5800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							114.7917	(35)
Thermal bridges (Default value 0.200 * total exposed area)							8.8100	(36)
Point Thermal bridges					(36a) =		0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		29.5172	(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	29.2477	28.6742	28.1008	25.3033	24.7770	22.3270	22.3270	21.8733	23.2707	24.7770	25.8417	26.9548	(38)

Heat transfer coeff

	58.7649	58.1914	57.6180	54.8205	54.2942	51.8442	51.8442	51.3905	52.7879	54.2942	55.3589	56.4720 (39)
Average = Sum(39)m / 12 =												54.8067

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7193	1.7025	1.6857	1.6039	1.5885	1.5168	1.5168	1.5035	1.5444	1.5885	1.6196	1.6522	(40)
HLP (average)												1.6035	
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 1.2617 (42)

Hot water usage for mixer showers

	82.9236	81.6775	79.8615	76.3871	73.8230	70.9636	69.3383	71.1405	73.1160	76.1862	79.7353	82.6059 (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

	27.5510	26.5492	25.5473	24.5454	23.5436	22.5417	22.5417	23.5436	24.5454	25.5473	26.5492	27.5510 (42c)

Average daily hot water use (litres/day) 101.4992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	110.4747	108.2266	105.4088	100.9325	97.3666	93.5053	91.8800	94.6841	97.6615	101.7335	106.2844	110.1569	(44)
Energy conte	174.9648	154.1133	162.0094	138.1716	131.0742	114.9757	111.1209	117.2387	120.4264	138.0514	151.4216	172.4791	(45)
Energy content (annual)										Total = Sum(45)m =		1686.0471	
Distribution loss (46)m = 0.15 x (45)m													
	26.2447	23.1170	24.3014	20.7257	19.6611	17.2464	16.6681	17.5858	18.0640	20.7077	22.7132	25.8719	(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	(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	17.8248	16.1004	17.8171	17.2117	17.7462	17.1289	17.6747	17.6996	17.1572	17.7690	17.2242	17.8203	(61)
Total heat required for water heating calculated for each month													
	192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(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													
	192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(64)
										Total per year (kWh/year) = Sum(64)m =		1895.2214	(64)
12Total per year (kWh/year)												1895	(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													
	62.6320	55.2678	58.3224	50.2450	48.0187	42.5117	41.3664	43.4068	44.3311	50.3443	54.6538	61.8044	(65)

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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	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	55.7961	61.7743	55.7961	57.6560	55.7961	57.6560	55.7961	55.7961	57.6560	55.7961	57.6560	55.7961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	107.2224	108.3350	105.5312	99.5623	92.0275	84.9459	80.2150	79.1024	81.9062	87.8751	95.4099	102.4914	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	(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)													
	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	(71)
Water heating gains (Table 5)													
	84.1828	82.2437	78.3904	69.7847	64.5413	59.0440	55.6000	58.3424	61.5709	67.6671	75.9080	83.0704	(72)
Total internal gains													
	289.1268	294.2784	281.6431	268.9284	254.2904	243.5713	233.5366	235.1664	243.0585	253.2638	270.8993	283.2834	(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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	310.8653	336.1065	352.0734	379.0561	399.0430	396.8331	377.3100	351.5529	326.9409	303.0080	297.8001	301.3345	(84)

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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	18.5465	18.7293	18.9157	19.8810	20.0737	21.0223	21.0223	21.2079	20.6465	20.0737	19.6876	19.2995	
alpha	2.2364	2.2486	2.2610	2.3254	2.3382	2.4015	2.4015	2.4139	2.3764	2.3382	2.3125	2.2866	
util living area													
	0.9465	0.9337	0.9128	0.8619	0.7777	0.6406	0.5175	0.5585	0.7408	0.8764	0.9287	0.9493	(86)
MIT	17.8127	18.0968	18.5937	19.3884	20.0645	20.6194	20.8387	20.8028	20.4060	19.5620	18.6505	17.8696	(87)
Th 2	20.1404	20.1488	20.1571	20.1981	20.2058	20.2416	20.2416	20.2482	20.2278	20.2058	20.1902	20.1739	(88)
util rest of house													
	0.9410	0.9269	0.9033	0.8461	0.7497	0.5928	0.4480	0.4911	0.7001	0.8593	0.9205	0.9442	(89)
MIT 2	17.1795	17.4657	17.9625	18.7683	19.4238	19.9608	20.1447	20.1246	19.7673	18.9502	18.0427	17.2567	(90)
Living area fraction										fLA = Living area / (4) =		0.4447	(91)

MIT	17.4610	17.7463	18.2432	19.0441	19.7087	20.2537	20.4533	20.4262	20.0513	19.2223	18.3130	17.5293	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4610	17.7463	18.2432	19.0441	19.7087	20.2537	20.4533	20.4262	20.0513	19.2223	18.3130	17.5293	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9178	0.9014	0.8757	0.8188	0.7299	0.5936	0.4683	0.5080	0.6897	0.8335	0.8957	0.9222	(94)
Useful gains	285.3144	302.9828	308.3204	310.3532	291.2615	235.5682	176.7057	178.5930	225.4816	252.5449	266.7273	277.9029	(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													
	773.4079	747.5468	676.6173	556.1027	434.8269	293.1092	199.7716	206.9096	314.1588	468.1383	620.7394	752.7289	(97)
Space heating kWh													
	363.1415	298.7470	274.0128	176.9397	106.8127	0.0000	0.0000	0.0000	0.0000	160.4015	254.8887	353.2705	(98a)
Space heating requirement - total per year (kWh/year)												1988.2145	
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													
	363.1415	298.7470	274.0128	176.9397	106.8127	0.0000	0.0000	0.0000	0.0000	160.4015	254.8887	353.2705	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1988.2145	
Space heating per m2											(98c) / (4) =	58.1689	(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 %)												84.0000	(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													
	363.1415	298.7470	274.0128	176.9397	106.8127	0.0000	0.0000	0.0000	0.0000	160.4015	254.8887	353.2705	(98)
Space heating efficiency (main heating system 1)													
	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)													
	432.3114	355.6512	326.2057	210.6425	127.1579	0.0000	0.0000	0.0000	0.0000	190.9542	303.4389	420.5602	(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													
	192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.2170	85.0484	84.7037	83.9739	82.8275	78.9000	78.9000	78.9000	78.9000	83.7192	84.6835	85.1825	(217)
Fuel for water heating, kWh/month													
	226.2337	200.1374	212.3008	185.0377	179.6751	167.4330	163.2391	171.0245	174.3771	186.1227	199.1484	223.4019	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.4478	9.9861	8.9914	6.5875	5.0884	4.1572	4.6418	6.0335	7.8370	10.2825	11.6141	12.7938	(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)
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	2366.9220	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2288.1315	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	100.4612	(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	4800.5147	(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	2366.9220	0.2100	497.0536	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2288.1315	0.2100	480.5076	(264)

Space and water heating			977.5612 (265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421 (267)
Energy for lighting	100.4612	0.1443	14.4997 (268)
Total CO2, kg/year			998.3029 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			29.2100 (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	2366.9220	1.1300	2674.6219	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2288.1315	1.1300	2585.5886	(278)
Space and water heating			5260.2105	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	100.4612	1.5338	154.0907	(282)
Total Primary energy kWh/year			5482.3772	(286)
Dwelling Primary energy Rate (DPER)			160.4000	(287)

SAP 10 WORKSHEET FOR Conversion (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						
Ground floor	34.1800	(1b) x	2.4100	(2b) =	82.3738	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	82.3738	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2428	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9928	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8439	(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	1.0759	1.0548	1.0337	0.9283	0.9072	0.8017	0.8017	0.7806	0.8439	0.9072	0.9494	0.9916	(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	1.0759	1.0548	1.0337	0.9308	0.9115	0.8213	0.8213	0.8047	0.8561	0.9115	0.9506	0.9916	(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								
Window			5.8000	1.5918	9.2322			(27)
External Wall 1	44.0500	5.8000	38.2500	0.3000	11.4750	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			44.0500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.7072			(33)
Main dwelling								
Party Wall 1			7.5400	0.0000	0.0000	180.0000	1357.2000	(32)
Party Wall 2			16.5800	0.0000	0.0000	20.0000	331.6000	(32)
Party Floor 1			34.1800			30.0000	1025.4000	(32d)
Party Ceiling 1			34.1800			30.0000	1025.4000	(32b)
Internal Wall - Timber			58.4200			9.0000	525.7800	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4265.3800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							124.7917	(35)
Thermal bridges (Default value 0.200 * total exposed area)							8.8100	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		29.5172	(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	29.2477	28.6742	28.1008	25.3033	24.7770	22.3270	22.3270	21.8733	23.2707	24.7770	25.8417	26.9548	(38)

Heat transfer coeff

	58.7649	58.1914	57.6180	54.8205	54.2942	51.8442	51.8442	51.3905	52.7879	54.2942	55.3589	56.4720 (39)
Average = Sum(39)m / 12 =												54.8067

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7193	1.7025	1.6857	1.6039	1.5885	1.5168	1.5168	1.5035	1.5444	1.5885	1.6196	1.6522	(40)
HLP (average)												1.6035	
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 1.2617 (42)

Hot water usage for mixer showers

	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

	19.6355	19.3439	18.9332	18.1760	17.6091	16.9804	16.6408	17.0486	17.4926	18.1653	18.9381	19.5691 (42b)

Hot water usage for other uses

	27.5510	26.5492	25.5473	24.5454	23.5436	22.5417	22.5417	23.5436	24.5454	25.5473	26.5492	27.5510 (42c)

Average daily hot water use (litres/day) 43.2515 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	47.1865	45.8930	44.4805	42.7215	41.1527	39.5221	39.1826	40.5922	42.0380	43.7126	45.4872	47.1201	(44)
Energy conte	74.7318	65.3510	68.3649	58.4836	55.3994	48.5971	47.3879	50.2616	51.8371	59.3176	64.8049	73.7787	(45)
Energy content (annual)										Total = Sum(45)m =		718.3156	
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	(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													
	63.5221	55.5484	58.1101	49.7110	47.0895	41.3075	40.2797	42.7224	44.0615	50.4199	55.0842	62.7119	(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													
	63.5221	55.5484	58.1101	49.7110	47.0895	41.3075	40.2797	42.7224	44.0615	50.4199	55.0842	62.7119	(64)
										Total per year (kWh/year) = Sum(64)m =		610.5682	(64)
12Total per year (kWh/year)												611	(64)
Electric shower(s)													
	36.3369	32.3765	35.3539	33.7377	34.3708	32.7864	33.8793	34.3708	33.7377	35.3539	34.6891	36.3369	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		413.3299	(64a)
Heat gains from water heating, kWh/month													
	24.9647	21.9812	23.3660	20.8622	20.3651	18.5235	18.5398	19.2733	19.4498	21.4434	22.4433	24.7622	(65)

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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	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	55.7961	61.7743	55.7961	57.6560	55.7961	57.6560	55.7961	55.7961	57.6560	55.7961	57.6560	55.7961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	107.2224	108.3350	105.5312	99.5623	92.0275	84.9459	80.2150	79.1024	81.9062	87.8751	95.4099	102.4914	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	(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)													
	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	(71)
Water heating gains (Table 5)													
	33.5548	32.7101	31.4059	28.9753	27.3724	25.7271	24.9190	25.9050	27.0136	28.8218	31.1713	33.2825	(72)
Total internal gains													
	238.4987	244.7449	234.6587	228.1190	217.1215	210.2544	202.8556	202.7289	208.5012	214.4185	226.1626	233.4955	(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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	260.2372	286.5729	305.0889	338.2467	361.8742	363.5162	346.6291	319.1154	292.3836	264.1627	253.0633	251.5466	(84)

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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	20.1622	20.3609	20.5635	21.6129	21.8224	22.8536	22.8536	23.0554	22.4451	21.8224	21.4027	20.9808	
alpha	2.3441	2.3574	2.3709	2.4409	2.4548	2.5236	2.5236	2.5370	2.4963	2.4548	2.4268	2.3987	
util living area													
	0.9669	0.9567	0.9397	0.8950	0.8171	0.6828	0.5566	0.6036	0.7874	0.9111	0.9538	0.9692	(86)
MIT	17.7663	18.0506	18.5471	19.3531	20.0404	20.6092	20.8355	20.7947	20.3782	19.5144	18.5982	17.8215	(87)
Th 2	19.5270	19.5390	19.5511	19.6105	19.6218	19.6749	19.6749	19.6849	19.6544	19.6218	19.5990	19.5753	(88)
util rest of house													
	0.9601	0.9478	0.9265	0.8702	0.7690	0.5937	0.4225	0.4736	0.7150	0.8852	0.9430	0.9631	(89)
MIT 2	16.6691	16.9566	17.4533	18.2733	18.9256	19.4539	19.6143	19.6020	19.2639	18.4479	17.5374	16.7525	(90)
Living area fraction											fLA = Living area / (4) =	0.4447	(91)

MIT	17.1570	17.4431	17.9397	18.7535	19.4214	19.9677	20.1574	20.1324	19.7594	18.9222	18.0092	17.2279	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1570	17.4431	17.9397	18.7535	19.4214	19.9677	20.1574	20.1324	19.7594	18.9222	18.0092	17.2279	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9445	0.9299	0.9066	0.8510	0.7607	0.6156	0.4753	0.5221	0.7216	0.8681	0.9259	0.9485	(94)
Useful gains	245.8035	266.4928	276.5810	287.8457	275.2896	223.7754	164.7404	166.6138	210.9937	229.3311	234.3020	238.5941	(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													
	755.5428	729.9011	659.1341	540.1739	419.2248	278.2833	184.4294	191.8085	298.7491	451.8463	603.9191	735.7104	(97)
Space heating kWh													
	379.2460	311.4103	284.6195	181.6763	107.0877	0.0000	0.0000	0.0000	0.0000	165.5513	266.1243	369.8545	(98a)
Space heating requirement - total per year (kWh/year)												2065.5701	
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													
	379.2460	311.4103	284.6195	181.6763	107.0877	0.0000	0.0000	0.0000	0.0000	165.5513	266.1243	369.8545	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2065.5701	
Space heating per m2											(98c) / (4) =	60.4321	(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	487.3354	383.6470	390.5677	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6479	0.7193	0.6832	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	315.7366	275.9706	266.8508	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	405.5969	387.0307	355.9270	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	64.6994	82.6287	66.2727	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	16.1749	20.6572	16.5682	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												53.4002	(107)
Energy for space heating												60.4321	(99)
Energy for space cooling												1.5623	(108)
Total												61.9944	(109)
Fabric Energy Efficiency (DFEE)												62.0	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		34.1800	(1b)	x 2.4100	(2b) =	82.3738	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.1800						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		82.3738	(5)

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2. Ventilation rate

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		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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2428	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9928	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8439	(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													
	1.0759	1.0548	1.0337	0.9283	0.9072	0.8017	0.8017	0.7806	0.8439	0.9072	0.9494	0.9916	(22b)
Effective ac	1.0759	1.0548	1.0337	0.9308	0.9115	0.8213	0.8213	0.8047	0.8561	0.9115	0.9506	0.9916	(25)

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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								
Window			5.8000	1.5918	9.2322			(27)
External Wall 1	44.0500	5.8000	38.2500	0.3000	11.4750	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			44.0500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.7072			(33)
Main dwelling								
Party Wall 1			7.5400	0.0000	0.0000	180.0000	1357.2000	(32)
Party Wall 2			16.5800	0.0000	0.0000	20.0000	331.6000	(32)
Party Floor 1			34.1800			30.0000	1025.4000	(32d)
Party Ceiling 1			34.1800			30.0000	1025.4000	(32b)
Internal Wall - Timber			58.4200			9.0000	525.7800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4265.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		124.7917 (35)
Thermal bridges (Default value 0.200 * total exposed area)		8.8100 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	29.5172 (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	29.2477	28.6742	28.1008	25.3033	24.7770	22.3270	22.3270	21.8733	23.2707	24.7770	25.8417	26.9548	(38)
Heat transfer coeff	58.7649	58.1914	57.6180	54.8205	54.2942	51.8442	51.8442	51.3905	52.7879	54.2942	55.3589	56.4720	(39)
Average = Sum(39)m / 12 =												54.8067	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7193	1.7025	1.6857	1.6039	1.5885	1.5168	1.5168	1.5035	1.5444	1.5885	1.6196	1.6522	(40)
HLP (average)												1.6035	
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		1.2617 (42)
Hot water usage for mixer showers	82.9236 81.6775 79.8615 76.3871 73.8230 70.9636 69.3383 71.1405 73.1160 76.1862 79.7353	82.6059 (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	27.5510 26.5492 25.5473 24.5454 23.5436 22.5417 22.5417 23.5436 24.5454 25.5473 26.5492	27.5510 (42c)
Average daily hot water use (litres/day)		101.4992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.4747	108.2266	105.4088	100.9325	97.3666	93.5053	91.8800	94.6841	97.6615	101.7335	106.2844	110.1569	(44)
Energy conte	174.9648	154.1133	162.0094	138.1716	131.0742	114.9757	111.1209	117.2387	120.4264	138.0514	151.4216	172.4791	(45)
Energy content (annual)										Total = Sum(45)m =		1686.0471	
Distribution loss (46)m = 0.15 x (45)m	26.2447	23.1170	24.3014	20.7257	19.6611	17.2464	16.6681	17.5858	18.0640	20.7077	22.7132	25.8719	(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	(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	17.8248	16.1004	17.8171	17.2117	17.7462	17.1289	17.6747	17.6996	17.1572	17.7690	17.2242	17.8203	(61)
Total heat required for water heating calculated for each month	192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(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	192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(64)
										Total per year (kWh/year) = Sum(64)m =		1895.2214	(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	62.6320	55.2678	58.3224	50.2450	48.0187	42.5117	41.3664	43.4068	44.3311	50.3443	54.6538	61.8044	(65)

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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	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.2213	12.6312	10.2724	7.7769	5.8133	4.9078	5.3031	6.8932	9.2520	11.7475	13.7111	14.6166	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.0334	161.6940	157.5093	148.6004	137.3545	126.7850	119.7239	118.0632	122.2480	131.1569	142.4028	152.9723	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	(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)	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	(71)
Water heating gains (Table 5)	84.1828	82.2437	78.3904	69.7847	64.5413	59.0440	55.6000	58.3424	61.5709	67.6671	75.9080	83.0704	(72)
Total internal gains	327.5033	325.6348	315.2378	295.2277	276.7748	259.8025	249.6927	252.3646	262.1367	279.6373	301.0876	319.7250	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
North					4.7500	10.6334		0.6300	0.7000	0.7700		15.4361	(74)
East					1.0500	19.6403		0.6300	0.7000	0.7700		6.3024	(76)
Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	349.2418	367.4628	385.6680	405.3555	421.5275	413.0643	393.4662	368.7511	346.0190	329.3815	327.9884	337.7761	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.1622	20.3609	20.5635	21.6129	21.8224	22.8536	22.8536	23.0554	22.4451	21.8224	21.4027	20.9808	
alpha	2.3441	2.3574	2.3709	2.4409	2.4548	2.5236	2.5236	2.5370	2.4963	2.4548	2.4268	2.3987	
util living area	0.9410	0.9301	0.9070	0.8568	0.7715	0.6342	0.5076	0.5471	0.7321	0.8686	0.9234	0.9443	(86)
MIT	18.1075	18.3515	18.8292	19.5568	20.1758	20.6736	20.8673	20.8374	20.4853	19.7227	18.8779	18.1603	(87)
Th 2	20.1404	20.1488	20.1571	20.1981	20.2058	20.2416	20.2416	20.2482	20.2278	20.2058	20.1902	20.1739	(88)
util rest of house	0.9348	0.9227	0.8966	0.8400	0.7422	0.5852	0.4375	0.4788	0.6896	0.8501	0.9144	0.9385	(89)
MIT 2	17.4621	17.7086	18.1855	18.9246	19.5227	20.0042	20.1638	20.1487	19.8340	19.0982	18.2585	17.5358	(90)
Living area fraction									fLA = Living area / (4) =			0.4447	(91)
MIT	17.7491	17.9945	18.4718	19.2057	19.8132	20.3019	20.4767	20.4550	20.1236	19.3759	18.5340	17.8135	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7491	17.9945	18.4718	19.2057	19.8132	20.3019	20.4767	20.4550	20.1236	19.3759	18.5340	17.8135	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9120	0.8984	0.8707	0.8155	0.7260	0.5893	0.4602	0.4985	0.6832	0.8270	0.8908	0.9170	(94)
Useful gains	318.5045	330.1441	335.7992	330.5677	306.0356	243.4233	181.0688	183.8224	236.4077	272.3821	292.1752	309.7263	(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	790.3382	761.9859	689.7893	564.9651	440.4975	295.6103	200.9823	208.3867	317.9737	476.4828	632.9710	768.7815	(97)
Space heating kWh	351.0443	290.1977	263.3686	168.7661	100.0396	0.0000	0.0000	0.0000	0.0000	151.8509	245.3730	341.5370	(98a)
Space heating requirement - total per year (kWh/year)												1912.1773	
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	351.0443	290.1977	263.3686	168.7661	100.0396	0.0000	0.0000	0.0000	0.0000	151.8509	245.3730	341.5370	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1912.1773	
Space heating per m2											(98c) / (4) =	55.9443	(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 %)												84.0000	(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	351.0443	290.1977	263.3686	168.7661	100.0396	0.0000	0.0000	0.0000	0.0000	151.8509	245.3730	341.5370	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	417.9098	345.4734	313.5341	200.9121	119.0948	0.0000	0.0000	0.0000	0.0000	180.7749	292.1107	406.5917	(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	192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.1365	84.9784	84.6056	83.8545	82.6714	78.9000	78.9000	78.9000	78.9000	83.5814	84.5892	85.1020	(217)
Fuel for water heating, kWh/month	226.4476	200.3024	212.5470	185.3012	180.0143	167.4330	163.2391	171.0245	174.3771	186.4296	199.3704	223.6133	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.4478	9.9861	8.9914	6.5875	5.0884	4.1572	4.6418	6.0335	7.8370	10.2825	11.6141	12.7938	(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)
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												2276.4016	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												78.9000	

Water heating fuel used	2290.0995	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	100.4612	(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	4711.9623	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2276.4016	3.6400	82.8610	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2290.0995	3.6400	83.3596	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	100.4612	16.4900	16.5660	(250)
Additional standing charges			92.0000	(251)
Total energy cost			282.2072	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2831	(257)
SAP value		79.2012	
SAP rating (Section 12)		79	(258)
SAP band		C	

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	2276.4016	0.2100	478.0443	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2290.0995	0.2100	480.9209	(264)
Space and water heating			958.9652	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	100.4612	0.1443	14.4997	(268)
Total CO2, kg/year			979.7069	(272)
CO2 emissions per m2			28.6600	(273)
EI value			83.4200	
EI rating			83	(274)
EI band			B	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	34.1800	(1b) x	2.4100	(2b) =	82.3738	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		82.3738	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2428	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9928	(18)

Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.8439 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.9072	0.8650	0.8650	0.8017	0.8228	0.7173	0.7173	0.6962	0.7173	0.8017	0.7806	0.8439	(22b)
Effective ac	0.9115	0.8741	0.8741	0.8213	0.8385	0.7573	0.7573	0.7423	0.7573	0.8213	0.8047	0.8561	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			5.8000	1.5918	9.2322			(27)
External Wall 1	44.0500	5.8000	38.2500	0.3000	11.4750	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			44.0500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.7072			(33)
Main dwelling								
Party Wall 1			7.5400	0.0000	0.0000	180.0000	1357.2000	(32)
Party Wall 2			16.5800	0.0000	0.0000	20.0000	331.6000	(32)
Party Floor 1			34.1800			30.0000	1025.4000	(32d)
Party Ceiling 1			34.1800			30.0000	1025.4000	(32b)
Internal Wall - Timber			58.4200			9.0000	525.7800	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 4265.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 124.7917 (35)
Thermal bridges (Default value 0.200 * total exposed area) 8.8100 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.5172 (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	24.7770	23.7607	23.7607	22.3270	22.7928	20.5848	20.5848	20.1794	20.5848	22.3270	21.8733	23.2707	(38)
Heat transfer coeff	54.2942	53.2779	53.2779	51.8442	52.3100	50.1020	50.1020	49.6967	50.1020	51.8442	51.3905	52.7879	(39)
Average = Sum(39)m / 12 =												51.7524	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5885	1.5587	1.5587	1.5168	1.5304	1.4658	1.4658	1.4540	1.4658	1.5168	1.5035	1.5444	(40)
HLP (average)												1.5141	
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 1.2617 (42)
Hot water usage for mixer showers

82.9236	81.6775	79.8615	76.3871	73.8230	70.9636	69.3383	71.1405	73.1160	76.1862	79.7353	82.6059	(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

27.5510	26.5492	25.5473	24.5454	23.5436	22.5417	22.5417	23.5436	24.5454	25.5473	26.5492	27.5510	(42c)

Average daily hot water use (litres/day) 101.4992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.4747	108.2266	105.4088	100.9325	97.3666	93.5053	91.8800	94.6841	97.6615	101.7335	106.2844	110.1569	(44)
Energy conte	174.9648	154.1133	162.0094	138.1716	131.0742	114.9757	111.1209	117.2387	120.4264	138.0514	151.4216	172.4791	(45)
Energy content (annual)											Total = Sum(45)m =	1686.0471	
Distribution loss (46)m = 0.15 x (45)m	26.2447	23.1170	24.3014	20.7257	19.6611	17.2464	16.6681	17.5858	18.0640	20.7077	22.7132	25.8719	(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	(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	17.8248	16.1004	17.8171	17.2117	17.7462	17.1289	17.6747	17.6996	17.1572	17.7690	17.2242	17.8203	(61)
Total heat required for water heating calculated for each month	192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(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	192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(64)
										Total per year (kWh/year) = Sum(64)m =		1895.2214	(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	62.6320	55.2678	58.3224	50.2450	48.0187	42.5117	41.3664	43.4068	44.3311	50.3443	54.6538	61.8044	(65)

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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	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.2213	12.6312	10.2724	7.7769	5.8133	4.9078	5.3031	6.8932	9.2520	11.7475	13.7111	14.6166	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.0334	161.6940	157.5093	148.6004	137.3545	126.7850	119.7239	118.0632	122.2480	131.1569	142.4028	152.9723	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	(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)	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	(71)
Water heating gains (Table 5)													

	84.1828	82.2437	78.3904	69.7847	64.5413	59.0440	55.6000	58.3424	61.5709	67.6671	75.9080	83.0704	(72)
Total internal gains	327.5033	325.6348	315.2378	295.2277	276.7748	259.8025	249.6927	252.3646	262.1367	279.6373	301.0876	319.7250	(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	
North	4.7500	12.7650	0.6300	0.7000	0.7700	18.5305	(74)
East	1.0500	23.8018	0.6300	0.7000	0.7700	7.6378	(76)

Solar gains	26.1684	44.2835	74.5620	118.7397	151.9098	169.9124	157.9212	131.2772	94.8457	56.6982	31.9610	21.8144	(83)
Total gains	353.6716	369.9183	389.7998	413.9674	428.6846	429.7149	407.6139	383.6418	356.9824	336.3355	333.0486	341.5394	(84)

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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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	21.8224	22.2386	22.2386	22.8536	22.6501	23.6483	23.6483	23.8412	23.6483	22.8536	23.0554	22.4451	
alpha	2.4548	2.4826	2.4826	2.5236	2.5100	2.5766	2.5766	2.5894	2.5766	2.5236	2.5370	2.4963	
util living area	0.9308	0.9179	0.8879	0.8220	0.7109	0.5274	0.3811	0.4093	0.6561	0.8362	0.9063	0.9343	(86)
MIT	18.5509	18.8017	19.2507	19.9006	20.4460	20.8392	20.9526	20.9432	20.6853	20.0123	19.2817	18.5861	(87)
Th 2	20.2058	20.2206	20.2206	20.2416	20.2348	20.2671	20.2671	20.2730	20.2671	20.2416	20.2482	20.2278	(88)
util rest of house	0.9237	0.9095	0.8757	0.8016	0.6744	0.4694	0.3043	0.3314	0.6053	0.8132	0.8953	0.9276	(89)
MIT 2	17.9429	18.1999	18.6412	19.2864	19.7944	20.1622	20.2454	20.2459	20.0404	19.4016	18.6941	17.9925	(90)
Living area fraction									fLA = Living area / (4) =			0.4447	(91)
MIT	18.2133	18.4675	18.9122	19.5595	20.0841	20.4633	20.5599	20.5560	20.3272	19.6731	18.9554	18.2565	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2133	18.4675	18.9122	19.5595	20.0841	20.4633	20.5599	20.5560	20.3272	19.6731	18.9554	18.2565	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9008	0.8858	0.8510	0.7806	0.6666	0.4855	0.3357	0.3626	0.6097	0.7932	0.8722	0.9057	(94)
Useful gains	318.5954	327.6576	331.7112	323.1465	285.7804	208.6319	136.8480	139.1063	217.6628	266.7922	290.4960	309.3311	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	711.9753	680.2264	613.3478	500.7912	375.8023	233.6400	143.2847	146.9035	266.9020	423.7295	563.0017	694.5024	(97)
Space heating kWh	292.6746	236.9262	209.5377	127.9042	66.9763	0.0000	0.0000	0.0000	0.0000	116.7614	196.2041	286.5675	(98a)
Space heating requirement - total per year (kWh/year)												1533.5519	
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	292.6746	236.9262	209.5377	127.9042	66.9763	0.0000	0.0000	0.0000	0.0000	116.7614	196.2041	286.5675	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1533.5519	
Space heating per m2										(98c) / (4) =		44.8669	(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 %)	84.0000	(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	292.6746	236.9262	209.5377	127.9042	66.9763	0.0000	0.0000	0.0000	0.0000	116.7614	196.2041	286.5675	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	348.4222	282.0550	249.4496	152.2670	79.7337	0.0000	0.0000	0.0000	0.0000	139.0016	233.5763	341.1517	(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	192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(64)
Efficiency of water heater												78.9000	(216)
(217)m	84.6945	84.4789	84.0319	83.1610	81.7804	78.9000	78.9000	78.9000	78.9000	82.9314	84.0280	84.6745	(217)
Fuel for water heating, kWh/month	227.6295	201.4866	213.9979	186.8465	181.9755	167.4330	163.2391	171.0245	174.3771	187.8908	200.7020	224.7423	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.4478	9.9861	8.9914	6.5875	5.0884	4.1572	4.6418	6.0335	7.8370	10.2825	11.6141	12.7938	(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)
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	1825.6571	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2301.3448	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	100.4612	(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	4272.4630	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1825.6571	5.6000	102.2368	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.3448	5.6000	128.8753	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	100.4612	26.0600	26.1802	(250)
Additional standing charges			99.0000	(251)
Total energy cost			368.0193	(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	1825.6571	0.2100	383.3880	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.3448	0.2100	483.2824	(264)
Space and water heating			866.6704	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	100.4612	0.1443	14.4997	(268)
Total CO2, kg/year			887.4121	(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	1825.6571	1.1300	2062.9925	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.3448	1.1300	2600.5196	(278)
Space and water heating			4663.5121	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	100.4612	1.5338	154.0907	(282)
Total Primary energy kWh/year			4885.6788	(286)

SAP 10 EPC IMPROVEMENTS

Mid-floor Flat

Current energy efficiency rating:	C 79
Current environmental impact rating:	B 83

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

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

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

Potential energy efficiency rating:	C 79
Potential environmental impact rating:	B 83

Fuel prices for cost data on this page from database revision number 561 TEST (31 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£38	£38	£0
Mains gas	£330	£330	£0
Space heating	£213	£213	£0
Water heating	£129	£129	£0
Lighting	£26	£26	£0
Total cost of fuels	£368	£368	£0
Total cost of uses	£368	£368	£0
Delivered energy	125 kWh/m²	125 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	26 kg/m²	26 kg/m²	0 kg/m²
Primary energy	143 kWh/m²	143 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	34.1800	(1b)	x 2.4100	(2b) =	82.3738	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		82.3738	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2428	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9928	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8439	(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	1.0759	1.0548	1.0337	0.9283	0.9072	0.8017	0.8017	0.7806	0.8439	0.9072	0.9494	0.9916	(22b)
Effective ac	1.0759	1.0548	1.0337	0.9308	0.9115	0.8213	0.8213	0.8047	0.8561	0.9115	0.9506	0.9916	(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								
Window			5.8000	1.5918	9.2322			(27)
External Wall 1	44.0500	5.8000	38.2500	0.3000	11.4750	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			44.0500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.7072			(33)
Main dwelling								
Party Wall 1			7.5400	0.0000	0.0000	180.0000	1357.2000	(32)
Party Wall 2			16.5800	0.0000	0.0000	20.0000	331.6000	(32)
Party Floor 1			34.1800			30.0000	1025.4000	(32d)
Party Ceiling 1			34.1800			30.0000	1025.4000	(32b)
Internal Wall - Timber			58.4200			9.0000	525.7800	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4265.3800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							124.7917	(35)
Thermal bridges (Default value 0.200 * total exposed area)							8.8100	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		29.5172	(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	29.2477	28.6742	28.1008	25.3033	24.7770	22.3270	22.3270	21.8733	23.2707	24.7770	25.8417	26.9548	(38)
Heat transfer coeff	58.7649	58.1914	57.6180	54.8205	54.2942	51.8442	51.8442	51.3905	52.7879	54.2942	55.3589	56.4720	(39)
Average = Sum(39)m / 12 =												54.8067	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7193	1.7025	1.6857	1.6039	1.5885	1.5168	1.5168	1.5035	1.5444	1.5885	1.6196	1.6522	(40)
HLP (average)												1.6035	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.2617	(42)
Hot water usage for mixer showers													
	82.9236	81.6775	79.8615	76.3871	73.8230	70.9636	69.3383	71.1405	73.1160	76.1862	79.7353	82.6059	(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													
	27.5510	26.5492	25.5473	24.5454	23.5436	22.5417	22.5417	23.5436	24.5454	25.5473	26.5492	27.5510	(42c)
Average daily hot water use (litres/day)												101.4992	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	110.4747	108.2266	105.4088	100.9325	97.3666	93.5053	91.8800	94.6841	97.6615	101.7335	106.2844	110.1569	(44)
Energy conte	174.9648	154.1133	162.0094	138.1716	131.0742	114.9757	111.1209	117.2387	120.4264	138.0514	151.4216	172.4791	(45)
Energy content (annual)										Total = Sum(45)m =		1686.0471	
Distribution loss (46)m = 0.15 x (45)m													
	26.2447	23.1170	24.3014	20.7257	19.6611	17.2464	16.6681	17.5858	18.0640	20.7077	22.7132	25.8719	(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	(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	17.8248	16.1004	17.8171	17.2117	17.7462	17.1289	17.6747	17.6996	17.1572	17.7690	17.2242	17.8203	(61)
Total heat required for water heating calculated for each month													
	192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(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													
	192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(64)
										Total per year (kWh/year) = Sum(64)m =		1895.2214	(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													
	62.6320	55.2678	58.3224	50.2450	48.0187	42.5117	41.3664	43.4068	44.3311	50.3443	54.6538	61.8044	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.2213	12.6312	10.2724	7.7769	5.8133	4.9078	5.3031	6.8932	9.2520	11.7475	13.7111	14.6166	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	160.0334	161.6940	157.5093	148.6004	137.3545	126.7850	119.7239	118.0632	122.2480	131.1569	142.4028	152.9723	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	(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)													
	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	(71)
Water heating gains (Table 5)													
	84.1828	82.2437	78.3904	69.7847	64.5413	59.0440	55.6000	58.3424	61.5709	67.6671	75.9080	83.0704	(72)
Total internal gains													
	327.5033	325.6348	315.2378	295.2277	276.7748	259.8025	249.6927	252.3646	262.1367	279.6373	301.0876	319.7250	(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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	349.2418	367.4628	385.6680	405.3555	421.5275	413.0643	393.4662	368.7511	346.0190	329.3815	327.9884	337.7761	(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	20.1622	20.3609	20.5635	21.6129	21.8224	22.8536	22.8536	23.0554	22.4451	21.8224	21.4027	20.9808	
alpha	2.3441	2.3574	2.3709	2.4409	2.4548	2.5236	2.5236	2.5370	2.4963	2.4548	2.4268	2.3987	
util living area													
	0.9410	0.9301	0.9070	0.8568	0.7715	0.6342	0.5076	0.5471	0.7321	0.8686	0.9234	0.9443	(86)
MIT	18.1075	18.3515	18.8292	19.5568	20.1758	20.6736	20.8673	20.8374	20.4853	19.7227	18.8779	18.1603	(87)
Th 2	20.1404	20.1488	20.1571	20.1981	20.2058	20.2416	20.2416	20.2482	20.2278	20.2058	20.1902	20.1739	(88)
util rest of house													
	0.9348	0.9227	0.8966	0.8400	0.7422	0.5852	0.4375	0.4788	0.6896	0.8501	0.9144	0.9385	(89)
MIT 2	17.4621	17.7086	18.1855	18.9246	19.5227	20.0042	20.1638	20.1487	19.8340	19.0982	18.2585	17.5358	(90)
Living area fraction										fLA = Living area / (4) =		0.4447	(91)
MIT	17.7491	17.9945	18.4718	19.2057	19.8132	20.3019	20.4767	20.4550	20.1236	19.3759	18.5340	17.8135	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7491	17.9945	18.4718	19.2057	19.8132	20.3019	20.4767	20.4550	20.1236	19.3759	18.5340	17.8135	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9120	0.8984	0.8707	0.8155	0.7260	0.5893	0.4602	0.4985	0.6832	0.8270	0.8908	0.9170	(94)
Useful gains	318.5045	330.1441	335.7992	330.5677	306.0356	243.4233	181.0688	183.8224	236.4077	272.3821	292.1752	309.7263	(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	790.3382	761.9859	689.7893	564.9651	440.4975	295.6103	200.9823	208.3867	317.9737	476.4828	632.9710	768.7815	(97)
Space heating kWh	351.0443	290.1977	263.3686	168.7661	100.0396	0.0000	0.0000	0.0000	0.0000	151.8509	245.3730	341.5370	(98a)
Space heating requirement - total per year (kWh/year)												1912.1773	
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	351.0443	290.1977	263.3686	168.7661	100.0396	0.0000	0.0000	0.0000	0.0000	151.8509	245.3730	341.5370	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1912.1773	
Space heating per m2											(98c) / (4) =	55.9443	(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 %)	84.0000	(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	351.0443	290.1977	263.3686	168.7661	100.0396	0.0000	0.0000	0.0000	0.0000	151.8509	245.3730	341.5370	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	417.9098	345.4734	313.5341	200.9121	119.0948	0.0000	0.0000	0.0000	0.0000	180.7749	292.1107	406.5917	(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	192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.1365	84.9784	84.6056	83.8545	82.6714	78.9000	78.9000	78.9000	78.9000	83.5814	84.5892	85.1020	(217)
Fuel for water heating, kWh/month	226.4476	200.3024	212.5470	185.3012	180.0143	167.4330	163.2391	171.0245	174.3771	186.4296	199.3704	223.6133	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.4478	9.9861	8.9914	6.5875	5.0884	4.1572	4.6418	6.0335	7.8370	10.2825	11.6141	12.7938	(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)
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	2276.4016	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2290.0995	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	100.4612	(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	4711.9623	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2276.4016	3.6400	82.8610	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2290.0995	3.6400	83.3596	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	100.4612	16.4900	16.5660	(250)
Additional standing charges			92.0000	(251)
Total energy cost			282.2072	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2831 (257)
SAP value		79.2012
SAP rating (Section 12)		79 (258)
SAP band		C

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	2276.4016	0.2100	478.0443	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2290.0995	0.2100	480.9209	(264)
Space and water heating			958.9652	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	100.4612	0.1443	14.4997	(268)
Total CO2, kg/year			979.7069	(272)
CO2 emissions per m2			28.6600	(273)
EI value			83.4200	
EI rating			83	(274)
EI band			B	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	34.1800	(1b)	x 2.4100	(2b) =	82.3738	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.1800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	82.3738	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.2428 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9928 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8439 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.9072	0.8650	0.8650	0.8017	0.8228	0.7173	0.7173	0.6962	0.7173	0.8017	0.7806	0.8439	(22b)
Effective ac	0.9115	0.8741	0.8741	0.8213	0.8385	0.7573	0.7573	0.7423	0.7573	0.8213	0.8047	0.8561	(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								
Window			5.8000	1.5918	9.2322			(27)
External Wall 1	44.0500	5.8000	38.2500	0.3000	11.4750	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			44.0500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.7072			(33)
Main dwelling								
Party Wall 1			7.5400	0.0000	0.0000	180.0000	1357.2000	(32)
Party Wall 2			16.5800	0.0000	0.0000	20.0000	331.6000	(32)
Party Floor 1			34.1800			30.0000	1025.4000	(32d)
Party Ceiling 1			34.1800			30.0000	1025.4000	(32b)
Internal Wall - Timber			58.4200			9.0000	525.7800	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4265.3800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							124.7917	(35)
Thermal bridges (Default value 0.200 * total exposed area)							8.8100	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		29.5172	(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	24.7770	23.7607	23.7607	22.3270	22.7928	20.5848	20.5848	20.1794	20.5848	22.3270	21.8733	23.2707	(38)
Heat transfer coeff	54.2942	53.2779	53.2779	51.8442	52.3100	50.1020	50.1020	49.6967	50.1020	51.8442	51.3905	52.7879	(39)
Average = Sum(39)m / 12 =												51.7524	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5885	1.5587	1.5587	1.5168	1.5304	1.4658	1.4658	1.4540	1.4658	1.5168	1.5035	1.5444	(40)
HLP (average)												1.5141	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.2617 (42)

Hot water usage for mixer showers

82.9236	81.6775	79.8615	76.3871	73.8230	70.9636	69.3383	71.1405	73.1160	76.1862	79.7353	82.6059	(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

27.5510	26.5492	25.5473	24.5454	23.5436	22.5417	22.5417	23.5436	24.5454	25.5473	26.5492	27.5510	(42c)

Average daily hot water use (litres/day) 101.4992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.4747	108.2266	105.4088	100.9325	97.3666	93.5053	91.8800	94.6841	97.6615	101.7335	106.2844	110.1569	(44)
Energy conte	174.9648	154.1133	162.0094	138.1716	131.0742	114.9757	111.1209	117.2387	120.4264	138.0514	151.4216	172.4791	(45)
Energy content (annual)										Total = Sum(45)m =		1686.0471	

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

26.2447	23.1170	24.3014	20.7257	19.6611	17.2464	16.6681	17.5858	18.0640	20.7077	22.7132	25.8719	(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	(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 17.8248	16.1004	17.8171	17.2117	17.7462	17.1289	17.6747	17.6996	17.1572	17.7690	17.2242	17.8203	(61)

Total heat required for water heating calculated for each month

192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(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

192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(64)
									Total per year (kWh/year) = Sum(64)m =		1895.2214	(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

62.6320	55.2678	58.3224	50.2450	48.0187	42.5117	41.3664	43.4068	44.3311	50.3443	54.6538	61.8044	(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	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.2213	12.6312	10.2724	7.7769	5.8133	4.9078	5.3031	6.8932	9.2520	11.7475	13.7111	14.6166	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.0334	161.6940	157.5093	148.6004	137.3545	126.7850	119.7239	118.0632	122.2480	131.1569	142.4028	152.9723	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	(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)	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	(71)
Water heating gains (Table 5)	84.1828	82.2437	78.3904	69.7847	64.5413	59.0440	55.6000	58.3424	61.5709	67.6671	75.9080	83.0704	(72)
Total internal gains	327.5033	325.6348	315.2378	295.2277	276.7748	259.8025	249.6927	252.3646	262.1367	279.6373	301.0876	319.7250	(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	
North	4.7500	12.7650	0.6300	0.7000	0.7700	18.5305	(74)
East	1.0500	23.8018	0.6300	0.7000	0.7700	7.6378	(76)

Solar gains	26.1684	44.2835	74.5620	118.7397	151.9098	169.9124	157.9212	131.2772	94.8457	56.6982	31.9610	21.8144	(83)
Total gains	353.6716	369.9183	389.7998	413.9674	428.6846	429.7149	407.6139	383.6418	356.9824	336.3355	333.0486	341.5394	(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	21.8224	22.2386	22.2386	22.8536	22.6501	23.6483	23.6483	23.8412	23.6483	22.8536	23.0554	22.4451	
alpha	2.4548	2.4826	2.4826	2.5236	2.5100	2.5766	2.5766	2.5894	2.5766	2.5236	2.5370	2.4963	
util living area	0.9308	0.9179	0.8879	0.8220	0.7109	0.5274	0.3811	0.4093	0.6561	0.8362	0.9063	0.9343	(86)
MIT	18.5509	18.8017	19.2507	19.9006	20.4460	20.8392	20.9526	20.9432	20.6853	20.0123	19.2817	18.5861	(87)
Th 2	20.2058	20.2206	20.2206	20.2416	20.2348	20.2671	20.2671	20.2730	20.2671	20.2416	20.2482	20.2278	(88)
util rest of house													

	0.9237	0.9095	0.8757	0.8016	0.6744	0.4694	0.3043	0.3314	0.6053	0.8132	0.8953	0.9276	(89)
MIT 2	17.9429	18.1999	18.6412	19.2864	19.7944	20.1622	20.2454	20.2459	20.0404	19.4016	18.6941	17.9925	(90)
Living area fraction										fLA = Living area / (4) =		0.4447	(91)
MIT	18.2133	18.4675	18.9122	19.5595	20.0841	20.4633	20.5599	20.5560	20.3272	19.6731	18.9554	18.2565	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2133	18.4675	18.9122	19.5595	20.0841	20.4633	20.5599	20.5560	20.3272	19.6731	18.9554	18.2565	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9008	0.8858	0.8510	0.7806	0.6666	0.4855	0.3357	0.3626	0.6097	0.7932	0.8722	0.9057	(94)
Useful gains	318.5954	327.6576	331.7112	323.1465	285.7804	208.6319	136.8480	139.1063	217.6628	266.7922	290.4960	309.3311	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	711.9753	680.2264	613.3478	500.7912	375.8023	233.6400	143.2847	146.9035	266.9020	423.7295	563.0017	694.5024	(97)
Space heating kWh													
	292.6746	236.9262	209.5377	127.9042	66.9763	0.0000	0.0000	0.0000	0.0000	116.7614	196.2041	286.5675	(98a)
Space heating requirement - total per year (kWh/year)												1533.5519	
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													
	292.6746	236.9262	209.5377	127.9042	66.9763	0.0000	0.0000	0.0000	0.0000	116.7614	196.2041	286.5675	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1533.5519	
Space heating per m2											(98c) / (4) =	44.8669	(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 %)	84.0000	(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													
	292.6746	236.9262	209.5377	127.9042	66.9763	0.0000	0.0000	0.0000	0.0000	116.7614	196.2041	286.5675	(98)
Space heating efficiency (main heating system 1)													
	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)													
	348.4222	282.0550	249.4496	152.2670	79.7337	0.0000	0.0000	0.0000	0.0000	139.0016	233.5763	341.1517	(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													
	192.7896	170.2137	179.8266	155.3833	148.8203	132.1046	128.7957	134.9383	137.5836	155.8204	168.6459	190.2994	(64)
Efficiency of water heater												78.9000	(216)
(217)m	84.6945	84.4789	84.0319	83.1610	81.7804	78.9000	78.9000	78.9000	78.9000	82.9314	84.0280	84.6745	(217)
Fuel for water heating, kWh/month													
	227.6295	201.4866	213.9979	186.8465	181.9755	167.4330	163.2391	171.0245	174.3771	187.8908	200.7020	224.7423	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.4478	9.9861	8.9914	6.5875	5.0884	4.1572	4.6418	6.0335	7.8370	10.2825	11.6141	12.7938	(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)
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	1825.6571	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2301.3448	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	100.4612	(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	4272.4630	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year

Space heating - main system 1	1825.6571	5.6000	102.2368	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.3448	5.6000	128.8753	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	100.4612	26.0600	26.1802	(250)
Additional standing charges			99.0000	(251)
Total energy cost			368.0193	(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	1825.6571	0.2100	383.3880	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2301.3448	0.2100	483.2824	(264)
Space and water heating			866.6704	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	100.4612	0.1443	14.4997	(268)
Total CO2, kg/year			887.4121	(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	1825.6571	1.1300	2062.9925	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2301.3448	1.1300	2600.5196	(278)
Space and water heating			4663.5121	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	100.4612	1.5338	154.0907	(282)
Total Primary energy kWh/year			4885.6788	(286)

Predicted Energy Assessment

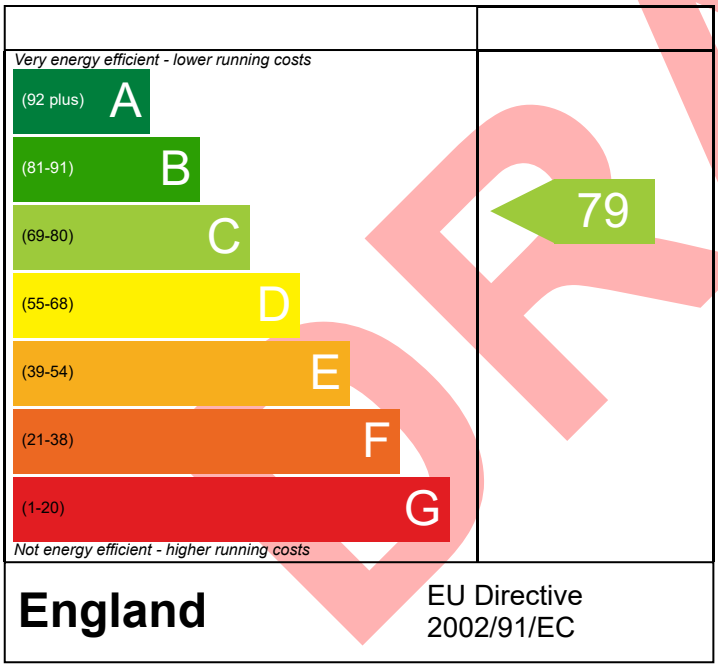
Flat 4, 99 London Road, Reading, RG1 5BY

Dwelling type:	Flat, Semi-Detached
Date of assessment:	17/02/2025
Produced by:	Sammit Pancholi
Total floor area:	34.18 m²
DRRN:	

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.

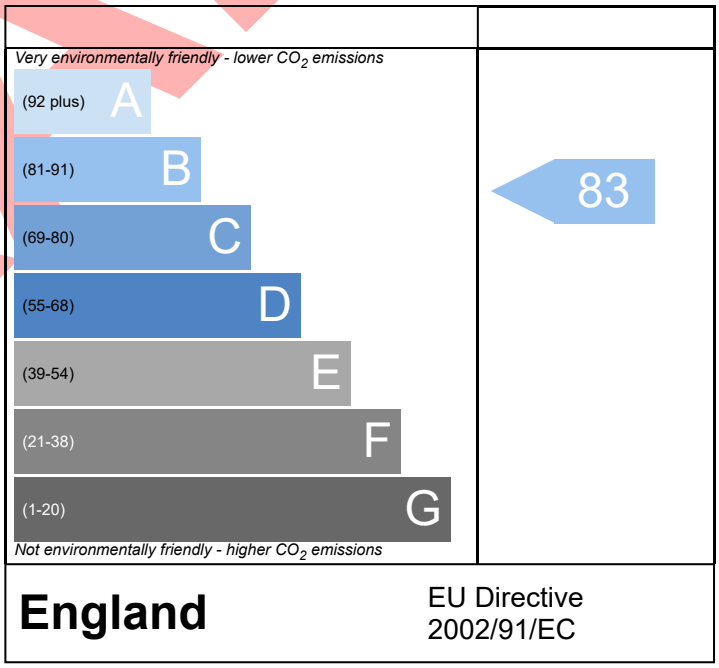
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

Property Reference	Flat 4 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Mid-floor Flat	**Prop Type Ref**	Ground Floor, Flat
Property	Flat 4, 99 London Road, Reading, RG1 5BY		

SAP Rating	79 C	**DER**	29.21	**TER**	
Environmental	83 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.89	**DFEE**	61.99	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	160.40	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	West	
Property Tenture	ND	
Transaction Type	5	
Terrain Type	Suburban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Mid-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2025	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	124.79	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	18.28 m	34.18 m²	2.41 m

8.0 Living Area	15.20	m²

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
External Wall 1	Solid Wall	Other	0.30	0.00	44.05	38.25	0.00	None	5.80	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, dense blocks, cavity or cavity fill	0.00	180.00	7.54		None
Party Wall 2	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	20.00	16.58		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall - Timber	Plasterboard on timber frame	9.00	58.42

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Timber I-joists, carpeted	20.00	34.18

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Timber I-joists, carpeted	20.00	34.18

Summary for Input Data

elmhurst energy

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	SAP table	Solid Door				0.00			3.00
Window	SAP table	Window	Double Low-E Soft 0.05	≥ 16 mm	Argon Filled	0.63	PVC	0.70	1.70

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening 1	Window	External Wall 1	East	1.05	
Opening 2	Window	External Wall 1	North	4.75	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.20	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	2	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	No	
Test Method	Blower Door	
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
LED	66.00	8.00	528.00	15

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18830	
Fuel Type	Mains gas	
In Winter	84.00	
In Summer	78.90	
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Controls SAP Code	2104	
Delayed Start Stat	No	
Flue Type	Open	
Fan Assisted Flue	Yes	
Is MHS Pumped	No pump	
Heat Emitter	Radiators	

Summary for Input Data

elmhurst energy

Flow Temperature	Unknown
Boiler Interlock	No
Combi boiler type	Standard Combi
Combi keep hot type	None

25.0 Main Heating 2 — None

26.0 Heat Networks — None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	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	0

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.40		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder — None

In Airing Cupboard — No

34.0 Small-scale Hydro — None

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

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
			0	0
			0	0
			0	0

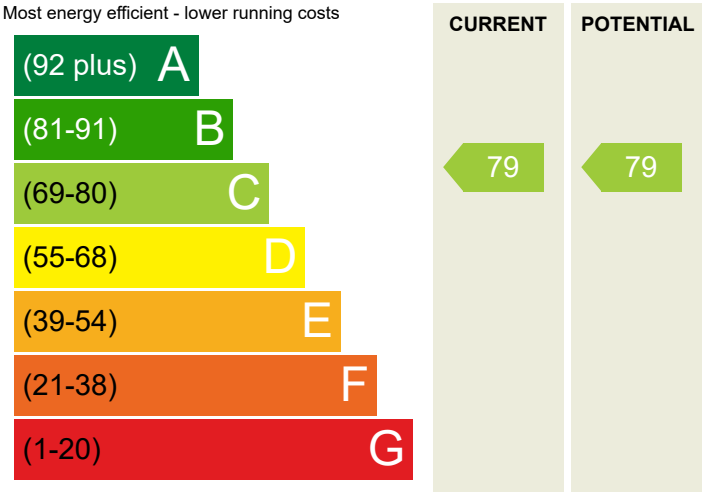
Energy Report

Dwelling Address	Flat 4, 99 London Road, Reading, RG1 5BY
Reference	Flat 4 - Baseline-Mid-floor Flat
Assessment Date	17/02/2025
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	34

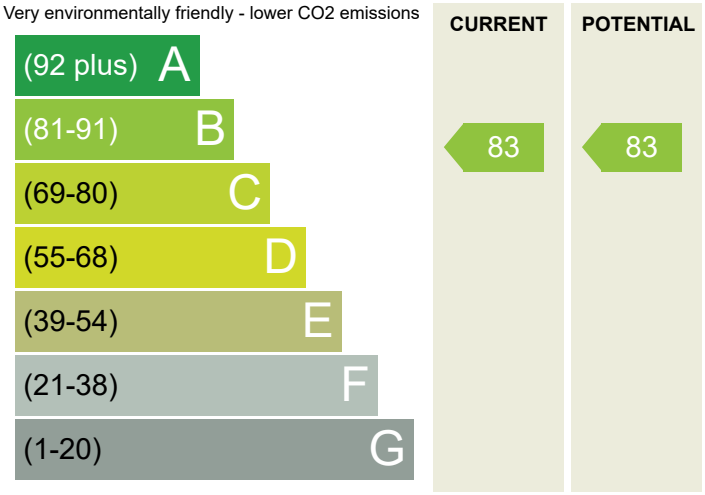
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

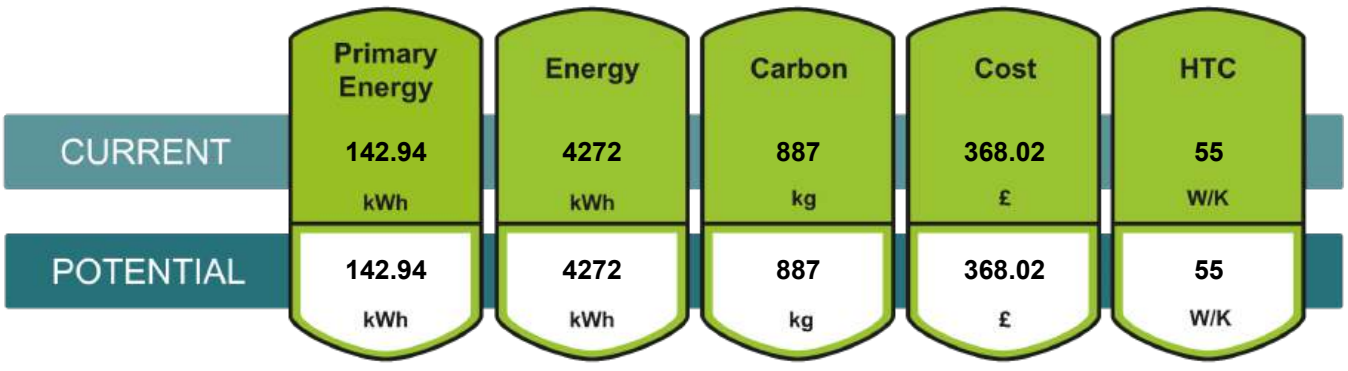
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.3 W/m²K	Good
Windows	Fully double glazed	Average
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer and room thermostat	Average
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

Energy Report

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£26	£26	
Heating	£213	£213	
Hot Water	£129	£129	
New Technologies e.g. Impact of PV	£0	£0	
TOTAL	£368	£368	

Estimated energy use and potential savings

Space Heating
1826
kWh per year

Water Heating
2301
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report

Property Reference	Flat 4 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Mid-floor Flat	**Prop Type Ref**	Semi-Detached Flat
Property	Flat 4, 99 London Road, Reading, RG1 5BY		

SAP Rating	79 C	**DER**	29.21	**TER**	
Environmental	83 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.89	**DFEE**	61.99	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	160.40	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	Flat 4, 99 London Road	
House Number		
Postcode	RG1 5BY	
Street		
Town	Reading	
County		

Dwelling Orientation West (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Suburban

Property Type Flat, Semi-Detached

Comments

Electricity Tariff Standard

Smart electricity meter fitted: No

Smart gas meter fitted: No

Comments

Section 2: Dwelling Construction Details

External Walls

Description	External Wall 1	
Type	Solid Wall	
Construction	Other	
U-value	0.30	W/m²K U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	44.05	m²

Comments

Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	7.54
Party Wall 2	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	16.58

Comments

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
Door	SAP table	Solid Door		0.00	Wood	3.00
Window	SAP table	Window	Double Low-E Soft 0.05	0.63	PVC	1.70

Comments

Openings

Name	Opening Type	Location	Orientation	Area (m²)
Opening 1	Window	External Wall 1	East	1.05
Opening 2	Window	External Wall 1	North	4.75

Comments

Thermal Bridging Default

Y-value 0.200

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing No

Designed AP_{50} 8.00 $m^3/(h.m^2)$ @ 50 Pa

Property Tested? Yes

Test Method Blower Door

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

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	2
Number of passive vents	0
Number of flueless gas fires	0

Comments

Fixed Cooling System No

Comments

Lighting

No Fixed Lighting: No

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
LED	66.00	8.00	528.00	15

Comments

Main Heating 1 Database

Fuel Type	Mains gas	
Winter Efficiency	84.00	%
Summer Efficiency	78.90	%
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Flue Type	Open	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Programmer and room thermostat
Boiler Interlock	No
Delayed Start Stat	No
PCDF Control Description	

Comments

Main Heating 2 None

Secondary Heating None

Water Heating System

Water Heating	Main Heating 1
Supplementary Immersion	No
SAP Code	901
Water use <= 125 l/p/day	Yes
Cold Water Source	From mains
Number of baths	0

Comments

Hot Water Cylinder None

Comments

Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.40		No	

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit None

Dwelling Sign Off Report

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed .....

Date .....

Full SAP Calculation Printout

Property Reference	Flat 4 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Mid-floor Flat	**Prop Type Ref**	Ground Floor, Flat
Property	Flat 4, 99 London Road, Reading, RG1 5BY		

SAP Rating	85 B	**DER**	22.74	**TER**	
Environmental	87 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.67	**DFEE**	53.95	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	121.48	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

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

---

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	34.1800	(1b)	x 2.4100	(2b) =	82.3738	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.1800					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	82.3738	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2428	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9928	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8439	(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	1.0759	1.0548	1.0337	0.9283	0.9072	0.8017	0.8017	0.7806	0.8439	0.9072	0.9494	0.9916	(22b)
Effective ac	1.0759	1.0548	1.0337	0.9308	0.9115	0.8213	0.8213	0.8047	0.8561	0.9115	0.9506	0.9916	(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								
Window			5.8000	1.1450	6.6412			(27)
External Wall 1	44.0500	5.8000	38.2500	0.2100	8.0325	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			44.0500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.6737			(33)
Main dwelling								
Party Wall 1			7.5400	0.0000	0.0000	180.0000	1357.2000	(32)
Party Wall 2			16.5800	0.0000	0.0000	20.0000	331.6000	(32)
Party Floor 1			34.1800			30.0000	1025.4000	(32d)
Party Ceiling 1			34.1800			20.0000	683.6000	(32b)
Internal Wall - Timber			58.4200			9.0000	525.7800	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		3923.5800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							114.7917	(35)
Thermal bridges (Default value 0.200 * total exposed area)							8.8100	(36)
Point Thermal bridges					(36a) =		0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		23.4837	(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	29.2477	28.6742	28.1008	25.3033	24.7770	22.3270	22.3270	21.8733	23.2707	24.7770	25.8417	26.9548	(38)

Heat transfer coeff

	52.7314	52.1580	51.5845	48.7870	48.2607	45.8107	45.8107	45.3570	46.7544	48.2607	49.3254	50.4385 (39)
Average = Sum(39)m / 12 =												48.7732

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5428	1.5260	1.5092	1.4274	1.4120	1.3403	1.3403	1.3270	1.3679	1.4120	1.4431	1.4757	(40)
HLP (average)												1.4270	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.2617 (42)

Hot water usage for mixer showers

	69.1030	68.0645	66.5513	63.6559	61.5192	59.1363	57.7819	59.2837	60.9300	63.4885	66.4460	68.8383 (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

	27.5510	26.5492	25.5473	24.5454	23.5436	22.5417	22.5417	23.5436	24.5454	25.5473	26.5492	27.5510 (42c)

Average daily hot water use (litres/day) 88.7571 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	96.6540	94.6137	92.0986	88.2013	85.0628	81.6781	80.3237	82.8273	85.4755	89.0358	92.9952	96.3893	(44)
Energy conte	153.0764	134.7287	141.5521	120.7432	114.5108	100.4327	97.1445	102.5575	105.3998	120.8207	132.4887	150.9223	(45)
Energy content (annual)										Total = Sum(45)m =		1474.3775	
Distribution loss (46)m = 0.15 x (45)m													
	22.9615	20.2093	21.2328	18.1115	17.1766	15.0649	14.5717	15.3836	15.8100	18.1231	19.8733	22.6383	(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	(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	17.8031	16.0630	17.7539	17.1261	17.6616	17.0576	17.6073	17.6267	17.0802	17.6900	17.1729	17.7962	(61)
Total heat required for water heating calculated for each month													
	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185	(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													
	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185	(64)
										Total per year (kWh/year) = Sum(64)m =		1682.8159	(64)
12Total per year (kWh/year)												1683	(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													
	55.3487	48.8130	51.5045	44.4286	42.4902	37.6583	36.7024	38.5071	39.3155	44.5954	48.3457	54.6307	(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	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	55.7961	61.7743	55.7961	57.6560	55.7961	57.6560	55.7961	55.7961	57.6560	55.7961	57.6560	55.7961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	107.2224	108.3350	105.5312	99.5623	92.0275	84.9459	80.2150	79.1024	81.9062	87.8751	95.4099	102.4914	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	(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)													
	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	(71)
Water heating gains (Table 5)													
	74.3934	72.6384	69.2265	61.7065	57.1105	52.3032	49.3312	51.7568	54.6048	59.9400	67.1468	73.4284	(72)
Total internal gains													
	279.3373	284.6732	272.4793	260.8502	246.8596	236.8305	227.2677	228.5807	236.0924	245.5367	262.1381	273.6414	(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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511 (83)
Total gains	301.0758	326.5012	342.9095	370.9779	391.6123	390.0923	371.0412	344.9673	319.9748	295.2809	289.0389	291.6925 (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	20.6686	20.8958	21.1281	22.3396	22.5832	23.7910	23.7910	24.0290	23.3108	22.5832	22.0958	21.6082	
alpha	2.3779	2.3931	2.4085	2.4893	2.5055	2.5861	2.5861	2.6019	2.5541	2.5055	2.4731	2.4405	
util living area													
	0.9473	0.9336	0.9110	0.8543	0.7616	0.6124	0.4856	0.5276	0.7216	0.8709	0.9281	0.9502	(86)
MIT	18.1004	18.3824	18.8584	19.6236	20.2386	20.7195	20.8894	20.8618	20.5301	19.7623	18.9085	18.1693	(87)
Th 2	19.6556	19.6681	19.6806	19.7424	19.7542	19.8094	19.8094	19.8197	19.7880	19.7542	19.7304	19.7058	(88)
util rest of house													
	0.9381	0.9219	0.8944	0.8261	0.7121	0.5313	0.3736	0.4169	0.6495	0.8402	0.9138	0.9416	(89)
MIT 2	17.0876	17.3718	17.8457	18.6222	19.1987	19.6473	19.7660	19.7611	19.4903	18.7747	17.9320	17.1867	(90)
Living area fraction										fLA = Living area / (4) =		0.4447	(91)

MIT	17.5380	17.8212	18.2960	19.0675	19.6611	20.1241	20.2656	20.2506	19.9527	19.2139	18.3662	17.6237 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.3880	17.6712	18.1460	18.9175	19.5111	19.9741	20.1156	20.1006	19.8027	19.0639	18.2162	17.4737 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9165	0.8984	0.8695	0.8037	0.7010	0.5435	0.4042	0.4451	0.6505	0.8191	0.8912	0.9212	(94)
Useful gains	275.9413	293.3314	298.1559	298.1390	274.5179	212.0100	149.9667	153.5577	208.1406	241.8661	257.5806	268.7056	(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	690.1488	666.1206	600.7538	488.7247	376.9702	246.1908	161.0520	167.8487	266.6253	408.4738	548.3117	669.5043	(97)
Space heating kWh	308.1704	250.5143	225.1328	137.2217	76.2245	0.0000	0.0000	0.0000	0.0000	123.9562	209.3264	298.1943	(98a)
Space heating requirement - total per year (kWh/year)												1628.7406	
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	308.1704	250.5143	225.1328	137.2217	76.2245	0.0000	0.0000	0.0000	0.0000	123.9562	209.3264	298.1943	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1628.7406	
Space heating per m2											(98c) / (4) =	47.6519	(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 %)												89.0000	(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	308.1704	250.5143	225.1328	137.2217	76.2245	0.0000	0.0000	0.0000	0.0000	123.9562	209.3264	298.1943	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	346.2588	281.4768	252.9582	154.1817	85.6455	0.0000	0.0000	0.0000	0.0000	139.2766	235.1982	335.0498	(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	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.1136	84.9156	84.5168	83.6344	82.3168	78.9000	78.9000	78.9000	78.9000	83.3681	84.4910	85.0652	(217)
Fuel for water heating, kWh/month	200.7665	177.5783	188.4904	164.8477	160.5655	148.9104	145.4396	152.3247	155.2344	166.1435	177.1333	198.3402	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.4478	9.9861	8.9914	6.5875	5.0884	4.1572	4.6418	6.0335	7.8370	10.2825	11.6141	12.7938	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.3946	-12.1115	-20.4567	-26.4377	-31.0924	-29.9721	-29.4469	-26.3349	-21.1909	-15.0642	-8.6081	-6.1537	(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	-2.1074	-5.2396	-12.7363	-22.7898	-33.4441	-34.9049	-33.9767	-26.6728	-16.9413	-8.1387	-2.9654	-1.5891	(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												1830.0457	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												78.9000	
Water heating fuel used												2035.7744	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												45.0000	(231)
Electricity for lighting (calculated in Appendix L)												100.4612	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-435.7700	(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												3575.5113	(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	1830.0457	0.2100	384.3096	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2035.7744	0.2100	427.5126	(264)

Space and water heating			811.8222	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	100.4612	0.1443	14.4997	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-234.2638	0.1319	-30.9095	
PV Unit electricity exported	-201.5063	0.1218	-24.5458	
Total			-55.4553	(269)
Total CO2, kg/year			777.1086	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			22.7400	(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	1830.0457	1.1300	2067.9516	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2035.7744	1.1300	2300.4251	(278)
Space and water heating			4368.3767	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	100.4612	1.5338	154.0907	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-234.2638	1.4875	-348.4653	
PV Unit electricity exported	-201.5063	0.4469	-90.0591	
Total			-438.5244	(283)
Total Primary energy kWh/year			4152.0191	(286)
Dwelling Primary energy Rate (DPER)			121.4800	(287)

SAP 10 WORKSHEET FOR Conversion (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						
Ground floor	34.1800	(1b) x	2.4100	(2b) =	82.3738	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		82.3738	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2428	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9928	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8439	(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	1.0759	1.0548	1.0337	0.9283	0.9072	0.8017	0.8017	0.7806	0.8439	0.9072	0.9494	0.9916	(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	1.0759	1.0548	1.0337	0.9308	0.9115	0.8213	0.8213	0.8047	0.8561	0.9115	0.9506	0.9916	(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								
Window			5.8000	1.1450	6.6412			(27)
External Wall 1	44.0500	5.8000	38.2500	0.2100	8.0325	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			44.0500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.6737			(33)
Main dwelling								
Party Wall 1			7.5400	0.0000	0.0000	180.0000	1357.2000	(32)
Party Wall 2			16.5800	0.0000	0.0000	20.0000	331.6000	(32)
Party Floor 1			34.1800			30.0000	1025.4000	(32d)
Party Ceiling 1			34.1800			30.0000	1025.4000	(32b)
Internal Wall - Timber			58.4200			9.0000	525.7800	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 4265.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 124.7917 (35)
Thermal bridges (Default value 0.200 * total exposed area) 8.8100 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 23.4837 (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	29.2477	28.6742	28.1008	25.3033	24.7770	22.3270	22.3270	21.8733	23.2707	24.7770	25.8417	26.9548	(38)
Heat transfer coeff	52.7314	52.1580	51.5845	48.7870	48.2607	45.8107	45.8107	45.3570	46.7544	48.2607	49.3254	50.4385	(39)

Average = Sum(39)m / 12 = 48.7732

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5428	1.5260	1.5092	1.4274	1.4120	1.3403	1.3403	1.3270	1.3679	1.4120	1.4431	1.4757	(40)
HLP (average)												1.4270	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.2617 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	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	19.6355	19.3439	18.9332	18.1760	17.6091	16.9804	16.6408	17.0486	17.4926	18.1653	18.9381	19.5691	(42b)
Hot water usage for other uses	27.5510	26.5492	25.5473	24.5454	23.5436	22.5417	22.5417	23.5436	24.5454	25.5473	26.5492	27.5510	(42c)

Average daily hot water use (litres/day) 43.2515 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	47.1865	45.8930	44.4805	42.7215	41.1527	39.5221	39.1826	40.5922	42.0380	43.7126	45.4872	47.1201	(44)
Energy conte	74.7318	65.3510	68.3649	58.4836	55.3994	48.5971	47.3879	50.2616	51.8371	59.3176	64.8049	73.7787	(45)

Energy content (annual) Total = Sum(45)m = 718.3156

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	(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	63.5221	55.5484	58.1101	49.7110	47.0895	41.3075	40.2797	42.7224	44.0615	50.4199	55.0842	62.7119	(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	63.5221	55.5484	58.1101	49.7110	47.0895	41.3075	40.2797	42.7224	44.0615	50.4199	55.0842	62.7119	(64)

Total per year (kWh/year) = Sum(64)m = 610.5682 (64)

12Total per year (kWh/year) 611 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Electric shower(s)	36.3369	32.3765	35.3539	33.7377	34.3708	32.7864	33.8793	34.3708	33.7377	35.3539	34.6891	36.3369	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 413.3299 (64a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	24.9647	21.9812	23.3660	20.8622	20.3651	18.5235	18.5398	19.2733	19.4498	21.4434	22.4433	24.7622	(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	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	63.0847	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.7961	61.7743	55.7961	57.6560	55.7961	57.6560	55.7961	55.7961	57.6560	55.7961	57.6560	55.7961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	107.2224	108.3350	105.5312	99.5623	92.0275	84.9459	80.2150	79.1024	81.9062	87.8751	95.4099	102.4914	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	29.3085	(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)	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	(71)
Water heating gains (Table 5)	33.5548	32.7101	31.4059	28.9753	27.3724	25.7271	24.9190	25.9050	27.0136	28.8218	31.1713	33.2825	(72)
Total internal gains	238.4987	244.7449	234.6587	228.1190	217.1215	210.2544	202.8556	202.7289	208.5012	214.4185	226.1626	233.4955	(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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	260.2372	286.5729	305.0889	338.2467	361.8742	363.5162	346.6291	319.1154	292.3836	264.1627	253.0633	251.5466	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	22.4691	22.7161	22.9687	24.2857	24.5506	25.8636	25.8636	26.1223	25.3415	24.5506	24.0206	23.4906

alpha	2.4979	2.5144	2.5312	2.6190	2.6367	2.7242	2.7242	2.7415	2.6894	2.6367	2.6014	2.5660	
util living area	0.9660	0.9548	0.9361	0.8854	0.7978	0.6489	0.5174	0.5651	0.7637	0.9035	0.9515	0.9684	(86)
MIT	18.0791	18.3601	18.8340	19.6066	20.2295	20.7186	20.8909	20.8605	20.5162	19.7333	18.8780	18.1456	(87)
Th 2	19.6556	19.6681	19.6806	19.7424	19.7542	19.8094	19.8094	19.8197	19.7880	19.7542	19.7304	19.7058	(88)
util rest of house	0.9594	0.9461	0.9229	0.8606	0.7504	0.5660	0.3995	0.4490	0.6936	0.8775	0.9407	0.9624	(89)
MIT 2	17.0558	17.3404	17.8146	18.6027	19.1905	19.6478	19.7675	19.7615	19.4804	18.7438	17.8941	17.1529	(90)
Living area fraction									fLA = Living area / (4) =			0.4447	(91)
MIT	17.5108	17.7939	18.2679	19.0491	19.6526	20.1240	20.2671	20.2502	19.9410	19.1838	18.3317	17.5944	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.5108	17.7939	18.2679	19.0491	19.6526	20.1240	20.2671	20.2502	19.9410	19.1838	18.3317	17.5944	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9447	0.9293	0.9044	0.8439	0.7460	0.5896	0.4474	0.4942	0.7036	0.8626	0.9248	0.9487	(94)
Useful gains	245.8446	266.3067	275.9231	285.4447	269.9542	214.3460	155.0891	157.7174	205.7291	227.8717	234.0250	238.6536	(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	696.6261	672.5179	607.0431	495.1452	383.7960	253.0580	167.9927	174.6336	273.0931	414.2614	554.0060	675.5920	(97)
Space heating kWh	335.3815	272.9739	246.3533	150.9844	84.6983	0.0000	0.0000	0.0000	0.0000	138.6739	230.3863	325.0822	(98a)
Space heating requirement - total per year (kWh/year)												1784.5338	
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	335.3815	272.9739	246.3533	150.9844	84.6983	0.0000	0.0000	0.0000	0.0000	138.6739	230.3863	325.0822	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1784.5338	
Space heating per m2											(98c) / (4) =	52.2099	(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	430.6206	338.9992	344.7132	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7092	0.7779	0.7443	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	305.4107	263.7164	256.5849	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	405.5969	387.0307	355.9270	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	72.1340	91.7458	73.9105	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	18.0335	22.9365	18.4776	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												59.4476	(107)
Energy for space heating												52.2099	(99)
Energy for space cooling												1.7393	(108)
Total												53.9491	(109)
Fabric Energy Efficiency (DFEE)												53.9	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	34.1800	(1b)	x 2.4100	(2b) =	82.3738	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		82.3738	(5)

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2. Ventilation rate

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	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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2428	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9928	(18)
Number of sides sheltered		2	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.8439 (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													
	1.0759	1.0548	1.0337	0.9283	0.9072	0.8017	0.8017	0.7806	0.8439	0.9072	0.9494	0.9916	(22b)
Effective ac	1.0759	1.0548	1.0337	0.9308	0.9115	0.8213	0.8213	0.8047	0.8561	0.9115	0.9506	0.9916	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			5.8000	1.1450	6.6412			(27)
External Wall 1	44.0500	5.8000	38.2500	0.2100	8.0325	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			44.0500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.6737			(33)
Main dwelling								
Party Wall 1			7.5400	0.0000	0.0000	180.0000	1357.2000	(32)
Party Wall 2			16.5800	0.0000	0.0000	20.0000	331.6000	(32)
Party Floor 1			34.1800			30.0000	1025.4000	(32d)
Party Ceiling 1			34.1800			30.0000	1025.4000	(32b)
Internal Wall - Timber			58.4200			9.0000	525.7800	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 4265.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 124.7917 (35)
Thermal bridges (Default value 0.200 * total exposed area) 8.8100 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 23.4837 (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	29.2477	28.6742	28.1008	25.3033	24.7770	22.3270	22.3270	21.8733	23.2707	24.7770	25.8417	26.9548	(38)
Heat transfer coeff													
	52.7314	52.1580	51.5845	48.7870	48.2607	45.8107	45.8107	45.3570	46.7544	48.2607	49.3254	50.4385	(39)
Average = Sum(39)m / 12 =												48.7732	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5428	1.5260	1.5092	1.4274	1.4120	1.3403	1.3403	1.3270	1.3679	1.4120	1.4431	1.4757	(40)
HLP (average)												1.4270	
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 1.2617 (42)
Hot water usage for mixer showers

69.1030	68.0645	66.5513	63.6559	61.5192	59.1363	57.7819	59.2837	60.9300	63.4885	66.4460	68.8383	(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

27.5510	26.5492	25.5473	24.5454	23.5436	22.5417	22.5417	23.5436	24.5454	25.5473	26.5492	27.5510	(42c)

Average daily hot water use (litres/day) 88.7571 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	96.6540	94.6137	92.0986	88.2013	85.0628	81.6781	80.3237	82.8273	85.4755	89.0358	92.9952	96.3893	(44)
Energy conte	153.0764	134.7287	141.5521	120.7432	114.5108	100.4327	97.1445	102.5575	105.3998	120.8207	132.4887	150.9223	(45)
Energy content (annual)										Total = Sum(45)m =		1474.3775	
Distribution loss (46)m = 0.15 x (45)m													
	22.9615	20.2093	21.2328	18.1115	17.1766	15.0649	14.5717	15.3836	15.8100	18.1231	19.8733	22.6383	(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	(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	17.8031	16.0630	17.7539	17.1261	17.6616	17.0576	17.6073	17.6267	17.0802	17.6900	17.1729	17.7962	(61)
Total heat required for water heating calculated for each month													
	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185	(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													
	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185	(64)
									Total per year (kWh/year) = Sum(64)m =			1682.8159	(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													
	55.3487	48.8130	51.5045	44.4286	42.4902	37.6583	36.7024	38.5071	39.3155	44.5954	48.3457	54.6307	(65)

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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	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.2213	12.6312	10.2724	7.7769	5.8133	4.9078	5.3031	6.8932	9.2520	11.7475	13.7111	14.6166	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	160.0334	161.6940	157.5093	148.6004	137.3545	126.7850	119.7239	118.0632	122.2480	131.1569	142.4028	152.9723	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	(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)													
	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	(71)
Water heating gains (Table 5)													
	74.3934	72.6384	69.2265	61.7065	57.1105	52.3032	49.3312	51.7568	54.6048	59.9400	67.1468	73.4284	(72)
Total internal gains													

	317.7139	316.0295	306.0740	287.1495	269.3441	253.0617	243.4239	245.7789	255.1706	271.9102	292.3265	310.0830 (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	
North	4.7500	10.6334	0.6300	0.7000	0.7700	15.4361	(74)
East	1.0500	19.6403	0.6300	0.7000	0.7700	6.3024	(76)

Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511	(83)
Total gains	339.4524	357.8575	376.5042	397.2772	414.0968	406.3235	387.1974	362.1655	339.0529	321.6544	319.2273	328.1341	(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	22.4691	22.7161	22.9687	24.2857	24.5506	25.8636	25.8636	26.1223	25.3415	24.5506	24.0206	23.4906	
alpha	2.4979	2.5144	2.5312	2.6190	2.6367	2.7242	2.7242	2.7415	2.6894	2.6367	2.6014	2.5660	
util living area	0.9411	0.9293	0.9041	0.8478	0.7535	0.6042	0.4744	0.5144	0.7106	0.8614	0.9219	0.9444	(86)
MIT	18.3950	18.6348	19.0908	19.7854	20.3418	20.7658	20.9121	20.8899	20.6021	19.9181	19.1332	18.4590	(87)
Th 2	19.6556	19.6681	19.6806	19.7424	19.7542	19.8094	19.8094	19.8197	19.7880	19.7542	19.7304	19.7058	(88)
util rest of house	0.9305	0.9164	0.8859	0.8177	0.7017	0.5214	0.3624	0.4033	0.6357	0.8280	0.9059	0.9345	(89)
MIT 2	17.3630	17.6055	18.0580	18.7645	19.2820	19.6778	19.7765	19.7751	19.5424	18.9099	18.1381	17.4581	(90)
Living area fraction									fLA = Living area / (4) =			0.4447	(91)
MIT	17.8219	18.0632	18.5173	19.2185	19.7533	20.1616	20.2815	20.2709	20.0136	19.3583	18.5806	17.9032	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.6719	17.9132	18.3673	19.0685	19.6033	20.0116	20.1315	20.1209	19.8636	19.2083	18.4306	17.7532	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9095	0.8943	0.8629	0.7985	0.6946	0.5365	0.3943	0.4334	0.6409	0.8101	0.8848	0.9147	(94)
Useful gains	308.7204	320.0349	324.8776	317.2133	287.6336	218.0046	152.6895	156.9804	217.3005	260.5863	282.4426	300.1420	(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	705.1218	678.7437	612.1670	496.0883	381.4194	247.9106	161.7815	168.7673	269.4757	415.4408	558.8865	683.6047	(97)
Space heating kWh	294.9227	241.0523	213.7433	128.7900	69.7766	0.0000	0.0000	0.0000	0.0000	115.2118	199.0396	285.2963	(98a)
Space heating requirement - total per year (kWh/year)												1547.8326	
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	294.9227	241.0523	213.7433	128.7900	69.7766	0.0000	0.0000	0.0000	0.0000	115.2118	199.0396	285.2963	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1547.8326	
Space heating per m2											(98c) / (4) =	45.2847	(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 %)	89.0000	(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	294.9227	241.0523	213.7433	128.7900	69.7766	0.0000	0.0000	0.0000	0.0000	115.2118	199.0396	285.2963	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	331.3738	270.8453	240.1610	144.7079	78.4007	0.0000	0.0000	0.0000	0.0000	129.4514	223.6401	320.5576	(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	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.0080	84.8216	84.3870	83.4752	82.1199	78.9000	78.9000	78.9000	78.9000	83.1867	84.3649	84.9585	(217)
Fuel for water heating, kWh/month	201.0158	177.7751	188.7802	165.1619	160.9504	148.9104	145.4396	152.3247	155.2344	166.5059	177.3980	198.5893	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.4478	9.9861	8.9914	6.5875	5.0884	4.1572	4.6418	6.0335	7.8370	10.2825	11.6141	12.7938	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.3946	-12.1115	-20.4567	-26.4377	-31.0924	-29.9721	-29.4469	-26.3349	-21.1909	-15.0642	-8.6081	-6.1537	(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	-2.1074	-5.2396	-12.7363	-22.7898	-33.4441	-34.9049	-33.9767	-26.6728	-16.9413	-8.1387	-2.9654	-1.5891	(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	1739.1378	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2038.0859	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	100.4612	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-435.7700	(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	3486.9148	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1739.1378	3.6400	63.3046	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2038.0859	3.6400	74.1863	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	100.4612	16.4900	16.5660	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-234.2638	16.4900	-38.6301	
PV Unit electricity exported	-201.5063	5.5900	-11.2642	
Total			-49.8943	(252)
Total energy cost			203.5832	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9256	(257)
SAP value		84.9958	
SAP rating (Section 12)		85	(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	1739.1378	0.2100	365.2189	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2038.0859	0.2100	427.9980	(264)
Space and water heating			793.2170	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	100.4612	0.1443	14.4997	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-234.2638	0.1319	-30.9095	
PV Unit electricity exported	-201.5063	0.1218	-24.5458	
Total			-55.4553	(269)
Total CO2, kg/year			758.5034	(272)
CO2 emissions per m2			22.1900	(273)
EI value			87.1635	
EI rating			87	(274)
EI band			B	

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	34.1800	(1b)	x 2.4100	(2b) =	82.3738	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		82.3738	(5)

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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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2428	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9928	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8439	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.9072	0.8650	0.8650	0.8017	0.8228	0.7173	0.7173	0.6962	0.7173	0.8017	0.7806	0.8439	(22b)
Effective ac	0.9115	0.8741	0.8741	0.8213	0.8385	0.7573	0.7573	0.7423	0.7573	0.8213	0.8047	0.8561	(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								
Window			5.8000	1.1450	6.6412			(27)
External Wall 1	44.0500	5.8000	38.2500	0.2100	8.0325	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			44.0500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.6737			(33)
Main dwelling								
Party Wall 1			7.5400	0.0000	0.0000	180.0000	1357.2000	(32)
Party Wall 2			16.5800	0.0000	0.0000	20.0000	331.6000	(32)
Party Floor 1			34.1800			30.0000	1025.4000	(32d)
Party Ceiling 1			34.1800			30.0000	1025.4000	(32b)
Internal Wall - Timber			58.4200			9.0000	525.7800	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4265.3800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							124.7917	(35)
Thermal bridges (Default value 0.200 * total exposed area)							8.8100	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		23.4837	(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	24.7770	23.7607	23.7607	22.3270	22.7928	20.5848	20.5848	20.1794	20.5848	22.3270	21.8733	23.2707	(38)
Heat transfer coeff	48.2607	47.2444	47.2444	45.8107	46.2765	44.0685	44.0685	43.6632	44.0685	45.8107	45.3570	46.7544	(39)
Average = Sum(39)m / 12 =												45.7190	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4120	1.3822	1.3822	1.3403	1.3539	1.2893	1.2893	1.2774	1.2893	1.3403	1.3270	1.3679	(40)
HLP (average)												1.3376	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy											1.2617	(42)
Hot water usage for mixer showers	69.1030	68.0645	66.5513	63.6559	61.5192	59.1363	57.7819	59.2837	60.9300	63.4885	66.4460	68.8383	(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	27.5510	26.5492	25.5473	24.5454	23.5436	22.5417	22.5417	23.5436	24.5454	25.5473	26.5492	27.5510	(42c)
Average daily hot water use (litres/day)												88.7571	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.6540	94.6137	92.0986	88.2013	85.0628	81.6781	80.3237	82.8273	85.4755	89.0358	92.9952	96.3893	(44)
Energy conte	153.0764	134.7287	141.5521	120.7432	114.5108	100.4327	97.1445	102.5575	105.3998	120.8207	132.4887	150.9223	(45)
Energy content (annual)										Total = Sum(45)m =		1474.3775	
Distribution loss (46)m = 0.15 x (45)m	22.9615	20.2093	21.2328	18.1115	17.1766	15.0649	14.5717	15.3836	15.8100	18.1231	19.8733	22.6383	(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	(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	17.8031	16.0630	17.7539	17.1261	17.6616	17.0576	17.6073	17.6267	17.0802	17.6900	17.1729	17.7962	(61)
Total heat required for water heating calculated for each month	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185	(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	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185	(64)
										Total per year (kWh/year) = Sum(64)m =		1682.8159	(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

	55.3487	48.8130	51.5045	44.4286	42.4902	37.6583	36.7024	38.5071	39.3155	44.5954	48.3457	54.6307 (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	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	14.2213	12.6312	10.2724	7.7769	5.8133	4.9078	5.3031	6.8932	9.2520	11.7475	13.7111	14.6166	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	160.0334	161.6940	157.5093	148.6004	137.3545	126.7850	119.7239	118.0632	122.2480	131.1569	142.4028	152.9723	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	(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)													
	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	(71)
Water heating gains (Table 5)													
	74.3934	72.6384	69.2265	61.7065	57.1105	52.3032	49.3312	51.7568	54.6048	59.9400	67.1468	73.4284	(72)
Total internal gains													
	317.7139	316.0295	306.0740	287.1495	269.3441	253.0617	243.4239	245.7789	255.1706	271.9102	292.3265	310.0830	(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	
North	4.7500	12.7650	0.6300	0.7000	0.7700	18.5305	(74)
East	1.0500	23.8018	0.6300	0.7000	0.7700	7.6378	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	26.1684	44.2835	74.5620	118.7397	151.9098	169.9124	157.9212	131.2772	94.8457	56.6982	31.9610	21.8144	(83)
Total gains	343.8822	360.3130	380.6360	405.8891	421.2539	422.9741	401.3450	377.0561	350.0163	328.6084	324.2874	331.8974	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	24.5506	25.0787	25.0787	25.8636	25.6032	26.8861	26.8861	27.1356	26.8861	25.8636	26.1223	25.3415	
alpha	2.6367	2.6719	2.6719	2.7242	2.7069	2.7924	2.7924	2.8090	2.7924	2.7242	2.7415	2.6894	
util living area													
	0.9297	0.9154	0.8821	0.8077	0.6863	0.4921	0.3485	0.3758	0.6265	0.8244	0.9022	0.9333	(86)
MIT	18.8461	19.0930	19.5116	20.1130	20.5807	20.8953	20.9723	20.9662	20.7752	20.1933	19.5358	18.8874	(87)
Th 2	19.7542	19.7770	19.7770	19.8094	19.7988	19.8492	19.8492	19.8585	19.8492	19.8094	19.8197	19.7880	(88)
util rest of house													
	0.9172	0.9004	0.8603	0.7710	0.6230	0.3991	0.2328	0.2570	0.5397	0.7828	0.8825	0.9215	(89)
MIT 2	17.8689	18.1242	18.5286	19.1170	19.5209	19.8012	19.8428	19.8501	19.7256	19.2033	18.5879	17.9325	(90)
Living area fraction										fLA = Living area / (4) =		0.4447	(91)
MIT	18.3035	18.5551	18.9657	19.5599	19.9922	20.2878	20.3451	20.3464	20.1924	19.6435	19.0094	18.3572	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.1535	18.4051	18.8157	19.4099	19.8422	20.1378	20.1951	20.1964	20.0424	19.4935	18.8594	18.2072	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8965	0.8792	0.8394	0.7568	0.6255	0.4236	0.2686	0.2934	0.5555	0.7698	0.8626	0.9017	(94)
Useful gains	308.2953	316.8026	319.4873	307.1846	263.4792	179.1640	107.7907	110.6293	194.4371	252.9499	279.7384	299.2596	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	629.9698	600.2429	539.3302	435.6566	321.2604	191.1582	109.9544	113.3683	222.2094	366.1896	492.5513	612.8174	(97)
Space heating kWh													
	239.3259	190.4719	163.5631	92.4998	42.9892	0.0000	0.0000	0.0000	0.0000	84.2503	153.2253	233.2870	(98a)
Space heating requirement - total per year (kWh/year)												1199.6125	
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													
	239.3259	190.4719	163.5631	92.4998	42.9892	0.0000	0.0000	0.0000	0.0000	84.2503	153.2253	233.2870	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1199.6125	
Space heating per m2											(98c) / (4) =	35.0969	(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 %)	89.0000	(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													
	239.3259	190.4719	163.5631	92.4998	42.9892	0.0000	0.0000	0.0000	0.0000	84.2503	153.2253	233.2870	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	268.9055	214.0133	183.7788	103.9324	48.3025	0.0000	0.0000	0.0000	0.0000	94.6633	172.1633	262.1202	(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

	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185 (64)
Efficiency of water heater												78.9000 (216)
(217)m	84.4943	84.2354	83.7126	82.6669	81.1605	78.9000	78.9000	78.9000	78.9000	82.4383	83.7055	84.4623 (217)
Fuel for water heating, kWh/month												
	202.2378	179.0122	190.3010	166.7770	162.8532	148.9104	145.4396	152.3247	155.2344	168.0175	178.7955	199.7560 (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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219 (231)
Lighting	12.4478	9.9861	8.9914	6.5875	5.0884	4.1572	4.6418	6.0335	7.8370	10.2825	11.6141	12.7938 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-8.7937	-12.7742	-21.3418	-27.6900	-31.8658	-31.7037	-30.9849	-28.2726	-23.0097	-16.7285	-10.0615	-7.3701 (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	-2.8157	-5.7516	-13.7823	-25.0219	-35.2664	-39.5878	-38.0621	-31.0365	-19.9525	-9.8504	-3.8700	-2.1426 (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	1347.8792	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2049.6594	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	100.4612	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-477.7360	(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	3065.2638	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1347.8792	5.6000	75.4812	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2049.6594	5.6000	114.7809	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	100.4612	26.0600	26.1802	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-250.5964	26.0600	-65.3054	
PV Unit electricity exported	-227.1396	5.8100	-13.1968	
Total			-78.5022	(252)
Total energy cost			248.6671	(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	1347.8792	0.2100	283.0546	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2049.6594	0.2100	430.4285	(264)
Space and water heating			713.4831	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	100.4612	0.1443	14.4997	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-250.5964	0.1322	-33.1216	
PV Unit electricity exported	-227.1396	0.1217	-27.6489	
Total			-60.7706	(269)
Total CO2, kg/year			673.4542	(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	1347.8792	1.1300	1523.1035	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2049.6594	1.1300	2316.1151	(278)
Space and water heating			3839.2186	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	100.4612	1.5338	154.0907	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-250.5964	1.4883	-372.9718	
PV Unit electricity exported	-227.1396	0.4465	-101.4282	
Total			-474.4000	(283)
Total Primary energy kWh/year			3586.9853	(286)

SAP 10 EPC IMPROVEMENTS

Mid-floor Flat

Current energy efficiency rating: B 85
Current environmental impact rating: B 87

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

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

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

Potential energy efficiency rating: B 85
Potential environmental impact rating: B 87

Fuel prices for cost data on this page from database revision number 561 TEST (31 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£38	£38	£0
Mains gas	£289	£289	£0
Space heating	£186	£186	£0
Water heating	£115	£115	£0
Lighting	£26	£26	£0
Generated (PV)	-£79	-£79	£0
Total cost of fuels	£248	£248	£0
Total cost of uses	£248	£248	£0
Delivered energy	90 kWh/m²	90 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	20 kg/m²	20 kg/m²	0 kg/m²
Primary energy	105 kWh/m²	105 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	34.1800	(1b)	x 2.4100	(2b) =	82.3738	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.1800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		82.3738	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2428	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9928	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8439	(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	1.0759	1.0548	1.0337	0.9283	0.9072	0.8017	0.8017	0.7806	0.8439	0.9072	0.9494	0.9916	(22b)
Effective ac	1.0759	1.0548	1.0337	0.9308	0.9115	0.8213	0.8213	0.8047	0.8561	0.9115	0.9506	0.9916	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Window			5.8000	1.1450	6.6412			(27)
External Wall 1	44.0500	5.8000	38.2500	0.2100	8.0325	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			44.0500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.6737			(33)
Main dwelling								
Party Wall 1			7.5400	0.0000	0.0000	180.0000	1357.2000	(32)
Party Wall 2			16.5800	0.0000	0.0000	20.0000	331.6000	(32)
Party Floor 1			34.1800			30.0000	1025.4000	(32d)
Party Ceiling 1			34.1800			30.0000	1025.4000	(32b)
Internal Wall - Timber			58.4200			9.0000	525.7800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4265.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		124.7917 (35)
Thermal bridges (Default value 0.200 * total exposed area)		8.8100 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	23.4837 (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	29.2477	28.6742	28.1008	25.3033	24.7770	22.3270	22.3270	21.8733	23.2707	24.7770	25.8417	26.9548	(38)
Heat transfer coeff	52.7314	52.1580	51.5845	48.7870	48.2607	45.8107	45.8107	45.3570	46.7544	48.2607	49.3254	50.4385	(39)
Average = Sum(39)m / 12 =												48.7732	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5428	1.5260	1.5092	1.4274	1.4120	1.3403	1.3403	1.3270	1.3679	1.4120	1.4431	1.4757	(40)
HLP (average)												1.4270	
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												1.2617 (42)
Hot water usage for mixer showers	69.1030	68.0645	66.5513	63.6559	61.5192	59.1363	57.7819	59.2837	60.9300	63.4885	66.4460	68.8383 (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	27.5510	26.5492	25.5473	24.5454	23.5436	22.5417	22.5417	23.5436	24.5454	25.5473	26.5492	27.5510 (42c)
Average daily hot water use (litres/day)												88.7571 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.6540	94.6137	92.0986	88.2013	85.0628	81.6781	80.3237	82.8273	85.4755	89.0358	92.9952	96.3893	(44)
Energy conte	153.0764	134.7287	141.5521	120.7432	114.5108	100.4327	97.1445	102.5575	105.3998	120.8207	132.4887	150.9223	(45)
Energy content (annual)										Total = Sum(45)m =		1474.3775	
Distribution loss (46)m = 0.15 x (45)m	22.9615	20.2093	21.2328	18.1115	17.1766	15.0649	14.5717	15.3836	15.8100	18.1231	19.8733	22.6383	(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	(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	17.8031	16.0630	17.7539	17.1261	17.6616	17.0576	17.6073	17.6267	17.0802	17.6900	17.1729	17.7962	(61)
Total heat required for water heating calculated for each month	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185	(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	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185	(64)
										Total per year (kWh/year) = Sum(64)m =		1682.8159	(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	55.3487	48.8130	51.5045	44.4286	42.4902	37.6583	36.7024	38.5071	39.3155	44.5954	48.3457	54.6307	(65)

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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	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.2213	12.6312	10.2724	7.7769	5.8133	4.9078	5.3031	6.8932	9.2520	11.7475	13.7111	14.6166	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.0334	161.6940	157.5093	148.6004	137.3545	126.7850	119.7239	118.0632	122.2480	131.1569	142.4028	152.9723	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	(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)	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	(71)
Water heating gains (Table 5)	74.3934	72.6384	69.2265	61.7065	57.1105	52.3032	49.3312	51.7568	54.6048	59.9400	67.1468	73.4284	(72)
Total internal gains	317.7139	316.0295	306.0740	287.1495	269.3441	253.0617	243.4239	245.7789	255.1706	271.9102	292.3265	310.0830	(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

North				4.7500		10.6334		0.6300		0.7000		0.7700	15.4361 (74)
East				1.0500		19.6403		0.6300		0.7000		0.7700	6.3024 (76)
Solar gains	21.7385	41.8281	70.4302	110.1277	144.7527	153.2618	143.7735	116.3865	83.8824	49.7442	26.9008	18.0511 (83)	
Total gains	339.4524	357.8575	376.5042	397.2772	414.0968	406.3235	387.1974	362.1655	339.0529	321.6544	319.2273	328.1341 (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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.4691	22.7161	22.9687	24.2857	24.5506	25.8636	25.8636	26.1223	25.3415	24.5506	24.0206	23.4906	
alpha	2.4979	2.5144	2.5312	2.6190	2.6367	2.7242	2.7242	2.7415	2.6894	2.6367	2.6014	2.5660	
util living area	0.9411	0.9293	0.9041	0.8478	0.7535	0.6042	0.4744	0.5144	0.7106	0.8614	0.9219	0.9444 (86)	
MIT	18.3950	18.6348	19.0908	19.7854	20.3418	20.7658	20.9121	20.8899	20.6021	19.9181	19.1332	18.4590 (87)	
Th 2	19.6556	19.6681	19.6806	19.7424	19.7542	19.8094	19.8094	19.8197	19.7880	19.7542	19.7304	19.7058 (88)	
util rest of house	0.9305	0.9164	0.8859	0.8177	0.7017	0.5214	0.3624	0.4033	0.6357	0.8280	0.9059	0.9345 (89)	
MIT 2	17.3630	17.6055	18.0580	18.7645	19.2820	19.6778	19.7765	19.7751	19.5424	18.9099	18.1381	17.4581 (90)	
Living area fraction										fLA = Living area / (4) =		0.4447 (91)	
MIT	17.8219	18.0632	18.5173	19.2185	19.7533	20.1616	20.2815	20.2709	20.0136	19.3583	18.5806	17.9032 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	17.6719	17.9132	18.3673	19.0685	19.6033	20.0116	20.1315	20.1209	19.8636	19.2083	18.4306	17.7532 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9095	0.8943	0.8629	0.7985	0.6946	0.5365	0.3943	0.4334	0.6409	0.8101	0.8848	0.9147 (94)	
Useful gains	308.7204	320.0349	324.8776	317.2133	287.6336	218.0046	152.6895	156.9804	217.3005	260.5863	282.4426	300.1420 (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	705.1218	678.7437	612.1670	496.0883	381.4194	247.9106	161.7815	168.7673	269.4757	415.4408	558.8865	683.6047 (97)	
Space heating kWh	294.9227	241.0523	213.7433	128.7900	69.7766	0.0000	0.0000	0.0000	0.0000	115.2118	199.0396	285.2963 (98a)	
Space heating requirement - total per year (kWh/year)												1547.8326	
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	294.9227	241.0523	213.7433	128.7900	69.7766	0.0000	0.0000	0.0000	0.0000	115.2118	199.0396	285.2963 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1547.8326	
Space heating per m2											(98c) / (4) =	45.2847 (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 %)												89.0000 (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	294.9227	241.0523	213.7433	128.7900	69.7766	0.0000	0.0000	0.0000	0.0000	115.2118	199.0396	285.2963 (98)	
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)	
Space heating fuel (main heating system)	331.3738	270.8453	240.1610	144.7079	78.4007	0.0000	0.0000	0.0000	0.0000	129.4514	223.6401	320.5576 (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	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185 (64)	
Efficiency of water heater												78.9000 (216)	
(217)m	85.0080	84.8216	84.3870	83.4752	82.1199	78.9000	78.9000	78.9000	78.9000	83.1867	84.3649	84.9585 (217)	
Fuel for water heating, kWh/month	201.0158	177.7751	188.7802	165.1619	160.9504	148.9104	145.4396	152.3247	155.2344	166.5059	177.3980	198.5893 (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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219 (231)	
Lighting	12.4478	9.9861	8.9914	6.5875	5.0884	4.1572	4.6418	6.0335	7.8370	10.2825	11.6141	12.7938 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.3946	-12.1115	-20.4567	-26.4377	-31.0924	-29.9721	-29.4469	-26.3349	-21.1909	-15.0642	-8.6081	-6.1537 (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	-2.1074	-5.2396	-12.7363	-22.7898	-33.4441	-34.9049	-33.9767	-26.6728	-16.9413	-8.1387	-2.9654	-1.5891 (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												1739.1378 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												78.9000	
Water heating fuel used												2038.0859 (219)	

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	100.4612	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-435.7700	(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	3486.9148	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1739.1378	3.6400	63.3046	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2038.0859	3.6400	74.1863	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	100.4612	16.4900	16.5660	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-234.2638	16.4900	-38.6301	
PV Unit electricity exported	-201.5063	5.5900	-11.2642	
Total			-49.8943	(252)
Total energy cost			203.5832	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9256	(257)
SAP value		84.9958	
SAP rating (Section 12)		85	(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	1739.1378	0.2100	365.2189	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2038.0859	0.2100	427.9980	(264)
Space and water heating			793.2170	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	100.4612	0.1443	14.4997	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-234.2638	0.1319	-30.9095	
PV Unit electricity exported	-201.5063	0.1218	-24.5458	
Total			-55.4553	(269)
Total CO2, kg/year			758.5034	(272)
CO2 emissions per m2			22.1900	(273)
EI value			87.1635	
EI rating			87	(274)
EI band			B	

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		34.1800	(1b)	x 2.4100	(2b) =	82.3738	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	34.1800						(4)
Dwelling volume						82.3738	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.2428 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9928 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8439 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.9072	0.8650	0.8650	0.8017	0.8228	0.7173	0.7173	0.6962	0.7173	0.8017	0.7806	0.8439	(22b)
Effective ac	0.9115	0.8741	0.8741	0.8213	0.8385	0.7573	0.7573	0.7423	0.7573	0.8213	0.8047	0.8561	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			5.8000	1.1450	6.6412			(27)
External Wall 1	44.0500	5.8000	38.2500	0.2100	8.0325	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			44.0500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.6737			(33)
Main dwelling								
Party Wall 1			7.5400	0.0000	0.0000	180.0000	1357.2000	(32)
Party Wall 2			16.5800	0.0000	0.0000	20.0000	331.6000	(32)
Party Floor 1			34.1800			30.0000	1025.4000	(32d)
Party Ceiling 1			34.1800			30.0000	1025.4000	(32b)
Internal Wall - Timber			58.4200			9.0000	525.7800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4265.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		124.7917 (35)
Thermal bridges (Default value 0.200 * total exposed area)		8.8100 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	23.4837 (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	24.7770	23.7607	23.7607	22.3270	22.7928	20.5848	20.5848	20.1794	20.5848	22.3270	21.8733	23.2707	(38)
Heat transfer coeff	48.2607	47.2444	47.2444	45.8107	46.2765	44.0685	44.0685	43.6632	44.0685	45.8107	45.3570	46.7544	(39)
Average = Sum(39)m / 12 =												45.7190	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4120	1.3822	1.3822	1.3403	1.3539	1.2893	1.2893	1.2774	1.2893	1.3403	1.3270	1.3679	(40)
HLP (average)												1.3376	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.2617 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
69.1030	68.0645	66.5513	63.6559	61.5192	59.1363	57.7819	59.2837	60.9300	63.4885	66.4460	68.8383	(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

27.5510	26.5492	25.5473	24.5454	23.5436	22.5417	22.5417	23.5436	24.5454	25.5473	26.5492	27.5510	(42c)

Average daily hot water use (litres/day)	88.7571 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.6540	94.6137	92.0986	88.2013	85.0628	81.6781	80.3237	82.8273	85.4755	89.0358	92.9952	96.3893	(44)
Energy conte	153.0764	134.7287	141.5521	120.7432	114.5108	100.4327	97.1445	102.5575	105.3998	120.8207	132.4887	150.9223	(45)
Energy content (annual)										Total = Sum(45)m =		1474.3775	
Distribution loss (46)m = 0.15 x (45)m	22.9615	20.2093	21.2328	18.1115	17.1766	15.0649	14.5717	15.3836	15.8100	18.1231	19.8733	22.6383	(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	(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	17.8031	16.0630	17.7539	17.1261	17.6616	17.0576	17.6073	17.6267	17.0802	17.6900	17.1729	17.7962	(61)
Total heat required for water heating calculated for each month	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185	(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	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185	(64)
										Total per year (kWh/year) = Sum(64)m =		1682.8159	(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

55.3487	48.8130	51.5045	44.4286	42.4902	37.6583	36.7024	38.5071	39.3155	44.5954	48.3457	54.6307	(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	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	75.7017	(66)

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

	14.2213	12.6312	10.2724	7.7769	5.8133	4.9078	5.3031	6.8932	9.2520	11.7475	13.7111	14.6166	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	160.0334	161.6940	157.5093	148.6004	137.3545	126.7850	119.7239	118.0632	122.2480	131.1569	142.4028	152.9723	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	43.8319	(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)													
	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	-50.4678	(71)
Water heating gains (Table 5)													
	74.3934	72.6384	69.2265	61.7065	57.1105	52.3032	49.3312	51.7568	54.6048	59.9400	67.1468	73.4284	(72)
Total internal gains													
	317.7139	316.0295	306.0740	287.1495	269.3441	253.0617	243.4239	245.7789	255.1706	271.9102	292.3265	310.0830	(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	
North	4.7500	12.7650	0.6300	0.7000	0.7700	18.5305	(74)
East	1.0500	23.8018	0.6300	0.7000	0.7700	7.6378	(76)

Solar gains	26.1684	44.2835	74.5620	118.7397	151.9098	169.9124	157.9212	131.2772	94.8457	56.6982	31.9610	21.8144	(83)
Total gains	343.8822	360.3130	380.6360	405.8891	421.2539	422.9741	401.3450	377.0561	350.0163	328.6084	324.2874	331.8974	(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	24.5506	25.0787	25.0787	25.8636	25.6032	26.8861	26.8861	27.1356	26.8861	25.8636	26.1223	25.3415	
alpha	2.6367	2.6719	2.6719	2.7242	2.7069	2.7924	2.7924	2.8090	2.7924	2.7242	2.7415	2.6894	
util living area													
	0.9297	0.9154	0.8821	0.8077	0.6863	0.4921	0.3485	0.3758	0.6265	0.8244	0.9022	0.9333	(86)
MIT	18.8461	19.0930	19.5116	20.1130	20.5807	20.8953	20.9723	20.9662	20.7752	20.1933	19.5358	18.8874	(87)
Th 2	19.7542	19.7770	19.7770	19.8094	19.7988	19.8492	19.8492	19.8585	19.8492	19.8094	19.8197	19.7880	(88)
util rest of house													
	0.9172	0.9004	0.8603	0.7710	0.6230	0.3991	0.2328	0.2570	0.5397	0.7828	0.8825	0.9215	(89)
MIT 2	17.8689	18.1242	18.5286	19.1170	19.5209	19.8012	19.8428	19.8501	19.7256	19.2033	18.5879	17.9325	(90)
Living area fraction										fLA = Living area / (4) =		0.4447	(91)
MIT	18.3035	18.5551	18.9657	19.5599	19.9922	20.2878	20.3451	20.3464	20.1924	19.6435	19.0094	18.3572	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.1535	18.4051	18.8157	19.4099	19.8422	20.1378	20.1951	20.1964	20.0424	19.4935	18.8594	18.2072	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8965	0.8792	0.8394	0.7568	0.6255	0.4236	0.2686	0.2934	0.5555	0.7698	0.8626	0.9017	(94)
Useful gains	308.2953	316.8026	319.4873	307.1846	263.4792	179.1640	107.7907	110.6293	194.4371	252.9499	279.7384	299.2596	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	629.9698	600.2429	539.3302	435.6566	321.2604	191.1582	109.9544	113.3683	222.2094	366.1896	492.5513	612.8174	(97)
Space heating kWh													
	239.3259	190.4719	163.5631	92.4998	42.9892	0.0000	0.0000	0.0000	0.0000	84.2503	153.2253	233.2870	(98a)
Space heating requirement - total per year (kWh/year)												1199.6125	
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													
	239.3259	190.4719	163.5631	92.4998	42.9892	0.0000	0.0000	0.0000	0.0000	84.2503	153.2253	233.2870	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1199.6125	
Space heating per m2											(98c) / (4) =	35.0969	(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 %)												89.0000	(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													
	239.3259	190.4719	163.5631	92.4998	42.9892	0.0000	0.0000	0.0000	0.0000	84.2503	153.2253	233.2870	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	268.9055	214.0133	183.7788	103.9324	48.3025	0.0000	0.0000	0.0000	0.0000	94.6633	172.1633	262.1202	(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													
	170.8795	150.7916	159.3059	137.8693	132.1724	117.4903	114.7518	120.1842	122.4800	138.5107	149.6616	168.7185	(64)
Efficiency of water heater												78.9000	(216)
(217)m	84.4943	84.2354	83.7126	82.6669	81.1605	78.9000	78.9000	78.9000	78.9000	82.4383	83.7055	84.4623	(217)
Fuel for water heating, kWh/month													
	202.2378	179.0122	190.3010	166.7770	162.8532	148.9104	145.4396	152.3247	155.2344	168.0175	178.7955	199.7560	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.4478	9.9861	8.9914	6.5875	5.0884	4.1572	4.6418	6.0335	7.8370	10.2825	11.6141	12.7938	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-8.7937	-12.7742	-21.3418	-27.6900	-31.8658	-31.7037	-30.9849	-28.2726	-23.0097	-16.7285	-10.0615	-7.3701 (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	-2.8157	-5.7516	-13.7823	-25.0219	-35.2664	-39.5878	-38.0621	-31.0365	-19.9525	-9.8504	-3.8700	-2.1426 (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	1347.8792	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2049.6594	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	100.4612	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-477.7360	(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	3065.2638	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1347.8792	5.6000	75.4812	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2049.6594	5.6000	114.7809	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	100.4612	26.0600	26.1802	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-250.5964	26.0600	-65.3054	
PV Unit electricity exported	-227.1396	5.8100	-13.1968	
Total			-78.5022	(252)
Total energy cost			248.6671	(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	1347.8792	0.2100	283.0546	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2049.6594	0.2100	430.4285	(264)
Space and water heating			713.4831	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	100.4612	0.1443	14.4997	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-250.5964	0.1322	-33.1216	
PV Unit electricity exported	-227.1396	0.1217	-27.6489	
Total			-60.7706	(269)
Total CO2, kg/year			673.4542	(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	1347.8792	1.1300	1523.1035	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2049.6594	1.1300	2316.1151	(278)
Space and water heating			3839.2186	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	100.4612	1.5338	154.0907	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-250.5964	1.4883	-372.9718	
PV Unit electricity exported	-227.1396	0.4465	-101.4282	
Total			-474.4000	(283)
Total Primary energy kWh/year			3586.9853	(286)

Predicted Energy Assessment

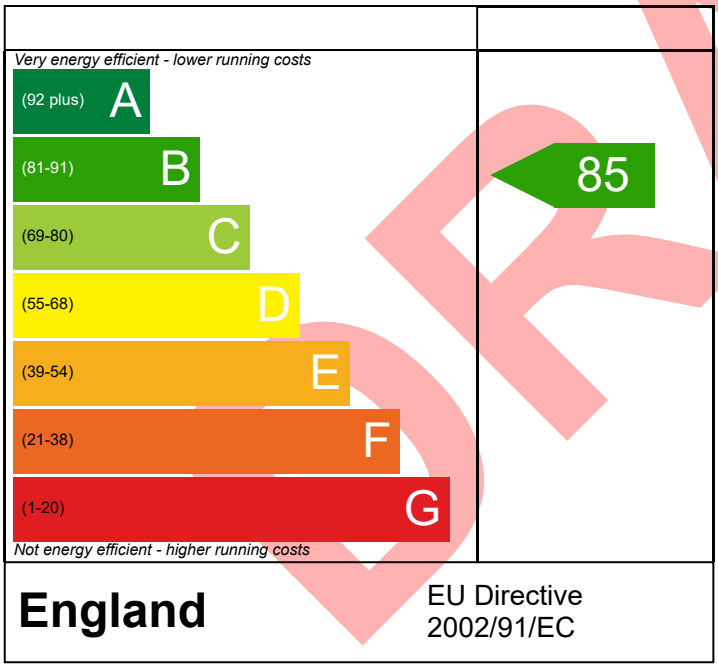
Flat 4, 99 London Road, Reading, RG1 5BY

Dwelling type:	Flat, Semi-Detached
Date of assessment:	17/02/2025
Produced by:	Sammit Pancholi
Total floor area:	34.18 m²
DRRN:	

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.

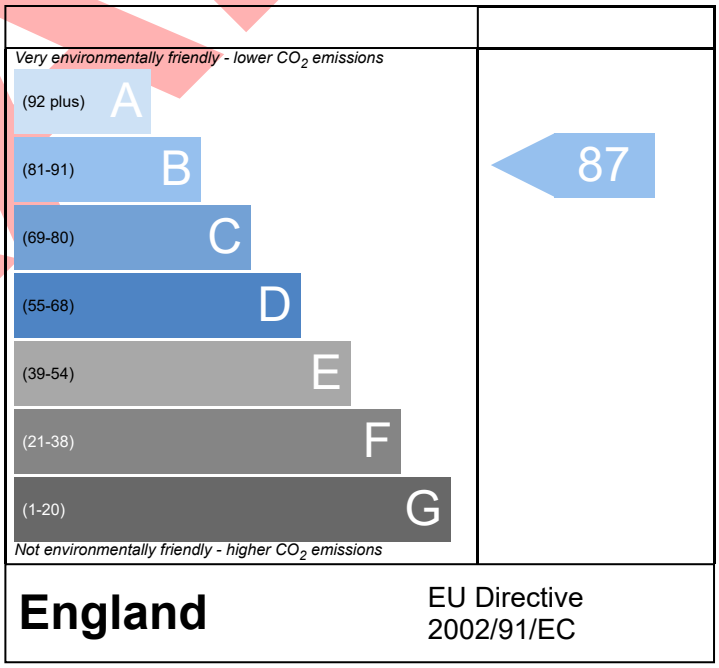
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

elmhurst energy

Property Reference	Flat 4 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Mid-floor Flat	**Prop Type Ref**	Ground Floor, Flat
Property	Flat 4, 99 London Road, Reading, RG1 5BY		

SAP Rating	85 B	**DER**	22.74	**TER**	
Environmental	87 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.67	**DFEE**	53.95	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	121.48	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	West	
Property Tenture	ND	
Transaction Type	5	
Terrain Type	Suburban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Mid-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2025	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	124.79	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	18.28 m	34.18 m²	2.41 m

8.0 Living Area	15.20	m²

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
External Wall 1	Solid Wall	Other	0.21	0.00	44.05	38.25	0.00	None	5.80	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, dense blocks, cavity or cavity fill	0.00	180.00	7.54		None
Party Wall 2	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	20.00	16.58		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall - Timber	Plasterboard on timber frame	9.00	58.42

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Timber I-joists, carpeted	20.00	34.18

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Timber I-joists, carpeted	20.00	34.18

Summary for Input Data

elmhurst energy

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			1.40
Window	Manufacturer	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 1	Window	External Wall 1	East	1.05	
Opening 2	Window	External Wall 1	North	4.75	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.20	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	2	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	No	
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
LED	66.00	8.00	528.00	15

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18830	
Fuel Type	Mains gas	
In Winter	89.00	
In Summer	78.90	
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Flue Type	Open	
Fan Assisted Flue	Yes	
Is MHS Pumped	No pump	
Heat Emitter	Radiators	
Flow Temperature	Unknown	

Summary for Input Data

elmhurst energy

Boiler Interlock	Yes
Combi boiler type	Standard Combi
Combi keep hot type	None

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	0

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.50		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder — None

In Airing Cupboard	No

32.0 Photovoltaic Unit — One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.60	West	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro — None

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

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
			0	0
			0	0
			0	0

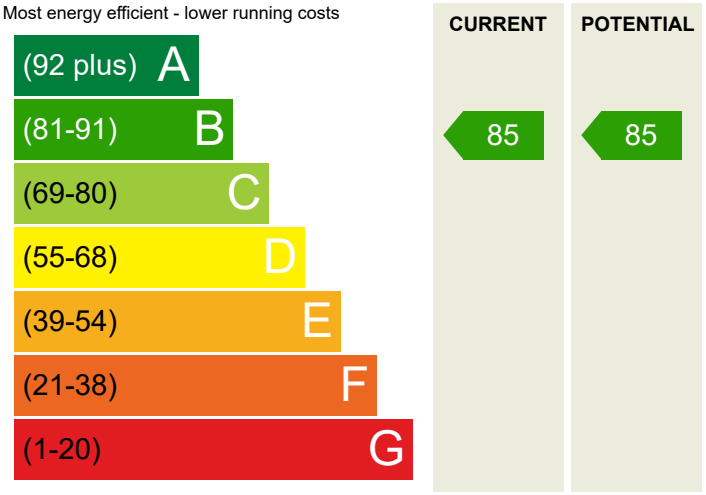
Energy Report

Dwelling Address	Flat 4, 99 London Road, Reading, RG1 5BY
Reference	Flat 4 - Gas + Solar-Mid-floor Flat
Assessment Date	17/02/2025
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	34

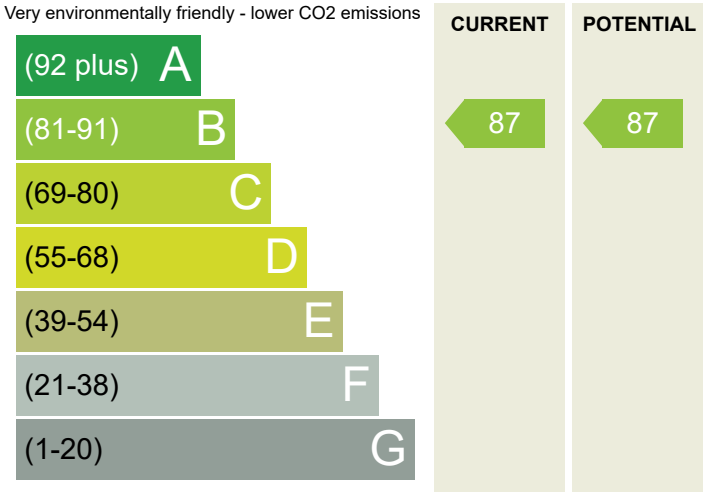
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

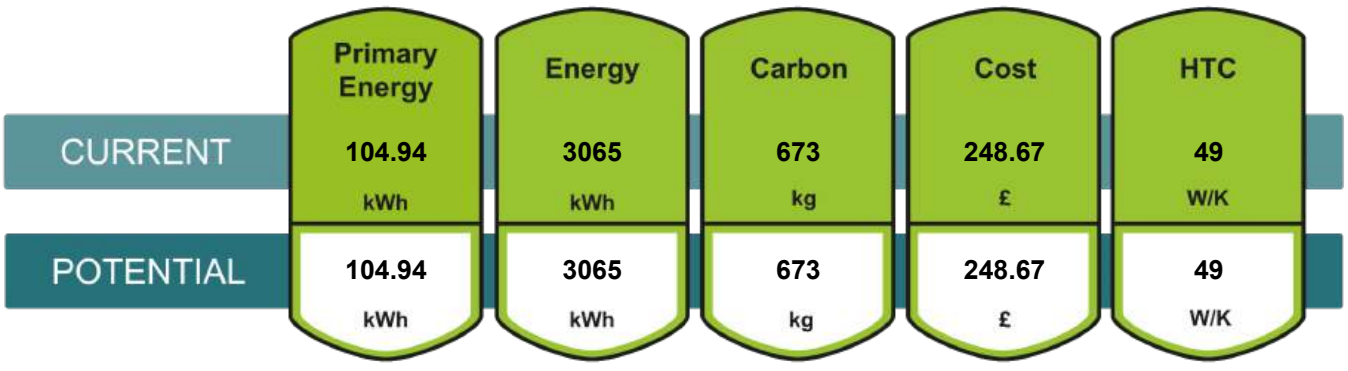
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.21 W/m²K	Very Good
Windows	High performance glazing	Very Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

Energy Report

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£26	£26	
Heating	£186	£186	
Hot Water	£115	£115	
New Technologies e.g. Impact of PV	-(£79)	-(£79)	
TOTAL	£249	£249	

Estimated energy use and potential savings

Space Heating
1348
kWh per year

Water Heating
2050
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report

Property Reference	Flat 4 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Mid-floor Flat	**Prop Type Ref**	Semi-Detached Flat
Property	Flat 4, 99 London Road, Reading, RG1 5BY		

SAP Rating	85 B	**DER**	22.74	**TER**	
Environmental	87 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.67	**DFEE**	53.95	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	121.48	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	Flat 4, 99 London Road	
House Number		
Postcode	RG1 5BY	
Street		
Town	Reading	
County		

Dwelling Orientation West (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Suburban

Property Type Flat, Semi-Detached

Comments

Electricity Tariff Standard

Smart electricity meter fitted: No

Smart gas meter fitted: No

Comments

Section 2: Dwelling Construction Details

External Walls

Description	External Wall 1	
Type	Solid Wall	
Construction	Other	
U-value	0.21	W/m²K U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	44.05	m²

Comments

Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	7.54
Party Wall 2	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	16.58

Comments

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
Door	Manufacturer	Solid Door		0.00		1.40
Window	Manufacturer	Window	Double Low-E Soft 0.05	0.63		1.20

Comments

Openings

Name	Opening Type	Location	Orientation	Area (m²)
Opening 1	Window	External Wall 1	East	1.05
Opening 2	Window	External Wall 1	North	4.75

Comments

Thermal Bridging Default

Y-value 0.200

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing No

Designed AP_{50} 8.00 $m^3/(h.m^2)$ @ 50 Pa

Property Tested? Yes

Test Method Blower Door

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

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	2
Number of passive vents	0
Number of flueless gas fires	0

Comments

Fixed Cooling System No

Comments

Lighting

No Fixed Lighting: No

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
LED	66.00	8.00	528.00	15

Comments

Main Heating 1 Database

Fuel Type	Mains gas	
Winter Efficiency	89.00	%
Summer Efficiency	78.90	%
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Flue Type	Open	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Programmer, room thermostat and TRVs
Boiler Interlock	Yes
Delayed Start Stat	Yes
PCDF Control Description	

Comments

Main Heating 2 None

Secondary Heating None

Water Heating System

Water Heating	Main Heating 1
Supplementary Immersion	No
SAP Code	901
Water use <= 125 l/p/day	Yes
Cold Water Source	From mains
Number of baths	0

Comments

Hot Water Cylinder None

Comments

Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.50		No	

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit One Dwelling

Dwelling Sign Off Report

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.60	West	30°	None Or Little	No	1.00		

Comments

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed .....

Date .....

Full SAP Calculation Printout

Property Reference	Flat 5 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Top Floor Flat	**Prop Type Ref**	Top Floor Flat
Property	Flat 5, 99 London Road, Reading, RG1 5BY		

SAP Rating	79 C	**DER**	31.72	**TER**	
Environmental	83 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.88	**DFEE**	65.72	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	174.25	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	30.5300	(1b)	x 1.8900	(2b) =	57.7017	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.5300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	57.7017	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.3466 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		1.0966 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9321 (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	1.1885	1.1651	1.1418	1.0253	1.0020	0.8855	0.8855	0.8622	0.9321	1.0020	1.0486	1.0952	(22b)
Effective ac	1.1885	1.1651	1.1418	1.0253	1.0020	0.8921	0.8921	0.8717	0.9344	1.0020	1.0486	1.0952	(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								
Window			1.8900	1.5918	3.0084			(27)
Rooflight			1.6000	2.0221	3.2353			(27a)
External Wall upgraded	26.9800	1.8900	25.0900	0.3000	7.5270	0.0000	0.0000	(29a)
Ashlar	3.2200		3.2200	0.3000	0.9660	18.0000	57.9600	(29a)
External Roof 1	45.0000	1.6000	43.4000	0.1600	6.9440	9.0000	390.6000	(30)
Total net area of external elements Aum(A, m2)			75.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.6807			(33)
Main dwelling								
Party Wall Solid			5.5100	0.0000	0.0000	180.0000	991.8000	(32)
Party Wall Timber			4.8100	0.0000	0.0000	20.0000	96.2000	(32)
Party Floor 1			30.5300			30.0000	915.9000	(32d)
Internal Wall - Timber			26.9600			9.0000	242.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	2695.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		88.2771 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.0400 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.7207 (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	22.6300	22.1862	21.7425	19.5239	19.0802	16.9863	16.9863	16.5986	17.7929	19.0802	19.9676	20.8551	(38)
Heat transfer coeff													
	59.3507	58.9070	58.4632	56.2446	55.8009	53.7071	53.7071	53.3193	54.5136	55.8009	56.6883	57.5758	(39)
Average = Sum(39)m / 12 =												56.1732	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9440	1.9295	1.9149	1.8423	1.8277	1.7592	1.7592	1.7465	1.7856	1.8277	1.8568	1.8859	(40)
HLP (average)												1.8399	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.1836	(42)
Hot water usage for mixer showers													
	80.5172	79.3072	77.5439	74.1703	71.6807	68.9042	67.3261	69.0760	70.9942	73.9752	77.4213	80.2087	(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													
	26.7507	25.7780	24.8052	23.8325	22.8597	21.8870	21.8870	22.8597	23.8325	24.8052	25.7780	26.7507	(42c)
Average daily hot water use (litres/day)												98.5530	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	107.2679	105.0852	102.3492	98.0028	94.5404	90.7912	89.2131	91.9357	94.8267	98.7805	103.1993	106.9594	(44)
Energy conte	169.8862	149.6399	157.3069	134.1609	127.2695	111.6384	107.8955	113.8356	116.9308	134.0442	147.0263	167.4726	(45)
Energy content (annual)										Total = Sum(45)m =		1637.1066	
Distribution loss (46)m = 0.15 x (45)m													
	25.4829	22.4460	23.5960	20.1241	19.0904	16.7458	16.1843	17.0753	17.5396	20.1066	22.0539	25.1209	(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	(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	17.8285	16.1031	17.8191	17.1960	17.7257	17.1117	17.6583	17.6819	17.1384	17.7596	17.2263	17.8238	(61)
Total heat required for water heating calculated for each month													
	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(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													
	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(64)
										Total per year (kWh/year) = Sum(64)m =		1846.1791	(64)
12Total per year (kWh/year)												1846	(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													
	60.9443	53.7810	56.7593	48.9075	46.7485	41.3977	40.2898	42.2708	43.1641	49.0096	53.1928	60.1406	(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	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	54.7242	60.5875	54.7242	56.5484	54.7242	56.5484	54.7242	54.7242	56.5484	54.7242	56.5484	54.7242	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	98.6452	99.6688	97.0893	91.5979	84.6659	78.1508	73.7983	72.7746	75.3542	80.8456	87.7776	94.2927	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	(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)													
	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	(71)
Water heating gains (Table 5)													
	81.9143	80.0313	76.2894	67.9271	62.8341	57.4968	54.1530	56.8156	59.9501	65.8731	73.8789	80.8341	(72)
Total internal gains													
	276.0371	281.0409	268.8562	256.8266	242.9774	232.9492	223.4288	225.0677	232.6059	242.1962	258.9582	270.6044	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.0600	46.7521	0.6300	0.7000	0.7700	15.1453	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
South	0.8000	42.0754	0.6300	0.7000	1.0000	13.3598	(82)

Solar gains	38.8205	69.4510	104.3991	145.9494	179.2606	185.0783	175.4621	149.4100	118.5394	79.2332	47.0905	32.8460	(83)
Total gains	314.8576	350.4920	373.2554	402.7760	422.2381	418.0275	398.8909	374.4777	351.1453	321.4294	306.0487	303.4503	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	12.6138	12.7088	12.8053	13.3104	13.4163	13.9393	13.9393	14.0407	13.7331	13.4163	13.2062	13.0027	
alpha	1.8409	1.8473	1.8537	1.8874	1.8944	1.9293	1.9293	1.9360	1.9155	1.8944	1.8804	1.8668	
util living area													
	0.9141	0.8935	0.8646	0.8056	0.7195	0.5926	0.4803	0.5149	0.6793	0.8222	0.8894	0.9182	(86)
MIT	17.1247	17.4841	18.0810	18.9741	19.7703	20.4392	20.7387	20.6924	20.2029	19.1935	18.0792	17.1359	(87)
Th 2	20.0280	20.0353	20.0425	20.0789	20.0861	20.1204	20.1204	20.1268	20.1072	20.0861	20.0716	20.0571	(88)

util rest of house													
	0.9061	0.8837	0.8515	0.7857	0.6876	0.5417	0.4075	0.4441	0.6339	0.8002	0.8779	0.9108	(89)
MIT 2	16.4567	16.8148	17.4075	18.3022	19.0709	19.7113	19.9654	19.9368	19.4995	18.5307	17.4289	16.4850	(90)
Living area fraction										fLA = Living area / (4) =		0.3875	(91)
MIT	16.7155	17.0741	17.6685	18.5625	19.3419	19.9933	20.2650	20.2296	19.7721	18.7876	17.6809	16.7372	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.7155	17.0741	17.6685	18.5625	19.3419	19.9933	20.2650	20.2296	19.7721	18.7876	17.6809	16.7372	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8686	0.8434	0.8095	0.7460	0.6577	0.5337	0.4202	0.4531	0.6145	0.7615	0.8386	0.8746	(94)
Useful gains	273.4700	295.5937	302.1347	300.4588	277.7188	223.1053	167.6257	169.6750	215.7876	244.7768	256.6429	265.3925	(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	736.8699	717.1421	652.9451	543.4651	426.4236	289.6598	196.8380	204.1898	309.2048	456.8728	599.8149	721.8400	(97)
Space heating kWh	344.7695	283.2805	261.0029	174.9645	110.6363	0.0000	0.0000	0.0000	0.0000	157.7994	247.0838	339.5969	(98a)
Space heating requirement - total per year (kWh/year)												1919.1340	
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	344.7695	283.2805	261.0029	174.9645	110.6363	0.0000	0.0000	0.0000	0.0000	157.7994	247.0838	339.5969	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1919.1340	
Space heating per m2											(98c) / (4) =	62.8606	(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 %)	84.0000	(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	344.7695	283.2805	261.0029	174.9645	110.6363	0.0000	0.0000	0.0000	0.0000	157.7994	247.0838	339.5969	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	410.4399	337.2387	310.7178	208.2911	131.7099	0.0000	0.0000	0.0000	0.0000	187.8564	294.1474	404.2821	(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	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.1571	84.9844	84.6489	84.0118	82.9753	78.9000	78.9000	78.9000	78.9000	83.7438	84.6719	85.1520	(217)
Fuel for water heating, kWh/month	220.4333	195.0275	206.8852	180.1615	174.7450	163.1813	159.1303	166.6888	169.9228	181.2717	193.9873	217.6066	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.2087	9.7943	8.8187	6.4609	4.9906	4.0774	4.5526	5.9176	7.6864	10.0850	11.3910	12.5480	(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)
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	2284.6833	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2229.0414	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	98.5312	(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	4657.2559	(238)

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

	Energy	Emission factor	Emissions

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	2284.6833	0.2100	479.7835	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2229.0414	0.2100	468.0987	(264)
Space and water heating			947.8822	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	98.5312	0.1443	14.2211	(268)
Total CO2, kg/year			968.3453	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			31.7200	(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	2284.6833	1.1300	2581.6922	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2229.0414	1.1300	2518.8167	(278)
Space and water heating			5100.5089	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	98.5312	1.5338	151.1304	(282)
Total Primary energy kWh/year			5319.7153	(286)
Dwelling Primary energy Rate (DPER)			174.2500	(287)

SAP 10 WORKSHEET FOR Conversion (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							
Ground floor		30.5300	(1b) x	1.8900	(2b) =	57.7017	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.5300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		57.7017	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.3466	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.0966	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9321	(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	1.1885	1.1651	1.1418	1.0253	1.0020	0.8855	0.8855	0.8622	0.9321	1.0020	1.0486	1.0952	(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	1.1885	1.1651	1.1418	1.0253	1.0020	0.8921	0.8921	0.8717	0.9344	1.0020	1.0486	1.0952	(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								
Window			1.8900	1.5918	3.0084			(27)
Rooflight			1.6000	2.0221	3.2353			(27a)
External Wall upgraded	26.9800	1.8900	25.0900	0.3000	7.5270	0.0000	0.0000	(29a)
Ashlar	3.2200		3.2200	0.3000	0.9660	18.0000	57.9600	(29a)
External Roof 1	45.0000	1.6000	43.4000	0.1600	6.9440	9.0000	390.6000	(30)
Total net area of external elements Aum(A, m2)			75.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.6807			(33)
Main dwelling								
Party Wall Solid			5.5100	0.0000	0.0000	180.0000	991.8000	(32)
Party Wall Timber			4.8100	0.0000	0.0000	20.0000	96.2000	(32)
Party Floor 1			30.5300			30.0000	915.9000	(32d)
Internal Wall - Timber			26.9600			9.0000	242.6400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		2695.1000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							88.2771	(35)
Thermal bridges (Default value 0.200 * total exposed area)							15.0400	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.7207 (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	22.6300	22.1862	21.7425	19.5239	19.0802	16.9863	16.9863	16.5986	17.7929	19.0802	19.9676	20.8551	(38)
Heat transfer coeff	59.3507	58.9070	58.4632	56.2446	55.8009	53.7071	53.7071	53.3193	54.5136	55.8009	56.6883	57.5758	(39)

Average = Sum(39)m / 12 = 56.1732

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9440	1.9295	1.9149	1.8423	1.8277	1.7592	1.7592	1.7465	1.7856	1.8277	1.8568	1.8859	(40)
HLP (average)												1.8399	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.1836 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	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	19.0720	18.7888	18.3899	17.6545	17.1038	16.4931	16.1633	16.5594	16.9906	17.6440	18.3946	19.0075	(42b)
Hot water usage for other uses	26.7507	25.7780	24.8052	23.8325	22.8597	21.8870	21.8870	22.8597	23.8325	24.8052	25.7780	26.7507	(42c)

Average daily hot water use (litres/day) 42.0016 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	45.8228	44.5668	43.1951	41.4869	39.9635	38.3801	38.0503	39.4191	40.8231	42.4493	44.1726	45.7583	(44)
Energy conte	72.5721	63.4625	66.3893	56.7936	53.7985	47.1928	46.0185	48.8091	50.3390	57.6033	62.9320	71.6464	(45)

Energy content (annual) Total = Sum(45)m = 697.5571

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	(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	61.6863	53.9431	56.4309	48.2745	45.7288	40.1139	39.1157	41.4877	42.7881	48.9628	53.4922	60.8995	(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	61.6863	53.9431	56.4309	48.2745	45.7288	40.1139	39.1157	41.4877	42.7881	48.9628	53.4922	60.8995	(64)

Total per year (kWh/year) = Sum(64)m = 592.9235 (64)

12Total per year (kWh/year) 593 (64)

Electric shower(s)	35.2876	31.4415	34.3330	32.7635	33.3783	31.8397	32.9010	33.3783	32.7635	34.3330	33.6874	35.2876	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 401.3944 (64a)

Heat gains from water heating, kWh/month	24.2435	21.3462	22.6910	20.2595	19.7768	17.9884	18.0042	18.7165	18.8879	20.8239	21.7949	24.0468	(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	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.7242	60.5875	54.7242	56.5484	54.7242	56.5484	54.7242	54.7242	56.5484	54.7242	56.5484	54.7242	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	98.6452	99.6688	97.0893	91.5979	84.6659	78.1508	73.7983	72.7746	75.3542	80.8456	87.7776	94.2927	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	(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)	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	(71)
Water heating gains (Table 5)	32.5853	31.7651	30.4986	28.1382	26.5817	24.9839	24.1992	25.1566	26.2332	27.9892	30.2707	32.3209	(72)
Total internal gains	226.7080	232.7748	223.0654	217.0377	206.7250	200.4363	193.4749	193.4087	198.8890	204.3123	215.3499	222.0911	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.0600	46.7521	0.6300	0.7000	0.7700	15.1453	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
South	0.8000	42.0754	0.6300	0.7000	1.0000	13.3598	(82)

Solar gains	38.8205	69.4510	104.3991	145.9494	179.2606	185.0783	175.4621	149.4100	118.5394	79.2332	47.0905	32.8460	(83)
Total gains	265.5285	302.2258	327.4646	362.9871	385.9857	385.5146	368.9371	342.8188	317.4284	283.5455	262.4404	254.9371	(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	12.6138	12.7088	12.8053	13.3104	13.4163	13.9393	13.9393	14.0407	13.7331	13.4163	13.2062	13.0027	
alpha	1.8409	1.8473	1.8537	1.8874	1.8944	1.9293	1.9293	1.9360	1.9155	1.8944	1.8804	1.8668	
util living area													

	0.9336	0.9143	0.8873	0.8298	0.7459	0.6202	0.5068	0.5453	0.7111	0.8494	0.9119	0.9375	(86)
MIT	16.9049	17.2802	17.9021	18.8418	19.6794	20.3888	20.7117	20.6579	20.1285	19.0596	17.8930	16.9136	(87)
Th 2	19.3709	19.3808	19.3906	19.4406	19.4506	19.4987	19.4987	19.5077	19.4801	19.4506	19.4305	19.4105	(88)
util rest of house													
	0.9224	0.8998	0.8671	0.7972	0.6910	0.5285	0.3718	0.4140	0.6307	0.8138	0.8948	0.9271	(89)
MIT 2	15.7920	16.1646	16.7791	17.7140	18.5032	19.1519	19.3906	19.3683	18.9409	17.9467	16.8019	15.8226	(90)
Living area fraction										fLA = Living area / (4) =		0.3875	(91)
MIT	16.2232	16.5969	17.2142	18.1510	18.9590	19.6312	19.9025	19.8680	19.4011	18.3779	17.2247	16.2454	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.2232	16.5969	17.2142	18.1510	18.9590	19.6312	19.9025	19.8680	19.4011	18.3779	17.2247	16.2454	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8904	0.8645	0.8299	0.7629	0.6702	0.5377	0.4119	0.4495	0.6258	0.7815	0.8608	0.8965	(94)
Useful gains	236.4336	261.2872	271.7513	276.9321	258.6762	207.2736	151.9788	154.1046	198.6373	221.5901	225.9021	228.5483	(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													
	707.6527	689.0273	626.3892	520.3188	405.0565	270.2105	177.3669	184.9117	288.9824	434.0159	573.9504	693.5216	(97)
Space heating kWh													
	350.5870	287.4414	263.8506	175.2384	108.9070	0.0000	0.0000	0.0000	0.0000	158.0448	250.5948	345.9402	(98a)
Space heating requirement - total per year (kWh/year)												1940.6043	
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													
	350.5870	287.4414	263.8506	175.2384	108.9070	0.0000	0.0000	0.0000	0.0000	158.0448	250.5948	345.9402	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1940.6043	
Space heating per m2											(98c) / (4) =	63.5638	(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	504.8463	397.4322	405.2267	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.5879	0.6546	0.6260	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	296.8094	260.1411	253.6596	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	409.4532	392.5652	366.6579	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	81.1036	98.5235	84.0708	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	20.2759	24.6309	21.0177	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												65.9245	(107)
Energy for space heating												63.5638	(99)
Energy for space cooling												2.1593	(108)
Total												65.7232	(109)
Fabric Energy Efficiency (DFEE)												65.7	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		30.5300	(1b)	x 1.8900	(2b) =	57.7017	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.5300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		57.7017	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.3466	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.0966	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9321	(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													
	1.1885	1.1651	1.1418	1.0253	1.0020	0.8855	0.8855	0.8622	0.9321	1.0020	1.0486	1.0952	(22b)
Effective ac	1.1885	1.1651	1.1418	1.0253	1.0020	0.8921	0.8921	0.8717	0.9344	1.0020	1.0486	1.0952	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			1.8900	1.5918	3.0084			(27)
Rooflight			1.6000	2.0221	3.2353			(27a)
External Wall upgraded	26.9800	1.8900	25.0900	0.3000	7.5270	0.0000	0.0000	(29a)
Ashlar	3.2200		3.2200	0.3000	0.9660	18.0000	57.9600	(29a)
External Roof 1	45.0000	1.6000	43.4000	0.1600	6.9440	9.0000	390.6000	(30)
Total net area of external elements Aum(A, m2)			75.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.6807			(33)
Main dwelling								
Party Wall Solid			5.5100	0.0000	0.0000	180.0000	991.8000	(32)
Party Wall Timber			4.8100	0.0000	0.0000	20.0000	96.2000	(32)
Party Floor 1			30.5300			30.0000	915.9000	(32d)
Internal Wall - Timber			26.9600			9.0000	242.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	2695.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		88.2771 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.0400 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.7207 (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	22.6300	22.1862	21.7425	19.5239	19.0802	16.9863	16.9863	16.5986	17.7929	19.0802	19.9676	20.8551	(38)
Heat transfer coeff													
	59.3507	58.9070	58.4632	56.2446	55.8009	53.7071	53.7071	53.3193	54.5136	55.8009	56.6883	57.5758	(39)
Average = Sum(39)m / 12 =												56.1732	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9440	1.9295	1.9149	1.8423	1.8277	1.7592	1.7592	1.7465	1.7856	1.8277	1.8568	1.8859	(40)
HLP (average)												1.8399	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.1836 (42)
Hot water usage for mixer showers		
	80.5172 79.3072 77.5439 74.1703 71.6807 68.9042 67.3261 69.0760 70.9942 73.9752 77.4213 80.2087	(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		
	26.7507 25.7780 24.8052 23.8325 22.8597 21.8870 21.8870 22.8597 23.8325 24.8052 25.7780 26.7507	(42c)
Average daily hot water use (litres/day)		98.5530 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	107.2679	105.0852	102.3492	98.0028	94.5404	90.7912	89.2131	91.9357	94.8267	98.7805	103.1993	106.9594	(44)
Energy conte	169.8862	149.6399	157.3069	134.1609	127.2695	111.6384	107.8955	113.8356	116.9308	134.0442	147.0263	167.4726	(45)
Energy content (annual)										Total = Sum(45)m =		1637.1066	
Distribution loss (46)m = 0.15 x (45)m													
	25.4829	22.4460	23.5960	20.1241	19.0904	16.7458	16.1843	17.0753	17.5396	20.1066	22.0539	25.1209	(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	(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	17.8285	16.1031	17.8191	17.1960	17.7257	17.1117	17.6583	17.6819	17.1384	17.7596	17.2263	17.8238	(61)
Total heat required for water heating calculated for each month													
	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(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													
	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(64)
										Total per year (kWh/year) = Sum(64)m =		1846.1791	(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													
	60.9443	53.7810	56.7593	48.9075	46.7485	41.3977	40.2898	42.2708	43.1641	49.0096	53.1928	60.1406	(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	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.9481	12.3886	10.0751	7.6275	5.7016	4.8136	5.2012	6.7607	9.0743	11.5218	13.4477	14.3358	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2317	148.7595	144.9095	136.7132	126.3670	116.6429	110.1467	108.6189	112.4689	120.6651	131.0114	140.7354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	(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)													
	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	(71)
Water heating gains (Table 5)													
	81.9143	80.0313	76.2894	67.9271	62.8341	57.4968	54.1530	56.8156	59.9501	65.8731	73.8789	80.8341	(72)
Total internal gains													

	310.0500	308.1352	298.2298	279.2237	261.8585	245.9091	236.4568	239.1511	248.4491	265.0159	285.2939	302.8612 (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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.0600	46.7521	0.6300	0.7000	0.7700	15.1453	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
South	0.8000	42.0754	0.6300	0.7000	1.0000	13.3598	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	38.8205	69.4510	104.3991	145.9494	179.2606	185.0783	175.4621	149.4100	118.5394	79.2332	47.0905	32.8460	(83)
Total gains	348.8705	377.5862	402.6290	425.1731	441.1192	430.9874	411.9189	388.5611	366.9885	344.2492	332.3844	335.7071	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	12.6138	12.7088	12.8053	13.3104	13.4163	13.9393	13.9393	14.0407	13.7331	13.4163	13.2062	13.0027	
alpha	1.8409	1.8473	1.8537	1.8874	1.8944	1.9293	1.9293	1.9360	1.9155	1.8944	1.8804	1.8668	
util living area	0.9001	0.8816	0.8500	0.7921	0.7062	0.5821	0.4695	0.5023	0.6651	0.8059	0.8756	0.9049	(86)
MIT	17.2691	17.5932	18.1895	19.0442	19.8144	20.4576	20.7493	20.7062	20.2349	19.2688	18.1858	17.2770	(87)
Th 2	20.0280	20.0353	20.0425	20.0789	20.0861	20.1204	20.1204	20.1268	20.1072	20.0861	20.0716	20.0571	(88)
util rest of house	0.8910	0.8709	0.8359	0.7714	0.6737	0.5312	0.3974	0.4321	0.6190	0.7827	0.8630	0.8964	(89)
MIT 2	16.5976	16.9207	17.5116	18.3677	19.1099	19.7258	19.9722	19.9461	19.5261	18.6007	17.5317	16.6228	(90)
Living area fraction									fLA = Living area / (4) =			0.3875	(91)
MIT	16.8578	17.1813	17.7742	18.6298	19.3829	20.0094	20.2733	20.2406	19.8008	18.8596	17.7852	16.8763	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8578	17.1813	17.7742	18.6298	19.3829	20.0094	20.2733	20.2406	19.8008	18.8596	17.7852	16.8763	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8513	0.8294	0.7933	0.7323	0.6451	0.5242	0.4107	0.4419	0.6012	0.7447	0.8225	0.8580	(94)
Useful gains	296.9889	313.1628	319.4044	311.3578	284.5805	225.9410	169.1934	171.7081	220.6517	256.3502	273.3852	288.0265	(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	745.3123	723.4512	659.1287	547.2512	428.7127	290.5232	197.2843	204.7772	310.7697	460.8915	605.7249	729.8462	(97)
Space heating kWh	333.5526	275.7138	252.7549	169.8432	107.2344	0.0000	0.0000	0.0000	0.0000	152.1787	239.2845	328.7138	(98a)
Space heating requirement - total per year (kWh/year)												1859.2760	
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	333.5526	275.7138	252.7549	169.8432	107.2344	0.0000	0.0000	0.0000	0.0000	152.1787	239.2845	328.7138	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1859.2760	
Space heating per m2										(98c) / (4) =		60.9000	(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 %)												84.0000	(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	333.5526	275.7138	252.7549	169.8432	107.2344	0.0000	0.0000	0.0000	0.0000	152.1787	239.2845	328.7138	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	397.0864	328.2307	300.8987	202.1943	127.6600	0.0000	0.0000	0.0000	0.0000	181.1651	284.8625	391.3260	(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	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.0781	84.9187	84.5692	83.9368	82.8997	78.9000	78.9000	78.9000	78.9000	83.6524	84.5924	85.0741	(217)
Fuel for water heating, kWh/month	220.6381	195.1783	207.0802	180.3225	174.9045	163.1813	159.1303	166.6888	169.9228	181.4696	194.1696	217.8058	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.2087	9.7943	8.8187	6.4609	4.9906	4.0774	4.5526	5.9176	7.6864	10.0850	11.3910	12.5480	(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)
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	2213.4238	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2230.4920	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	98.5312	(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	4587.4470	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2213.4238	3.6400	80.5686	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2230.4920	3.6400	81.1899	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	98.5312	16.4900	16.2478	(250)
Additional standing charges			92.0000	(251)
Total energy cost			277.4268	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3223	(257)
SAP value		78.5654	
SAP rating (Section 12)		79	(258)
SAP band		C	

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	2213.4238	0.2100	464.8190	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2230.4920	0.2100	468.4033	(264)
Space and water heating			933.2223	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	98.5312	0.1443	14.2211	(268)
Total CO2, kg/year			953.6855	(272)
CO2 emissions per m2			31.2400	(273)
EI value			83.0804	
EI rating			83	(274)
EI band			B	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	30.5300	(1b)	x 1.8900	(2b)	= 57.7017	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		= 57.7017	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.3466	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.0966	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9321	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	1.0020	0.9554	0.9554	0.8855	0.9088	0.7923	0.7923	0.7690	0.7923	0.8855	0.8622	0.9321	(22b)
Effective ac	1.0020	0.9564	0.9564	0.8921	0.9130	0.8139	0.8139	0.7957	0.8139	0.8921	0.8717	0.9344	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			1.8900	1.5918	3.0084			(27)
Rooflight			1.6000	2.0221	3.2353			(27a)
External Wall upgraded	26.9800	1.8900	25.0900	0.3000	7.5270	0.0000	0.0000	(29a)
Ashlar	3.2200		3.2200	0.3000	0.9660	18.0000	57.9600	(29a)
External Roof 1	45.0000	1.6000	43.4000	0.1600	6.9440	9.0000	390.6000	(30)
Total net area of external elements Aum(A, m2)			75.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.6807			(33)
Main dwelling								
Party Wall Solid			5.5100	0.0000	0.0000	180.0000	991.8000	(32)
Party Wall Timber			4.8100	0.0000	0.0000	20.0000	96.2000	(32)
Party Floor 1			30.5300			30.0000	915.9000	(32d)
Internal Wall - Timber			26.9600			9.0000	242.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	2695.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		88.2771 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.0400 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.7207 (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	19.0802	18.2116	18.2116	16.9863	17.3844	15.4974	15.4974	15.1510	15.4974	16.9863	16.5986	17.7929	(38)
Heat transfer coeff	55.8009	54.9324	54.9324	53.7071	54.1052	52.2181	52.2181	51.8717	52.2181	53.7071	53.3193	54.5136	(39)
Average = Sum(39)m / 12 =												53.6286	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8277	1.7993	1.7993	1.7592	1.7722	1.7104	1.7104	1.6990	1.7104	1.7592	1.7465	1.7856	(40)
HLP (average)												1.7566	
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		1.1836 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
80.5172	79.3072	77.5439	74.1703	71.6807	68.9042	67.3261	69.0760	70.9942	73.9752	77.4213	80.2087	(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

26.7507	25.7780	24.8052	23.8325	22.8597	21.8870	21.8870	22.8597	23.8325	24.8052	25.7780	26.7507	(42c)

Average daily hot water use (litres/day)	98.5530 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.2679	105.0852	102.3492	98.0028	94.5404	90.7912	89.2131	91.9357	94.8267	98.7805	103.1993	106.9594	(44)
Energy conte	169.8862	149.6399	157.3069	134.1609	127.2695	111.6384	107.8955	113.8356	116.9308	134.0442	147.0263	167.4726	(45)
Energy content (annual)											Total = Sum(45)m =	1637.1066	
Distribution loss (46)m = 0.15 x (45)m	25.4829	22.4460	23.5960	20.1241	19.0904	16.7458	16.1843	17.0753	17.5396	20.1066	22.0539	25.1209	(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	(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	17.8285	16.1031	17.8191	17.1960	17.7257	17.1117	17.6583	17.6819	17.1384	17.7596	17.2263	17.8238	(61)
Total heat required for water heating calculated for each month	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(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	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(64)
										Total per year (kWh/year) = Sum(64)m =		1846.1791	(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

60.9443	53.7810	56.7593	48.9075	46.7485	41.3977	40.2898	42.2708	43.1641	49.0096	53.1928	60.1406	(65)

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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	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	(66)

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

	13.9481	12.3886	10.0751	7.6275	5.7016	4.8136	5.2012	6.7607	9.0743	11.5218	13.4477	14.3358	(67)

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

	147.2317	148.7595	144.9095	136.7132	126.3670	116.6429	110.1467	108.6189	112.4689	120.6651	131.0114	140.7354	(68)

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

	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	(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)

	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	(71)

Water heating gains (Table 5)

	81.9143	80.0313	76.2894	67.9271	62.8341	57.4968	54.1530	56.8156	59.9501	65.8731	73.8789	80.8341	(72)

Total internal gains

	310.0500	308.1352	298.2298	279.2237	261.8585	245.9091	236.4568	239.1511	248.4491	265.0159	285.2939	302.8612	(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	0.8300	23.8018	0.6300	0.7000	0.7700	6.0375	(76)
South	1.0600	54.2217	0.6300	0.7000	0.7700	17.5651	(78)
North	0.8000	20.0851	0.6300	0.7000	1.0000	6.3774	(82)
South	0.8000	50.2348	0.6300	0.7000	1.0000	15.9506	(82)

Solar gains	45.9306	72.0686	108.2711	154.7441	185.8255	203.1136	190.6038	166.0349	131.4448	88.4535	54.9374	39.0540	(83)
Total gains	355.9806	380.2039	406.5009	433.9678	447.6840	449.0227	427.0606	405.1860	379.8939	353.4694	340.2313	341.9152	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	13.4163	13.6284	13.6284	13.9393	13.8367	14.3368	14.3368	14.4325	14.3368	13.9393	14.0407	13.7331	
alpha	1.8944	1.9086	1.9086	1.9293	1.9224	1.9558	1.9558	1.9622	1.9558	1.9293	1.9360	1.9155	
util living area	0.8857	0.8662	0.8280	0.7565	0.6508	0.4892	0.3597	0.3827	0.5964	0.7703	0.8535	0.8908	(86)
MIT	17.7311	18.0519	18.6324	19.4351	20.1453	20.6922	20.8890	20.8732	20.4851	19.6098	18.6371	17.7432	(87)
Th 2	20.0861	20.1004	20.1004	20.1204	20.1139	20.1448	20.1448	20.1505	20.1448	20.1204	20.1268	20.1072	(88)
util rest of house	0.8756	0.8544	0.8121	0.7325	0.6119	0.4294	0.2786	0.3011	0.5431	0.7428	0.8389	0.8812	(89)
MIT 2	17.0881	17.4115	17.9804	18.7707	19.4368	19.9426	20.0933	20.0892	19.7748	18.9495	18.0079	17.1133	(90)
Living area fraction									fLA = Living area / (4) =			0.3875	(91)
MIT	17.3372	17.6596	18.2331	19.0281	19.7114	20.2331	20.4016	20.3930	20.0501	19.2054	18.2517	17.3574	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3372	17.6596	18.2331	19.0281	19.7114	20.2331	20.4016	20.3930	20.0501	19.2054	18.2517	17.3574	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8357	0.8137	0.7714	0.6979	0.5923	0.4360	0.3040	0.3255	0.5367	0.7091	0.7993	0.8423	(94)
Useful gains	297.4972	309.3758	313.5943	302.8764	265.1697	195.7533	129.8210	131.8889	203.8708	250.6357	271.9606	288.0119	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	682.8474	656.9702	595.0853	490.2460	368.5300	231.4873	141.0733	144.8779	263.7043	413.8318	546.6137	668.1947	(97)
Space heating kWh	286.7005	233.5834	209.4293	134.9061	76.9000	0.0000	0.0000	0.0000	0.0000	121.4179	197.7502	282.8560	(98a)
Space heating requirement - total per year (kWh/year)												1543.5436	
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	286.7005	233.5834	209.4293	134.9061	76.9000	0.0000	0.0000	0.0000	0.0000	121.4179	197.7502	282.8560	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1543.5436	
Space heating per m2											(98c) / (4) =	50.5583	(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 %)	84.0000	(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	286.7005	233.5834	209.4293	134.9061	76.9000	0.0000	0.0000	0.0000	0.0000	121.4179	197.7502	282.8560	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	341.3102	278.0755	249.3206	160.6025	91.5476	0.0000	0.0000	0.0000	0.0000	144.5451	235.4169	336.7334	(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	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(64)
Efficiency of water heater												78.9000	(216)

(217)m	84.7094	84.5099	84.0975	83.3581	82.1301	78.9000	78.9000	78.9000	78.9000	83.0903	84.1144	84.7081 (217)
Fuel for water heating, kWh/month												
	221.5983	196.1226	208.2417	181.5745	176.5434	163.1813	159.1303	166.6888	169.9228	182.6972	195.2729	218.7470 (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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219 (231)
Lighting	12.2087	9.7943	8.8187	6.4609	4.9906	4.0774	4.5526	5.9176	7.6864	10.0850	11.3910	12.5480 (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)
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	1837.5519	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2239.7209	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	98.5312	(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	4220.8040	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1837.5519	5.6000	102.9029	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2239.7209	5.6000	125.4244	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	98.5312	26.0600	25.6772	(250)
Additional standing charges			99.0000	(251)
Total energy cost			364.7315	(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	1837.5519	0.2100	385.8859	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2239.7209	0.2100	470.3414	(264)
Space and water heating			856.2273	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	98.5312	0.1443	14.2211	(268)
Total CO2, kg/year			876.6904	(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	1837.5519	1.1300	2076.4337	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2239.7209	1.1300	2530.8846	(278)
Space and water heating			4607.3183	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	98.5312	1.5338	151.1304	(282)
Total Primary energy kWh/year			4826.5247	(286)

SAP 10 EPC IMPROVEMENTS

Top Floor Flat

Current energy efficiency rating:	C 79
Current environmental impact rating:	B 83

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

Recommended measures:	SAP change	Cost change	CO2 change

(none)

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

Potential energy efficiency rating: C 79
Potential environmental impact rating: B 83

Fuel prices for cost data on this page from database revision number 561 TEST (31 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£37	£37	£0
Mains gas	£327	£327	£0
Space heating	£214	£214	£0
Water heating	£125	£125	£0
Lighting	£26	£26	£0
Total cost of fuels	£364	£364	£0
Total cost of uses	£365	£365	£0
Delivered energy	138 kWh/m²	138 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	29 kg/m²	29 kg/m²	0 kg/m²
Primary energy	158 kWh/m²	158 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	30.5300	(1b)	x 1.8900	(2b) =	57.7017	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		57.7017	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.3466 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		1.0966 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9321 (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	1.1885	1.1651	1.1418	1.0253	1.0020	0.8855	0.8855	0.8622	0.9321	1.0020	1.0486	1.0952	(22b)
Effective ac	1.1885	1.1651	1.1418	1.0253	1.0020	0.8921	0.8921	0.8717	0.9344	1.0020	1.0486	1.0952	(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								
Window			1.8900	1.5918	3.0084			(27)
Rooflight			1.6000	2.0221	3.2353			(27a)
External Wall upgraded	26.9800	1.8900	25.0900	0.3000	7.5270	0.0000	0.0000	(29a)
Ashlar	3.2200		3.2200	0.3000	0.9660	18.0000	57.9600	(29a)
External Roof 1	45.0000	1.6000	43.4000	0.1600	6.9440	9.0000	390.6000	(30)
Total net area of external elements Aum(A, m2)			75.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.6807			(33)
Main dwelling								
Party Wall Solid			5.5100	0.0000	0.0000	180.0000	991.8000	(32)
Party Wall Timber			4.8100	0.0000	0.0000	20.0000	96.2000	(32)
Party Floor 1			30.5300			30.0000	915.9000	(32d)
Internal Wall - Timber			26.9600			9.0000	242.6400	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 2695.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 88.2771 (35)
Thermal bridges (Default value 0.200 * total exposed area) 15.0400 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.7207 (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	22.6300	22.1862	21.7425	19.5239	19.0802	16.9863	16.9863	16.5986	17.7929	19.0802	19.9676	20.8551	(38)
Heat transfer coeff	59.3507	58.9070	58.4632	56.2446	55.8009	53.7071	53.7071	53.3193	54.5136	55.8009	56.6883	57.5758	(39)
Average = Sum(39)m / 12 =												56.1732	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9440	1.9295	1.9149	1.8423	1.8277	1.7592	1.7592	1.7465	1.7856	1.8277	1.8568	1.8859	(40)
HLP (average)												1.8399	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.1836 (42)
Hot water usage for mixer showers

80.5172	79.3072	77.5439	74.1703	71.6807	68.9042	67.3261	69.0760	70.9942	73.9752	77.4213	80.2087	(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

26.7507	25.7780	24.8052	23.8325	22.8597	21.8870	21.8870	22.8597	23.8325	24.8052	25.7780	26.7507	(42c)

Average daily hot water use (litres/day) 98.5530 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.2679	105.0852	102.3492	98.0028	94.5404	90.7912	89.2131	91.9357	94.8267	98.7805	103.1993	106.9594	(44)
Energy conte	169.8862	149.6399	157.3069	134.1609	127.2695	111.6384	107.8955	113.8356	116.9308	134.0442	147.0263	167.4726	(45)
Energy content (annual)										Total = Sum(45)m =		1637.1066	
Distribution loss (46)m = 0.15 x (45)m	25.4829	22.4460	23.5960	20.1241	19.0904	16.7458	16.1843	17.0753	17.5396	20.1066	22.0539	25.1209	(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	(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	17.8285	16.1031	17.8191	17.1960	17.7257	17.1117	17.6583	17.6819	17.1384	17.7596	17.2263	17.8238	(61)
Total heat required for water heating calculated for each month	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(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	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(64)
										Total per year (kWh/year) = Sum(64)m =		1846.1791	(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	60.9443	53.7810	56.7593	48.9075	46.7485	41.3977	40.2898	42.2708	43.1641	49.0096	53.1928	60.1406	(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	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.9481	12.3886	10.0751	7.6275	5.7016	4.8136	5.2012	6.7607	9.0743	11.5218	13.4477	14.3358	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2317	148.7595	144.9095	136.7132	126.3670	116.6429	110.1467	108.6189	112.4689	120.6651	131.0114	140.7354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	(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)	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	(71)
Water heating gains (Table 5)	81.9143	80.0313	76.2894	67.9271	62.8341	57.4968	54.1530	56.8156	59.9501	65.8731	73.8789	80.8341	(72)
Total internal gains	310.0500	308.1352	298.2298	279.2237	261.8585	245.9091	236.4568	239.1511	248.4491	265.0159	285.2939	302.8612	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.0600	46.7521	0.6300	0.7000	0.7700	15.1453	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
South	0.8000	42.0754	0.6300	0.7000	1.0000	13.3598	(82)

Solar gains	38.8205	69.4510	104.3991	145.9494	179.2606	185.0783	175.4621	149.4100	118.5394	79.2332	47.0905	32.8460	(83)
Total gains	348.8705	377.5862	402.6290	425.1731	441.1192	430.9874	411.9189	388.5611	366.9885	344.2492	332.3844	335.7071	(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, ni1,m (see Table 9a)

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

tau	12.6138	12.7088	12.8053	13.3104	13.4163	13.9393	13.9393	14.0407	13.7331	13.4163	13.2062	13.0027	
alpha	1.8409	1.8473	1.8537	1.8874	1.8944	1.9293	1.9293	1.9360	1.9155	1.8944	1.8804	1.8668	
util living area													
	0.9001	0.8816	0.8500	0.7921	0.7062	0.5821	0.4695	0.5023	0.6651	0.8059	0.8756	0.9049	(86)
MIT	17.2691	17.5932	18.1895	19.0442	19.8144	20.4576	20.7493	20.7062	20.2349	19.2688	18.1858	17.2770	(87)
Th 2	20.0280	20.0353	20.0425	20.0789	20.0861	20.1204	20.1204	20.1268	20.1072	20.0861	20.0716	20.0571	(88)
util rest of house													
	0.8910	0.8709	0.8359	0.7714	0.6737	0.5312	0.3974	0.4321	0.6190	0.7827	0.8630	0.8964	(89)
MIT 2	16.5976	16.9207	17.5116	18.3677	19.1099	19.7258	19.9722	19.9461	19.5261	18.6007	17.5317	16.6228	(90)
Living area fraction										fLA = Living area / (4) =		0.3875	(91)
MIT	16.8578	17.1813	17.7742	18.6298	19.3829	20.0094	20.2733	20.2406	19.8008	18.8596	17.7852	16.8763	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.8578	17.1813	17.7742	18.6298	19.3829	20.0094	20.2733	20.2406	19.8008	18.8596	17.7852	16.8763	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8513	0.8294	0.7933	0.7323	0.6451	0.5242	0.4107	0.4419	0.6012	0.7447	0.8225	0.8580	(94)
Useful gains	296.9889	313.1628	319.4044	311.3578	284.5805	225.9410	169.1934	171.7081	220.6517	256.3502	273.3852	288.0265	(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													
	745.3123	723.4512	659.1287	547.2512	428.7127	290.5232	197.2843	204.7772	310.7697	460.8915	605.7249	729.8462	(97)
Space heating kWh													
	333.5526	275.7138	252.7549	169.8432	107.2344	0.0000	0.0000	0.0000	0.0000	152.1787	239.2845	328.7138	(98a)
Space heating requirement - total per year (kWh/year)												1859.2760	
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													
	333.5526	275.7138	252.7549	169.8432	107.2344	0.0000	0.0000	0.0000	0.0000	152.1787	239.2845	328.7138	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1859.2760	
Space heating per m2											(98c) / (4) =	60.9000	(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 %)	84.0000	(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													
	333.5526	275.7138	252.7549	169.8432	107.2344	0.0000	0.0000	0.0000	0.0000	152.1787	239.2845	328.7138	(98)
Space heating efficiency (main heating system 1)													
	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)													
	397.0864	328.2307	300.8987	202.1943	127.6600	0.0000	0.0000	0.0000	0.0000	181.1651	284.8625	391.3260	(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													
	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.0781	84.9187	84.5692	83.9368	82.8997	78.9000	78.9000	78.9000	78.9000	83.6524	84.5924	85.0741	(217)
Fuel for water heating, kWh/month													
	220.6381	195.1783	207.0802	180.3225	174.9045	163.1813	159.1303	166.6888	169.9228	181.4696	194.1696	217.8058	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.2087	9.7943	8.8187	6.4609	4.9906	4.0774	4.5526	5.9176	7.6864	10.0850	11.3910	12.5480	(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)
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	2213.4238	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2230.4920	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	98.5312	(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	4587.4470	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2213.4238	3.6400	80.5686	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2230.4920	3.6400	81.1899	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	98.5312	16.4900	16.2478	(250)
Additional standing charges			92.0000	(251)
Total energy cost			277.4268	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3223	(257)
SAP value		78.5654	
SAP rating (Section 12)		79	(258)
SAP band		C	

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	2213.4238	0.2100	464.8190	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2230.4920	0.2100	468.4033	(264)
Space and water heating			933.2223	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	98.5312	0.1443	14.2211	(268)
Total CO2, kg/year			953.6855	(272)
CO2 emissions per m2			31.2400	(273)
EI value			83.0804	
EI rating			83	(274)
EI band			B	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	30.5300 (1b)	x 1.8900 (2b) =	57.7017	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.5300			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	57.7017	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.3466 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		1.0966 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9321 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	1.0020	0.9554	0.9554	0.8855	0.9088	0.7923	0.7923	0.7690	0.7923	0.8855	0.8622	0.9321	(22b)
Effective ac	1.0020	0.9564	0.9564	0.8921	0.9130	0.8139	0.8139	0.7957	0.8139	0.8921	0.8717	0.9344	(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								
Window			1.8900	1.5918	3.0084			(27)
Rooflight			1.6000	2.0221	3.2353			(27a)
External Wall upgraded	26.9800	1.8900	25.0900	0.3000	7.5270	0.0000	0.0000	(29a)
Ashlar	3.2200		3.2200	0.3000	0.9660	18.0000	57.9600	(29a)
External Roof 1	45.0000	1.6000	43.4000	0.1600	6.9440	9.0000	390.6000	(30)
Total net area of external elements Aum(A, m2)			75.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.6807			(33)
Main dwelling								
Party Wall Solid			5.5100	0.0000	0.0000	180.0000	991.8000	(32)
Party Wall Timber			4.8100	0.0000	0.0000	20.0000	96.2000	(32)
Party Floor 1			30.5300			30.0000	915.9000	(32d)
Internal Wall - Timber			26.9600			9.0000	242.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	2695.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		88.2771 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.0400 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.7207 (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	19.0802	18.2116	18.2116	16.9863	17.3844	15.4974	15.4974	15.1510	15.4974	16.9863	16.5986	17.7929	(38)
Heat transfer coeff	55.8009	54.9324	54.9324	53.7071	54.1052	52.2181	52.2181	51.8717	52.2181	53.7071	53.3193	54.5136	(39)
Average = Sum(39)m / 12 =												53.6286	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8277	1.7993	1.7993	1.7592	1.7722	1.7104	1.7104	1.6990	1.7104	1.7592	1.7465	1.7856	(40)
HLP (average)												1.7566	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.1836 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	80.5172	79.3072	77.5439	74.1703	71.6807	68.9042	67.3261	69.0760	70.9942	73.9752	77.4213	80.2087	(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	26.7507	25.7780	24.8052	23.8325	22.8597	21.8870	21.8870	22.8597	23.8325	24.8052	25.7780	26.7507	(42c)
Average daily hot water use (litres/day)												98.5530	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.2679	105.0852	102.3492	98.0028	94.5404	90.7912	89.2131	91.9357	94.8267	98.7805	103.1993	106.9594	(44)
Energy conte	169.8862	149.6399	157.3069	134.1609	127.2695	111.6384	107.8955	113.8356	116.9308	134.0442	147.0263	167.4726	(45)
Energy content (annual)										Total = Sum(45)m =		1637.1066	
Distribution loss (46)m = 0.15 x (45)m	25.4829	22.4460	23.5960	20.1241	19.0904	16.7458	16.1843	17.0753	17.5396	20.1066	22.0539	25.1209	(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	(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	17.8285	16.1031	17.8191	17.1960	17.7257	17.1117	17.6583	17.6819	17.1384	17.7596	17.2263	17.8238	(61)
Total heat required for water heating calculated for each month	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(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	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(64)
										Total per year (kWh/year) = Sum(64)m =		1846.1791	(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	60.9443	53.7810	56.7593	48.9075	46.7485	41.3977	40.2898	42.2708	43.1641	49.0096	53.1928	60.1406	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.9481	12.3886	10.0751	7.6275	5.7016	4.8136	5.2012	6.7607	9.0743	11.5218	13.4477	14.3358	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2317	148.7595	144.9095	136.7132	126.3670	116.6429	110.1467	108.6189	112.4689	120.6651	131.0114	140.7354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	(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)	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	(71)
Water heating gains (Table 5)	81.9143	80.0313	76.2894	67.9271	62.8341	57.4968	54.1530	56.8156	59.9501	65.8731	73.8789	80.8341	(72)
Total internal gains	310.0500	308.1352	298.2298	279.2237	261.8585	245.9091	236.4568	239.1511	248.4491	265.0159	285.2939	302.8612	(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	0.8300	23.8018	0.6300	0.7000	0.7700	6.0375	(76)

South				1.0600	54.2217	0.6300	0.7000	0.7700				17.5651	(78)
North				0.8000	20.0851	0.6300	0.7000	1.0000				6.3774	(82)
South				0.8000	50.2348	0.6300	0.7000	1.0000				15.9506	(82)
Solar gains	45.9306	72.0686	108.2711	154.7441	185.8255	203.1136	190.6038	166.0349	131.4448	88.4535	54.9374	39.0540	(83)
Total gains	355.9806	380.2039	406.5009	433.9678	447.6840	449.0227	427.0606	405.1860	379.8939	353.4694	340.2313	341.9152	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	13.4163	13.6284	13.6284	13.9393	13.8367	14.3368	14.3368	14.4325	14.3368	13.9393	14.0407	13.7331	
alpha	1.8944	1.9086	1.9086	1.9293	1.9224	1.9558	1.9558	1.9622	1.9558	1.9293	1.9360	1.9155	
util living area	0.8857	0.8662	0.8280	0.7565	0.6508	0.4892	0.3597	0.3827	0.5964	0.7703	0.8535	0.8908	(86)
MIT	17.7311	18.0519	18.6324	19.4351	20.1453	20.6922	20.8890	20.8732	20.4851	19.6098	18.6371	17.7432	(87)
Th 2	20.0861	20.1004	20.1004	20.1204	20.1139	20.1448	20.1448	20.1505	20.1448	20.1204	20.1268	20.1072	(88)
util rest of house	0.8756	0.8544	0.8121	0.7325	0.6119	0.4294	0.2786	0.3011	0.5431	0.7428	0.8389	0.8812	(89)
MIT 2	17.0881	17.4115	17.9804	18.7707	19.4368	19.9426	20.0933	20.0892	19.7748	18.9495	18.0079	17.1133	(90)
Living area fraction										fLA = Living area / (4) =		0.3875	(91)
MIT	17.3372	17.6596	18.2331	19.0281	19.7114	20.2331	20.4016	20.3930	20.0501	19.2054	18.2517	17.3574	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3372	17.6596	18.2331	19.0281	19.7114	20.2331	20.4016	20.3930	20.0501	19.2054	18.2517	17.3574	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8357	0.8137	0.7714	0.6979	0.5923	0.4360	0.3040	0.3255	0.5367	0.7091	0.7993	0.8423	(94)
Useful gains	297.4972	309.3758	313.5943	302.8764	265.1697	195.7533	129.8210	131.8889	203.8708	250.6357	271.9606	288.0119	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	682.8474	656.9702	595.0853	490.2460	368.5300	231.4873	141.0733	144.8779	263.7043	413.8318	546.6137	668.1947	(97)
Space heating kWh	286.7005	233.5834	209.4293	134.9061	76.9000	0.0000	0.0000	0.0000	0.0000	121.4179	197.7502	282.8560	(98a)
Space heating requirement - total per year (kWh/year)												1543.5436	
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	286.7005	233.5834	209.4293	134.9061	76.9000	0.0000	0.0000	0.0000	0.0000	121.4179	197.7502	282.8560	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1543.5436	
Space heating per m2											(98c) / (4) =	50.5583	(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 %)												84.0000	(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	286.7005	233.5834	209.4293	134.9061	76.9000	0.0000	0.0000	0.0000	0.0000	121.4179	197.7502	282.8560	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	341.3102	278.0755	249.3206	160.6025	91.5476	0.0000	0.0000	0.0000	0.0000	144.5451	235.4169	336.7334	(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	187.7147	165.7430	175.1260	151.3570	144.9953	128.7501	125.5538	131.5175	134.0691	151.8037	164.2527	185.2964	(64)
Efficiency of water heater												78.9000	(216)
(217)m	84.7094	84.5099	84.0975	83.3581	82.1301	78.9000	78.9000	78.9000	78.9000	83.0903	84.1144	84.7081	(217)
Fuel for water heating, kWh/month	221.5983	196.1226	208.2417	181.5745	176.5434	163.1813	159.1303	166.6888	169.9228	182.6972	195.2729	218.7470	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.2087	9.7943	8.8187	6.4609	4.9906	4.0774	4.5526	5.9176	7.6864	10.0850	11.3910	12.5480	(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)
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												1837.5519	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												78.9000	
Water heating fuel used												2239.7209	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	98.5312	(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	4220.8040	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1837.5519	5.6000	102.9029	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2239.7209	5.6000	125.4244	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	98.5312	26.0600	25.6772	(250)
Additional standing charges			99.0000	(251)
Total energy cost			364.7315	(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	1837.5519	0.2100	385.8859	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2239.7209	0.2100	470.3414	(264)
Space and water heating			856.2273	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	98.5312	0.1443	14.2211	(268)
Total CO2, kg/year			876.6904	(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	1837.5519	1.1300	2076.4337	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2239.7209	1.1300	2530.8846	(278)
Space and water heating			4607.3183	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	98.5312	1.5338	151.1304	(282)
Total Primary energy kWh/year			4826.5247	(286)

Predicted Energy Assessment

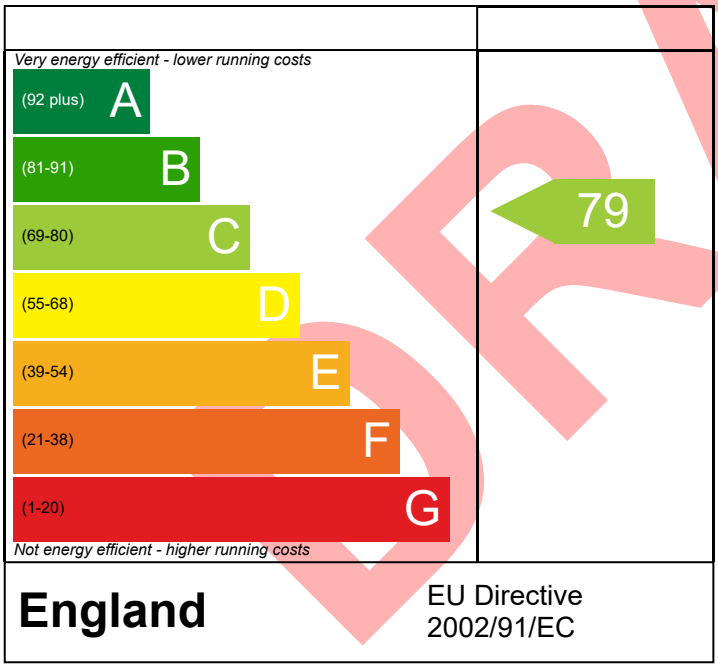
Flat 5, 99 London Road, Reading, RG1 5BY

Dwelling type:	Flat, Semi-Detached
Date of assessment:	17/02/2025
Produced by:	Sammit Pancholi
Total floor area:	30.53 m²
DRRN:	

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.

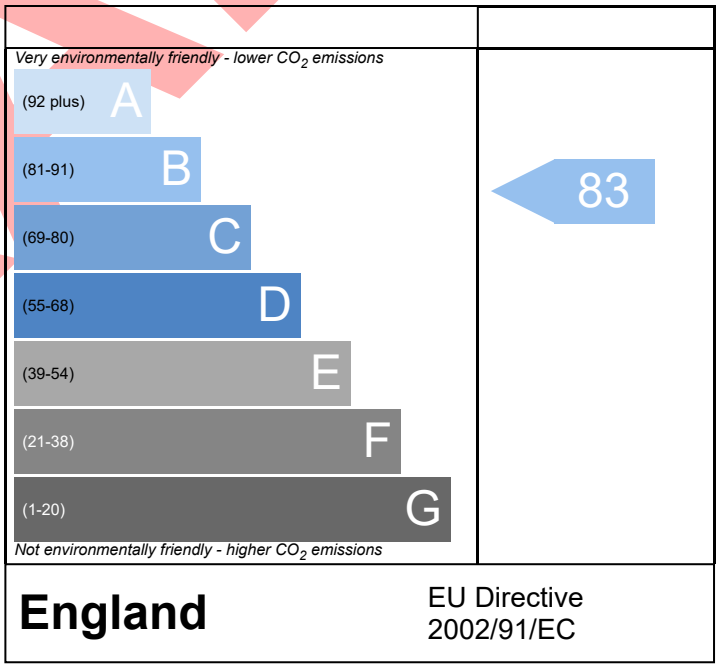
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

elmhurst energy

Property Reference	Flat 5 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Top Floor Flat	**Prop Type Ref**	Top Floor Flat
Property	Flat 5, 99 London Road, Reading, RG1 5BY		

SAP Rating	79 C	**DER**	31.72	**TER**	
Environmental	83 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.88	**DFEE**	65.72	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	174.25	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North	
Property Tenture	ND	
Transaction Type	5	
Terrain Type	Suburban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Top-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2025	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	88.28	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	19.14 m	30.53 m²	1.89 m

8.0 Living Area	11.83	m²

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
External Wall upgraded	Solid Wall	Other	0.30	0.00	26.98	25.09	0.00	None	1.89	Enter Gross Area
Ashlar	Timber Frame	Timber framed wall (two layers of plasterboard)	0.30	18.00	3.22	3.22	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 Solid	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	5.51		None
Party Wall Timber	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	20.00	4.81		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall - Timber	Plasterboard on timber frame	9.00	26.96

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
External Roof 1	External Slope Roof	Plasterboard, insulated slope	0.16	9.00	45.00	43.40	None	0.00	Enter Gross Area	1.60

11.1 Party Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Timber I-joists, carpeted	20.00	30.53

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	SAP table	Solid Door				0.00			3.00
Window	SAP table	Window	Double Low-E Soft 0.05	≥ 16 mm	Argon Filled	0.63	PVC	0.70	1.70
Rooflight	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	2.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening 1	Window	External Wall upgraded	East	0.83	
Opening 2	Window	External Wall upgraded	South	1.06	
Opening 3	Rooflight	External Roof 1	South	0.80	30
Opening 4	Rooflight	External Roof 1	North	0.80	30

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.20	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	2	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	No	
Test Method	Blower Door	
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
LED	66.00	8.00	528.00	15

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18830	
Fuel Type	Mains gas	
In Winter	84.00	
In Summer	78.90	
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Controls SAP Code	2104	
Delayed Start Stat	No	

Summary for Input Data

Flue Type	Open
Fan Assisted Flue	Yes
Is MHS Pumped	No pump
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	No
Combi boiler type	Standard Combi
Combi keep hot type	None

25.0 Main Heating 2 — None

26.0 Heat Networks — None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	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	0

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.40		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder — None

In Airing Cupboard — No

34.0 Small-scale Hydro — None

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

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
			0	0
			0	0
			0	0

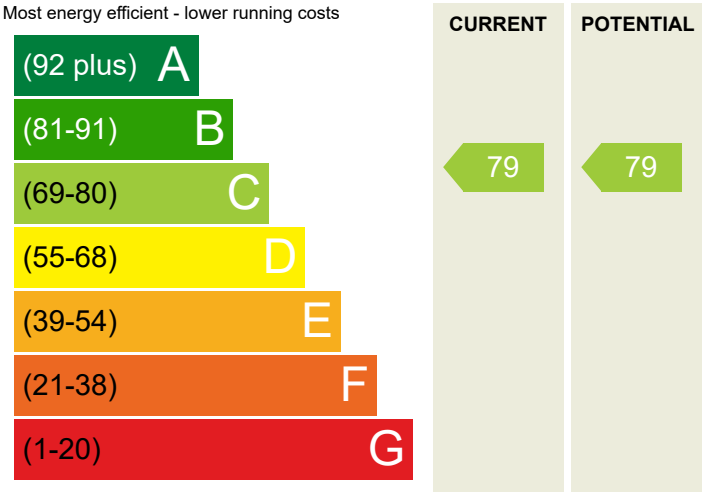
Energy Report

Dwelling Address	Flat 5, 99 London Road, Reading, RG1 5BY
Reference	Flat 5 - Baseline-Top Floor Flat
Assessment Date	17/02/2025
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	31

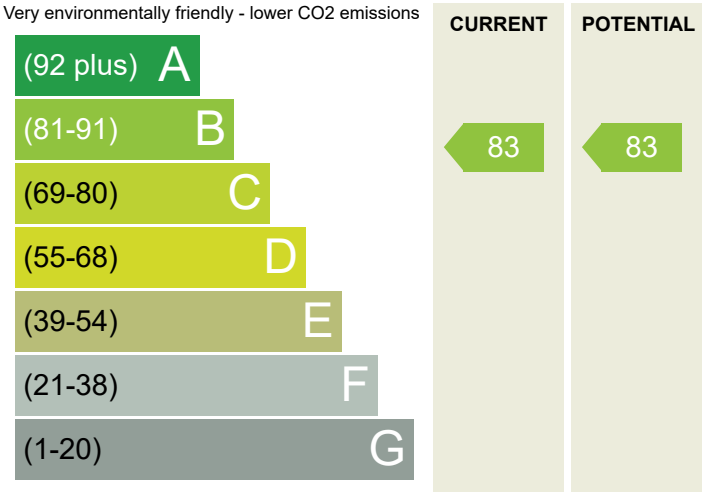
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

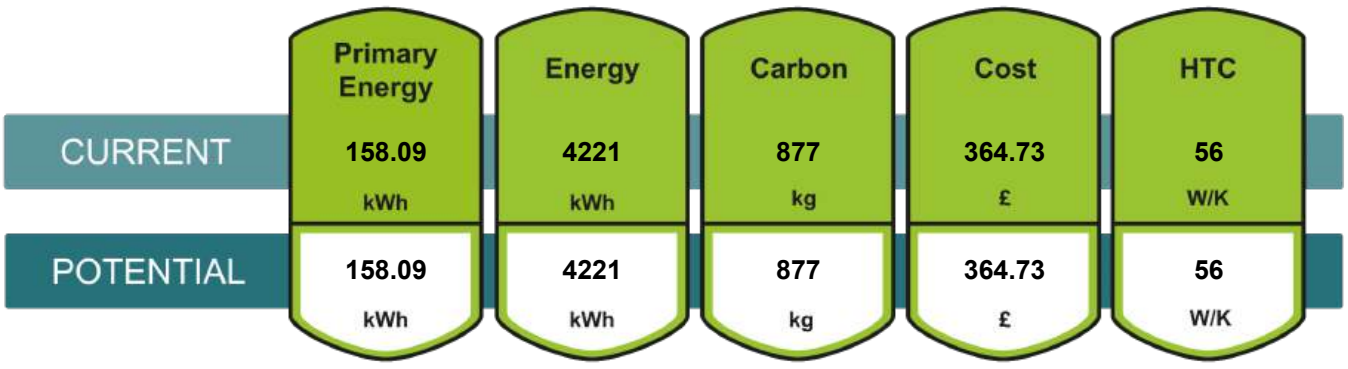
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.3 W/m²K	Good
Roof	Average thermal transmittance 0.16 W/m²K	Very Good
Windows	Fully double glazed	Average
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer and room thermostat	Average
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total

energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£26	£26	You could save £0
Heating	£214	£214	
Hot Water	£125	£125	
New Technologies e.g. Impact of PV	£0	£0	
TOTAL	£365	£365	

Estimated energy use and potential savings

Space Heating
1838
kWh per year

Water Heating
2240
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report

Property Reference	Flat 5 - Baseline	Issued on Date	17/02/2025
Assessment Reference	Top Floor Flat	Prop Type Ref	Semi-Detached Flat
Property	Flat 5, 99 London Road, Reading, RG1 5BY		

SAP Rating	79 C	DER	31.72	TER	
Environmental	83 B	% DER < TER			N/A
CO_2 Emissions (t/year)	0.88	DFEE	65.72	TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER	174.25	TPER	

Assessor Details	Mr. Sammit Pancholi	Assessor ID	DB55-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	Flat 5, 99 London Road	
House Number		
Postcode	RG1 5BY	
Street		
Town	Reading	
County		

Dwelling Orientation North (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Suburban

Property Type Flat, Semi-Detached

Comments

Electricity Tariff Standard

Smart electricity meter fitted: No

Smart gas meter fitted: No

Comments

Section 2: Dwelling Construction Details

External Walls

Description	External Wall upgraded		
Type	Solid Wall		
Construction	Other		
U-value	0.30	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	26.98	m²	

Description	Ashlar		
Type	Timber Frame		
Construction	Timber framed wall (two layers of plasterboard)		
U-value	0.30	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	3.22	m²	

Comments

Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall Solid	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	5.51
Party Wall Timber	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	4.81

Comments

External Roofs

Description	External Roof 1		
Type	External Slope Roof		
Construction	Plasterboard, insulated slope		
U-value	0.16	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	45.00	m²	

Comments

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
Door	SAP table	Solid Door		0.00		3.00
Window	SAP table	Window	Double Low-E Soft 0.05	0.63	PVC	1.70
Rooflight	Manufacturer	Roof Window	Double Low-E Soft 0.05	0.63		2.20

Comments

Openings

Name	Opening Type	Location	Orientation	Area (m²)
Opening 1	Window	External Wall upgraded	East	0.83
Opening 2	Window	External Wall upgraded	South	1.06
Opening 3	Rooflight	External Roof 1	South	0.80
Opening 4	Rooflight	External Roof 1	North	0.80

Comments

Thermal Bridging Default

Y-value 0.200

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing No

Designed AP_{50} 5.00 $m^3/(h.m^2)$ @ 50 Pa

Property Tested? Yes

Test Method Blower Door

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

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	2
Number of passive vents	0
Number of flueless gas fires	0

Comments

Fixed Cooling System No

Comments

Lighting

No Fixed Lighting No

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
LED	66.00	8.00	528.00	15

Comments

Main Heating 1	Database	
Fuel Type	Mains gas	
Winter Efficiency	84.00	%
Summer Efficiency	78.90	%
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Flue Type	Open	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Programmer and room thermostat
Boiler Interlock	No
Delayed Start Stat	No
PCDF Control Description	

Comments

Main Heating 2	None
Secondary Heating	None

Water Heating System

Water Heating	Main Heating 1
Supplementary Immersion	No
SAP Code	901
Water use <= 125 l/p/day	Yes
Cold Water Source	From mains
Number of baths	0

Comments

Hot Water Cylinder	None

Comments

Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.40		No	

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit None

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed .....

Date .....

Full SAP Calculation Printout

Property Reference	Flat 5 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Top Floor Flat	**Prop Type Ref**	Top Floor Flat
Property	Flat 5, 99 London Road, Reading, RG1 5BY		

SAP Rating	84 B	**DER**	24.81	**TER**	
Environmental	87 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.67	**DFEE**	58.43	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	132.66	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	30.5300	(1b)	x 1.8900	(2b) =	57.7017	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.5300					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	57.7017	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.3466 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		1.0966 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9321 (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	1.1885	1.1651	1.1418	1.0253	1.0020	0.8855	0.8855	0.8622	0.9321	1.0020	1.0486	1.0952	(22b)
Effective ac	1.1885	1.1651	1.1418	1.0253	1.0020	0.8921	0.8921	0.8717	0.9344	1.0020	1.0486	1.0952	(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								
Window			1.8900	1.1450	2.1641			(27)
Rooflight			1.6000	1.2357	1.9772			(27a)
External Wall upgraded	26.9800	1.8900	25.0900	0.2100	5.2689	0.0000	0.0000	(29a)
Ashlar	3.2200		3.2200	0.1800	0.5796	18.0000	57.9600	(29a)
External Roof 1	45.0000	1.6000	43.4000	0.1400	6.0760	9.0000	390.6000	(30)
Total net area of external elements Aum(A, m2)			75.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.0658			(33)
Main dwelling								
Party Wall Solid			5.5100	0.0000	0.0000	180.0000	991.8000	(32)
Party Wall Timber			4.8100	0.0000	0.0000	20.0000	96.2000	(32)
Party Floor 1			30.5300			30.0000	915.9000	(32d)
Internal Wall - Timber			26.9600			9.0000	242.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	2695.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		88.2771 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.0400 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	31.1058 (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	22.6300	22.1862	21.7425	19.5239	19.0802	16.9863	16.9863	16.5986	17.7929	19.0802	19.9676	20.8551	(38)
Heat transfer coeff													
	53.7358	53.2921	52.8483	50.6297	50.1860	48.0921	48.0921	47.7044	48.8987	50.1860	51.0734	51.9609	(39)
Average = Sum(39)m / 12 =												50.5583	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7601	1.7456	1.7310	1.6584	1.6438	1.5752	1.5752	1.5625	1.6017	1.6438	1.6729	1.7020	(40)
HLP (average)												1.6560	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.1836	(42)
Hot water usage for mixer showers													
	67.0976	66.0893	64.6199	61.8086	59.7339	57.4202	56.1051	57.5633	59.1618	61.6460	64.5178	66.8406	(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													
	26.7507	25.7780	24.8052	23.8325	22.8597	21.8870	21.8870	22.8597	23.8325	24.8052	25.7780	26.7507	(42c)
Average daily hot water use (litres/day)												86.1806	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	93.8484	91.8673	89.4252	85.6411	82.5936	79.3072	77.9920	80.4230	82.9943	86.4513	90.2958	93.5913	(44)
Energy conte	148.6329	130.8178	137.4432	117.2383	111.1869	97.5174	94.3246	99.5805	102.3403	117.3135	128.6429	146.5414	(45)
Energy content (annual)										Total = Sum(45)m =		1431.5797	
Distribution loss (46)m = 0.15 x (45)m													
	22.2949	19.6227	20.6165	17.5858	16.6780	14.6276	14.1487	14.9371	15.3510	17.5970	19.2964	21.9812	(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	(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	17.7794	16.0425	17.7330	17.1090	17.6460	17.0444	17.5948	17.6131	17.0657	17.6728	17.1531	17.7729	(61)
Total heat required for water heating calculated for each month													
	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(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													
	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(64)
										Total per year (kWh/year) = Sum(64)m =		1639.8064	(64)
12Total per year (kWh/year)												1640	(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													
	53.8653	47.5076	50.1331	43.2590	41.3811	36.6856	35.7616	37.5138	38.2946	43.4250	47.0620	53.1682	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	54.7242	60.5875	54.7242	56.5484	54.7242	56.5484	54.7242	54.7242	56.5484	54.7242	56.5484	54.7242	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	98.6452	99.6688	97.0893	91.5979	84.6659	78.1508	73.7983	72.7746	75.3542	80.8456	87.7776	94.2927	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	(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)													
	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	(71)
Water heating gains (Table 5)													
	72.3996	70.6958	67.3832	60.0820	55.6198	50.9523	48.0667	50.4218	53.1869	58.3669	65.3639	71.4627	(72)
Total internal gains													
	266.5223	271.7054	259.9500	248.9815	235.7631	226.4047	217.3425	218.6739	225.8427	234.6900	250.4432	261.2329	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.0600	46.7521	0.6300	0.7000	0.7700	15.1453	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
South	0.8000	42.0754	0.6300	0.7000	1.0000	13.3598	(82)

Solar gains	38.8205	69.4510	104.3991	145.9494	179.2606	185.0783	175.4621	149.4100	118.5394	79.2332	47.0905	32.8460	(83)
Total gains	305.3428	341.1564	364.3492	394.9309	415.0238	411.4830	392.8046	368.0839	344.3821	313.9232	297.5337	294.0789	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	13.9319	14.0479	14.1658	14.7866	14.9173	15.5668	15.5668	15.6933	15.3100	14.9173	14.6581	14.4077	
alpha	1.9288	1.9365	1.9444	1.9858	1.9945	2.0378	2.0378	2.0462	2.0207	1.9945	1.9772	1.9605	
util living area													
	0.9139	0.8918	0.8608	0.7966	0.7043	0.5700	0.4556	0.4908	0.6621	0.8151	0.8875	0.9182	(86)
MIT	17.3884	17.7505	18.3312	19.2009	19.9421	20.5457	20.7974	20.7585	20.3273	19.3863	18.3213	17.4117	(87)
Th 2	19.4981	19.5084	19.5187	19.5708	19.5814	19.6315	19.6315	19.6409	19.6121	19.5814	19.5603	19.5394	(88)

util rest of house													
	0.9005	0.8753	0.8385	0.7624	0.6499	0.4855	0.3386	0.3756	0.5844	0.7770	0.8678	0.9057	(89)
MIT 2	16.3341	16.6921	17.2634	18.1271	18.8184	19.3698	19.5522	19.5390	19.1924	18.3270	17.2882	16.3810	(90)
Living area fraction										fLA = Living area / (4) =		0.3875	(91)
MIT	16.7426	17.1022	17.6772	18.5432	19.2538	19.8255	20.0347	20.0116	19.6321	18.7374	17.6885	16.7804	(92)
Temperature adjustment												-0.1500	
adjusted MIT	16.5926	16.9522	17.5272	18.3932	19.1038	19.6755	19.8847	19.8616	19.4821	18.5874	17.5385	16.6304	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8645	0.8369	0.7993	0.7279	0.6286	0.4885	0.3621	0.3961	0.5760	0.7434	0.8307	0.8710	(94)
Useful gains	263.9569	285.4988	291.2133	287.4657	260.8919	201.0171	142.2217	145.7901	198.3779	233.3753	247.1602	256.1297	(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	660.5529	642.2879	582.7679	480.6374	371.5666	244.0906	157.9681	165.1314	263.1797	400.8576	533.1309	645.8925	(97)
Space heating kWh	295.0674	239.7623	216.9166	139.0836	82.3420	0.0000	0.0000	0.0000	0.0000	124.6068	205.8989	289.9836	(98a)
Space heating requirement - total per year (kWh/year)												1593.6612	
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	295.0674	239.7623	216.9166	139.0836	82.3420	0.0000	0.0000	0.0000	0.0000	124.6068	205.8989	289.9836	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1593.6612	
Space heating per m2											(98c) / (4) =	52.1998	(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 %)												89.0000	(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	295.0674	239.7623	216.9166	139.0836	82.3420	0.0000	0.0000	0.0000	0.0000	124.6068	205.8989	289.9836	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	331.5364	269.3958	243.7265	156.2737	92.5191	0.0000	0.0000	0.0000	0.0000	140.0076	231.3471	325.8242	(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	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.0729	84.8730	84.4895	83.7335	82.5529	78.9000	78.9000	78.9000	78.9000	83.4455	84.5150	85.0617	(217)
Fuel for water heating, kWh/month	195.6114	173.0353	183.6631	160.4464	156.0609	145.1988	141.8497	148.5343	151.3384	161.7659	172.5089	193.1707	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.2087	9.7943	8.8187	6.4609	4.9906	4.0774	4.5526	5.9176	7.6864	10.0850	11.3910	12.5480	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.3287	-11.9558	-20.1012	-25.8477	-30.2812	-29.1526	-28.6565	-25.6971	-20.7619	-14.8394	-8.5193	-6.1039	(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	-2.1733	-5.3953	-13.0918	-23.3798	-34.2553	-35.7244	-34.7671	-27.3106	-17.3703	-8.3635	-3.0542	-1.6389	(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												1790.6306	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												78.9000	
Water heating fuel used												1983.1839	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												45.0000	(231)
Electricity for lighting (calculated in Appendix L)												98.5312	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-435.7700	(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												3481.5756	(238)

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

	Energy	Emission factor	Emissions	

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	1790.6306	0.2100	376.0324	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1983.1839	0.2100	416.4686	(264)
Space and water heating			792.5010	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	98.5312	0.1443	14.2211	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-229.2455	0.1320	-30.2661	
PV Unit electricity exported	-206.5245	0.1219	-25.1673	
Total			-55.4334	(269)
Total CO2, kg/year			757.5308	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			24.8100	(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	1790.6306	1.1300	2023.4125	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1983.1839	1.1300	2240.9978	(278)
Space and water heating			4264.4104	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	98.5312	1.5338	151.1304	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-229.2455	1.4878	-341.0710	
PV Unit electricity exported	-206.5245	0.4471	-92.3403	
Total			-433.4113	(283)
Total Primary energy kWh/year			4050.2055	(286)
Dwelling Primary energy Rate (DPER)			132.6600	(287)

SAP 10 WORKSHEET FOR Conversion (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						
Ground floor	30.5300	(1b) x	1.8900	(2b) =	57.7017	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	57.7017	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.3466	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.0966	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9321	(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	1.1885	1.1651	1.1418	1.0253	1.0020	0.8855	0.8855	0.8622	0.9321	1.0020	1.0486	1.0952	(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	1.1885	1.1651	1.1418	1.0253	1.0020	0.8921	0.8921	0.8717	0.9344	1.0020	1.0486	1.0952	(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								
Window			1.8900	1.1450	2.1641			(27)
Rooflight			1.6000	1.2357	1.9772			(27a)
External Wall upgraded	26.9800	1.8900	25.0900	0.2100	5.2689	0.0000	0.0000	(29a)
Ashlar	3.2200		3.2200	0.1800	0.5796	18.0000	57.9600	(29a)
External Roof 1	45.0000	1.6000	43.4000	0.1400	6.0760	9.0000	390.6000	(30)
Total net area of external elements Aum(A, m2)			75.2000					(31)

Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	16.0658		(33)
Main dwelling						
Party Wall Solid	5.5100	0.0000	0.0000	180.0000	991.8000	(32)
Party Wall Timber	4.8100	0.0000	0.0000	20.0000	96.2000	(32)
Party Floor 1	30.5300			30.0000	915.9000	(32d)
Internal Wall - Timber	26.9600			9.0000	242.6400	(32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =		2695.1000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					88.2771	(35)
Thermal bridges (Default value 0.200 * total exposed area)					15.0400	(36)
Point Thermal bridges				(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =		31.1058	(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	22.6300	22.1862	21.7425	19.5239	19.0802	16.9863	16.9863	16.5986	17.7929	19.0802	19.9676	20.8551	(38)
Heat transfer coeff	53.7358	53.2921	52.8483	50.6297	50.1860	48.0921	48.0921	47.7044	48.8987	50.1860	51.0734	51.9609	(39)
Average = Sum(39)m / 12 =												50.5583	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7601	1.7456	1.7310	1.6584	1.6438	1.5752	1.5752	1.5625	1.6017	1.6438	1.6729	1.7020	(40)
HLP (average)												1.6560	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.1836	(42)
Hot water usage for mixer showers	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	19.0720	18.7888	18.3899	17.6545	17.1038	16.4931	16.1633	16.5594	16.9906	17.6440	18.3946	19.0075	(42b)
Hot water usage for other uses	26.7507	25.7780	24.8052	23.8325	22.8597	21.8870	21.8870	22.8597	23.8325	24.8052	25.7780	26.7507	(42c)
Average daily hot water use (litres/day)												42.0016	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	45.8228	44.5668	43.1951	41.4869	39.9635	38.3801	38.0503	39.4191	40.8231	42.4493	44.1726	45.7583	(44)
Energy conte	72.5721	63.4625	66.3893	56.7936	53.7985	47.1928	46.0185	48.8091	50.3390	57.6033	62.9320	71.6464	(45)
Energy content (annual)										Total = Sum(45)m =		697.5571	
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	(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	61.6863	53.9431	56.4309	48.2745	45.7288	40.1139	39.1157	41.4877	42.7881	48.9628	53.4922	60.8995	(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	61.6863	53.9431	56.4309	48.2745	45.7288	40.1139	39.1157	41.4877	42.7881	48.9628	53.4922	60.8995	(64)
									Total per year (kWh/year) = Sum(64)m =			592.9235	(64)
12Total per year (kWh/year)												593	(64)
Electric shower(s)	35.2876	31.4415	34.3330	32.7635	33.3783	31.8397	32.9010	33.3783	32.7635	34.3330	33.6874	35.2876	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			401.3944	(64a)
Heat gains from water heating, kWh/month	24.2435	21.3462	22.6910	20.2595	19.7768	17.9884	18.0042	18.7165	18.8879	20.8239	21.7949	24.0468	(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	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	59.1775	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	54.7242	60.5875	54.7242	56.5484	54.7242	56.5484	54.7242	54.7242	56.5484	54.7242	56.5484	54.7242	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	98.6452	99.6688	97.0893	91.5979	84.6659	78.1508	73.7983	72.7746	75.3542	80.8456	87.7776	94.2927	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	28.9178	(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)	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	(71)
Water heating gains (Table 5)	32.5853	31.7651	30.4986	28.1382	26.5817	24.9839	24.1992	25.1566	26.2332	27.9892	30.2707	32.3209	(72)
Total internal gains	226.7080	232.7748	223.0654	217.0377	206.7250	200.4363	193.4749	193.4087	198.8890	204.3123	215.3499	222.0911	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.0600	46.7521	0.6300	0.7000	0.7700	15.1453	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
South	0.8000	42.0754	0.6300	0.7000	1.0000	13.3598	(82)

Solar gains	38.8205	69.4510	104.3991	145.9494	179.2606	185.0783	175.4621	149.4100	118.5394	79.2332	47.0905	32.8460	(83)
Total gains	265.5285	302.2258	327.4646	362.9871	385.9857	385.5146	368.9371	342.8188	317.4284	283.5455	262.4404	254.9371	(84)

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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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	13.9319	14.0479	14.1658	14.7866	14.9173	15.5668	15.5668	15.6933	15.3100	14.9173	14.6581	14.4077	
alpha	1.9288	1.9365	1.9444	1.9858	1.9945	2.0378	2.0378	2.0462	2.0207	1.9945	1.9772	1.9605	
util living area	0.9308	0.9099	0.8806	0.8177	0.7270	0.5930	0.4769	0.5157	0.6891	0.8388	0.9071	0.9349	(86)
MIT	17.2021	17.5788	18.1822	19.0936	19.8711	20.5090	20.7789	20.7343	20.2704	19.2770	18.1651	17.2232	(87)
Th 2	19.4981	19.5084	19.5187	19.5708	19.5814	19.6315	19.6315	19.6409	19.6121	19.5814	19.5603	19.5394	(88)
util rest of house	0.9197	0.8956	0.8606	0.7857	0.6742	0.5082	0.3569	0.3977	0.6130	0.8039	0.8902	0.9246	(89)
MIT 2	16.1544	16.5283	17.1238	18.0311	18.7606	19.3458	19.5439	19.5272	19.1512	18.2301	17.1405	16.1987	(90)
Living area fraction										fLA = Living area / (4) =		0.3875	(91)
MIT	16.5604	16.9354	17.5339	18.4428	19.1909	19.7965	20.0224	19.9950	19.5849	18.6357	17.5375	16.5957	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.5604	16.9354	17.5339	18.4428	19.1909	19.7965	20.0224	19.9950	19.5849	18.6357	17.5375	16.5957	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8888	0.8617	0.8253	0.7545	0.6572	0.5195	0.3939	0.4313	0.6112	0.7744	0.8577	0.8951	(94)
Useful gains	235.9964	260.4171	270.2486	273.8835	253.6826	200.2665	145.3335	147.8577	194.0281	219.5679	225.0927	228.1857	(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	658.8220	641.3889	583.1251	483.1489	375.9398	249.9120	164.5906	171.4957	268.2034	403.2817	533.0787	644.0896	(97)
Space heating kWh	314.5822	256.0130	232.7801	150.6711	90.9594	0.0000	0.0000	0.0000	0.0000	136.6831	221.7499	309.4325	(98a)
Space heating requirement - total per year (kWh/year)												1712.8713	
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	314.5822	256.0130	232.7801	150.6711	90.9594	0.0000	0.0000	0.0000	0.0000	136.6831	221.7499	309.4325	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1712.8713	
Space heating per m2											(98c) / (4) =	56.1045	(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	452.0662	355.8819	362.5534	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6371	0.7031	0.6755	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	288.0084	250.2229	244.9040	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	409.4532	392.5652	366.6579	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	87.4403	105.9027	90.5849	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	21.8601	26.4757	22.6462	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												70.9820	(107)
Energy for space heating												56.1045	(99)
Energy for space cooling												2.3250	(108)
Total												58.4295	(109)
Fabric Energy Efficiency (DFEE)												58.4	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		30.5300	(1b)	x 1.8900	(2b) =	57.7017	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.5300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		57.7017	(5)

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2. Ventilation rate

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		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	2 * 10 =	20.0000	(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) =											20.0000 / (5) =	0.3466	(8)
Pressure test												No	
Pressure Test Method												Blower Door	
Measured/design AP50												15.0000	(17)
Infiltration rate												1.0966	(18)
Number of sides sheltered												2	(19)
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.9321	(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													
	1.1885	1.1651	1.1418	1.0253	1.0020	0.8855	0.8855	0.8622	0.9321	1.0020	1.0486	1.0952	(22b)
Effective ac	1.1885	1.1651	1.1418	1.0253	1.0020	0.8921	0.8921	0.8717	0.9344	1.0020	1.0486	1.0952	(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								
Window			1.8900	1.1450	2.1641			(27)
Rooflight			1.6000	1.2357	1.9772			(27a)
External Wall upgraded	26.9800	1.8900	25.0900	0.2100	5.2689	0.0000	0.0000	(29a)
Ashlar	3.2200		3.2200	0.1800	0.5796	18.0000	57.9600	(29a)
External Roof 1	45.0000	1.6000	43.4000	0.1400	6.0760	9.0000	390.6000	(30)
Total net area of external elements Aum(A, m2)			75.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.0658			(33)
Main dwelling								
Party Wall Solid			5.5100	0.0000	0.0000	180.0000	991.8000	(32)
Party Wall Timber			4.8100	0.0000	0.0000	20.0000	96.2000	(32)
Party Floor 1			30.5300			30.0000	915.9000	(32d)
Internal Wall - Timber			26.9600			9.0000	242.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	2695.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		88.2771 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.0400 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	31.1058 (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	22.6300	22.1862	21.7425	19.5239	19.0802	16.9863	16.9863	16.5986	17.7929	19.0802	19.9676	20.8551	(38)
Heat transfer coeff													
	53.7358	53.2921	52.8483	50.6297	50.1860	48.0921	48.0921	47.7044	48.8987	50.1860	51.0734	51.9609	(39)
Average = Sum(39)m / 12 =												50.5583	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7601	1.7456	1.7310	1.6584	1.6438	1.5752	1.5752	1.5625	1.6017	1.6438	1.6729	1.7020	(40)
HLP (average)												1.6560	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.1836	(42)
Hot water usage for mixer showers													
	67.0976	66.0893	64.6199	61.8086	59.7339	57.4202	56.1051	57.5633	59.1618	61.6460	64.5178	66.8406	(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													
	26.7507	25.7780	24.8052	23.8325	22.8597	21.8870	21.8870	22.8597	23.8325	24.8052	25.7780	26.7507	(42c)
Average daily hot water use (litres/day)												86.1806	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	93.8484	91.8673	89.4252	85.6411	82.5936	79.3072	77.9920	80.4230	82.9943	86.4513	90.2958	93.5913	(44)
Energy conte	148.6329	130.8178	137.4432	117.2383	111.1869	97.5174	94.3246	99.5805	102.3403	117.3135	128.6429	146.5414	(45)
Energy content (annual)										Total = Sum(45)m =		1431.5797	
Distribution loss (46)m = 0.15 x (45)m													
	22.2949	19.6227	20.6165	17.5858	16.6780	14.6276	14.1487	14.9371	15.3510	17.5970	19.2964	21.9812	(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	(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	17.7794	16.0425	17.7330	17.1090	17.6460	17.0444	17.5948	17.6131	17.0657	17.6728	17.1531	17.7729	(61)
Total heat required for water heating calculated for each month													
	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(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													
	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(64)
										Total per year (kWh/year) = Sum(64)m =		1639.8064	(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													
	53.8653	47.5076	50.1331	43.2590	41.3811	36.6856	35.7616	37.5138	38.2946	43.4250	47.0620	53.1682	(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	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.9481	12.3886	10.0751	7.6275	5.7016	4.8136	5.2012	6.7607	9.0743	11.5218	13.4477	14.3358	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2317	148.7595	144.9095	136.7132	126.3670	116.6429	110.1467	108.6189	112.4689	120.6651	131.0114	140.7354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	(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)													
	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	(71)
Water heating gains (Table 5)													
	72.3996	70.6958	67.3832	60.0820	55.6198	50.9523	48.0667	50.4218	53.1869	58.3669	65.3639	71.4627	(72)
Total internal gains													
	300.5352	298.7997	289.3236	271.3785	254.6442	239.3646	230.3705	232.7572	241.6859	257.5097	276.7789	293.4897	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.0600	46.7521	0.6300	0.7000	0.7700	15.1453	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
South	0.8000	42.0754	0.6300	0.7000	1.0000	13.3598	(82)

Solar gains	38.8205	69.4510	104.3991	145.9494	179.2606	185.0783	175.4621	149.4100	118.5394	79.2332	47.0905	32.8460	(83)
Total gains	339.3557	368.2507	393.7227	417.3280	433.9049	424.4429	405.8326	382.1673	360.2253	336.7429	323.8694	326.3357	(84)

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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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	13.9319	14.0479	14.1658	14.7866	14.9173	15.5668	15.5668	15.6933	15.3100	14.9173	14.6581	14.4077	
alpha	1.9288	1.9365	1.9444	1.9858	1.9945	2.0378	2.0378	2.0462	2.0207	1.9945	1.9772	1.9605	
util living area													
	0.8988	0.8790	0.8450	0.7819	0.6900	0.5590	0.4446	0.4779	0.6468	0.7974	0.8725	0.9038	(86)
MIT	17.5401	17.8645	18.4435	19.2718	19.9852	20.5627	20.8066	20.7707	20.3581	19.4630	18.4325	17.5600	(87)
Th 2	19.4981	19.5084	19.5187	19.5708	19.5814	19.6315	19.6315	19.6409	19.6121	19.5814	19.5603	19.5394	(88)
util rest of house													
	0.8837	0.8609	0.8209	0.7464	0.6348	0.4748	0.3293	0.3642	0.5686	0.7572	0.8509	0.8896	(89)
MIT 2	16.4796	16.8003	17.3678	18.1899	18.8530	19.3808	19.5562	19.5448	19.2142	18.3941	17.3926	16.5235	(90)
Living area fraction										fLA = Living area / (4) =		0.3875	(91)
MIT	16.8905	17.2127	17.7846	18.6092	19.2917	19.8387	20.0408	20.0198	19.6574	18.8083	17.7955	16.9252	(92)
Temperature adjustment												-0.1500	
adjusted MIT	16.7405	17.0627	17.6346	18.4592	19.1417	19.6887	19.8908	19.8698	19.5074	18.6583	17.6455	16.7752	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8457	0.8216	0.7816	0.7130	0.6151	0.4787	0.3529	0.3851	0.5618	0.7249	0.8130	0.8528	(94)
Useful gains	286.9779	302.5543	307.7408	297.5456	266.8743	203.1900	143.2312	147.1550	202.3914	244.0927	263.3173	278.3088	(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													
	668.5013	648.1731	588.4465	483.9774	373.4684	244.7282	158.2596	165.5260	264.4167	404.4141	538.5950	653.4169	(97)
Space heating kWh													
	283.8534	232.2558	208.8451	134.2309	79.3060	0.0000	0.0000	0.0000	0.0000	119.2792	198.1999	279.0804	(98a)
Space heating requirement - total per year (kWh/year)												1535.0506	
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													
	283.8534	232.2558	208.8451	134.2309	79.3060	0.0000	0.0000	0.0000	0.0000	119.2792	198.1999	279.0804	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1535.0506	
Space heating per m2											(98c) / (4) =	50.2801	(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 %)												89.0000	(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													
	283.8534	232.2558	208.8451	134.2309	79.3060	0.0000	0.0000	0.0000	0.0000	119.2792	198.1999	279.0804	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	318.9364	260.9616	234.6574	150.8212	89.1079	0.0000	0.0000	0.0000	0.0000	134.0215	222.6965	313.5735	(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													
	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(64)
Efficiency of water heater												78.9000	(216)
(217)m	84.9795	84.7952	84.3947	83.6440	82.4658	78.9000	78.9000	78.9000	78.9000	83.3365	84.4198	84.9692	(217)
Fuel for water heating, kWh/month													
	195.8263	173.1942	183.8695	160.6180	156.2257	145.1988	141.8497	148.5343	151.3384	161.9774	172.7035	193.3809	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)

Lighting	12.2087	9.7943	8.8187	6.4609	4.9906	4.0774	4.5526	5.9176	7.6864	10.0850	11.3910	12.5480	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.3287	-11.9558	-20.1012	-25.8477	-30.2812	-29.1526	-28.6565	-25.6971	-20.7619	-14.8394	-8.5193	-6.1039	(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	-2.1733	-5.3953	-13.0918	-23.3798	-34.2553	-35.7244	-34.7671	-27.3106	-17.3703	-8.3635	-3.0542	-1.6389	(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	1724.7760	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	1984.7169	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	98.5312	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-435.7700	(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	3417.2540	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1724.7760	3.6400	62.7818	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1984.7169	3.6400	72.2437	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	98.5312	16.4900	16.2478	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-229.2455	16.4900	-37.8026	
PV Unit electricity exported	-206.5245	5.5900	-11.5447	
Total			-49.3473	(252)
Total energy cost			201.3465	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600	(256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.9597	(257)
SAP value	84.4436	
SAP rating (Section 12)	84	(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	1724.7760	0.2100	362.2030	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1984.7169	0.2100	416.7905	(264)
Space and water heating			778.9935	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	98.5312	0.1443	14.2211	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-229.2455	0.1320	-30.2661	
PV Unit electricity exported	-206.5245	0.1219	-25.1673	
Total			-55.4334	(269)
Total CO2, kg/year			744.0232	(272)
CO2 emissions per m2			24.3700	(273)
EI value			86.8001	
EI rating			87	(274)
EI band			B	

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	30.5300	(1b)	x 1.8900	(2b) =	57.7017	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		57.7017	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.3466	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.0966	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9321	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	1.0020	0.9554	0.9554	0.8855	0.9088	0.7923	0.7923	0.7690	0.7923	0.8855	0.8622	0.9321	(22b)
Effective ac	1.0020	0.9564	0.9564	0.8921	0.9130	0.8139	0.8139	0.7957	0.8139	0.8921	0.8717	0.9344	(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								
Window			1.8900	1.1450	2.1641			(27)
Rooflight			1.6000	1.2357	1.9772			(27a)
External Wall upgraded	26.9800	1.8900	25.0900	0.2100	5.2689	0.0000	0.0000	(29a)
Ashlar	3.2200		3.2200	0.1800	0.5796	18.0000	57.9600	(29a)
External Roof 1	45.0000	1.6000	43.4000	0.1400	6.0760	9.0000	390.6000	(30)
Total net area of external elements Aum(A, m2)			75.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.0658			(33)
Main dwelling								
Party Wall Solid			5.5100	0.0000	0.0000	180.0000	991.8000	(32)
Party Wall Timber			4.8100	0.0000	0.0000	20.0000	96.2000	(32)
Party Floor 1			30.5300			30.0000	915.9000	(32d)
Internal Wall - Timber			26.9600			9.0000	242.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	2695.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		88.2771 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.0400 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	31.1058 (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	19.0802	18.2116	18.2116	16.9863	17.3844	15.4974	15.4974	15.1510	15.4974	16.9863	16.5986	17.7929	(38)
Heat transfer coeff	50.1860	49.3174	49.3174	48.0921	48.4902	46.6032	46.6032	46.2568	46.6032	48.0921	47.7044	48.8987	(39)
Average = Sum(39)m / 12 =												48.0137	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6438	1.6154	1.6154	1.5752	1.5883	1.5265	1.5265	1.5151	1.5265	1.5752	1.5625	1.6017	(40)
HLP (average)												1.5727	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.1836	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.0976	66.0893	64.6199	61.8086	59.7339	57.4202	56.1051	57.5633	59.1618	61.6460	64.5178	66.8406	(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

26.7507	25.7780	24.8052	23.8325	22.8597	21.8870	21.8870	22.8597	23.8325	24.8052	25.7780	26.7507	(42c)

Average daily hot water use (litres/day)	86.1806 (43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
93.8484	91.8673	89.4252	85.6411	82.5936	79.3072	77.9920	80.4230	82.9943	86.4513	90.2958	93.5913	(44)
Energy conte 148.6329	130.8178	137.4432	117.2383	111.1869	97.5174	94.3246	99.5805	102.3403	117.3135	128.6429	146.5414	(45)

Energy content (annual)	Total = Sum(45)m =	1431.5797

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

22.2949	19.6227	20.6165	17.5858	16.6780	14.6276	14.1487	14.9371	15.3510	17.5970	19.2964	21.9812	(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	(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	17.7794	16.0425	17.7330	17.1090	17.6460	17.0444	17.5948	17.6131	17.0657	17.6728	17.1531	17.7729	(61)
Total heat required for water heating calculated for each month													
	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(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													
	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(64)
										Total per year (kWh/year) = Sum(64)m =		1639.8064	(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													
	53.8653	47.5076	50.1331	43.2590	41.3811	36.6856	35.7616	37.5138	38.2946	43.4250	47.0620	53.1682	(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	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.9481	12.3886	10.0751	7.6275	5.7016	4.8136	5.2012	6.7607	9.0743	11.5218	13.4477	14.3358	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2317	148.7595	144.9095	136.7132	126.3670	116.6429	110.1467	108.6189	112.4689	120.6651	131.0114	140.7354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	(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)													
	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	(71)
Water heating gains (Table 5)													
	72.3996	70.6958	67.3832	60.0820	55.6198	50.9523	48.0667	50.4218	53.1869	58.3669	65.3639	71.4627	(72)
Total internal gains													
	300.5352	298.7997	289.3236	271.3785	254.6442	239.3646	230.3705	232.7572	241.6859	257.5097	276.7789	293.4897	(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	0.8300	23.8018	0.6300	0.7000	0.7700	6.0375	(76)
South	1.0600	54.2217	0.6300	0.7000	0.7700	17.5651	(78)
North	0.8000	20.0851	0.6300	0.7000	1.0000	6.3774	(82)
South	0.8000	50.2348	0.6300	0.7000	1.0000	15.9506	(82)

Solar gains	45.9306	72.0686	108.2711	154.7441	185.8255	203.1136	190.6038	166.0349	131.4448	88.4535	54.9374	39.0540	(83)
Total gains	346.4658	370.8683	397.5947	426.1226	440.4697	442.4782	420.9743	398.7922	373.1307	345.9632	331.7163	332.5438	(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	14.9173	15.1800	15.1800	15.5668	15.4390	16.0641	16.0641	16.1844	16.0641	15.5668	15.6933	15.3100	
alpha	1.9945	2.0120	2.0120	2.0378	2.0293	2.0709	2.0709	2.0790	2.0709	2.0378	2.0462	2.0207	
util living area													
	0.8832	0.8619	0.8207	0.7428	0.6308	0.4632	0.3351	0.3578	0.5736	0.7585	0.8481	0.8886	(86)
MIT	18.0163	18.3378	18.8916	19.6524	20.2903	20.7644	20.9199	20.9077	20.5866	19.7939	18.8899	18.0362	(87)
Th 2	19.5814	19.6021	19.6021	19.6315	19.6219	19.6677	19.6677	19.6762	19.6677	19.6315	19.6409	19.6121	(88)
util rest of house													
	0.8660	0.8418	0.7933	0.7017	0.5655	0.3672	0.2105	0.2312	0.4847	0.7109	0.8228	0.8722	(89)
MIT 2	16.9933	17.3162	17.8491	18.5834	19.1471	19.5558	19.6483	19.6520	19.4367	18.7316	17.8823	17.0321	(90)
Living area fraction										fLA = Living area / (4) =		0.3875	(91)
MIT	17.3897	17.7121	18.2531	18.9976	19.5901	20.0241	20.1410	20.1385	19.8822	19.1432	18.2727	17.4212	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.2397	17.5621	18.1031	18.8476	19.4401	19.8741	19.9910	19.9885	19.7322	18.9932	18.1227	17.2712	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8284	0.8040	0.7570	0.6741	0.5558	0.3832	0.2424	0.2629	0.4895	0.6844	0.7869	0.8355	(94)
Useful gains	287.0208	298.1899	300.9613	287.2434	244.8024	169.5599	102.0486	104.8375	182.6476	236.7740	261.0405	277.8542	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	609.2441	585.0072	527.8483	430.3091	317.1314	189.8663	106.7691	110.4862	220.5368	360.3637	482.8977	595.1531	(97)
Space heating kWh													
	239.7341	192.7413	168.8039	103.0073	53.8128	0.0000	0.0000	0.0000	0.0000	91.9507	159.7372	236.0704	(98a)
Space heating requirement - total per year (kWh/year)												1245.8578	
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													
	239.7341	192.7413	168.8039	103.0073	53.8128	0.0000	0.0000	0.0000	0.0000	91.9507	159.7372	236.0704	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1245.8578	
Space heating per m2											(98c) / (4) =	40.8077	(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 %)	89.0000	(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													
	239.7341	192.7413	168.8039	103.0073	53.8128	0.0000	0.0000	0.0000	0.0000	91.9507	159.7372	236.0704	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	269.3642	216.5632	189.6673	115.7386	60.4638	0.0000	0.0000	0.0000	0.0000	103.3154	179.4800	265.2477	(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													
	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(64)
Efficiency of water heater												78.9000	(216)
(217)m	84.5646	84.3316	83.8584	82.9871	81.6293	78.9000	78.9000	78.9000	78.9000	82.7028	83.8764	84.5578	(217)
Fuel for water heating, kWh/month													
	196.7873	174.1463	185.0454	161.8895	157.8267	145.1988	141.8497	148.5343	151.3384	163.2186	173.8223	194.3217	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.2087	9.7943	8.8187	6.4609	4.9906	4.0774	4.5526	5.9176	7.6864	10.0850	11.3910	12.5480	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.7069	-12.6044	-20.9601	-27.0503	-31.0177	-30.7948	-30.1168	-27.5479	-22.5149	-16.4610	-9.9475	-7.3039	(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	-2.9024	-5.9214	-14.1639	-25.6615	-36.1145	-40.4967	-38.9301	-31.7611	-20.4472	-10.1179	-3.9841	-2.2088	(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												1399.8402	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												78.9000	
Water heating fuel used												1993.9792	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												45.0000	(231)
Electricity for lighting (calculated in Appendix L)												98.5312	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-477.7360	(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												3059.6146	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1399.8402	5.6000	78.3911	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1993.9792	5.6000	111.6628	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	98.5312	26.0600	25.6772	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-245.0264	26.0600	-63.8539	
PV Unit electricity exported	-232.7096	5.8100	-13.5204	
Total			-77.3743	(252)
Total energy cost			249.0838	(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	1399.8402	0.2100	293.9664	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1993.9792	0.2100	418.7356	(264)
Space and water heating			712.7021	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	98.5312	0.1443	14.2211	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-245.0264	0.1323	-32.4072	
PV Unit electricity exported	-232.7096	0.1218	-28.3395	
Total			-60.7467	(269)
Total CO2, kg/year			672.4185	(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	1399.8402	1.1300	1581.8194	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1993.9792	1.1300	2253.1965	(278)
Space and water heating			3835.0159	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	98.5312	1.5338	151.1304	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-245.0264	1.4887	-364.7635	
PV Unit electricity exported	-232.7096	0.4467	-103.9624	
Total			-468.7259	(283)
Total Primary energy kWh/year			3585.4964	(286)

SAP 10 EPC IMPROVEMENTS

Top Floor Flat

Current energy efficiency rating: B 84
Current environmental impact rating: B 87

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

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

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

Potential energy efficiency rating: B 84
Potential environmental impact rating: B 87

Fuel prices for cost data on this page from database revision number 561 TEST (31 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£37	£37	£0
Mains gas	£289	£289	£0
Space heating	£189	£189	£0
Water heating	£112	£112	£0
Lighting	£26	£26	£0
Generated (PV)	-£77	-£77	£0
Total cost of fuels	£249	£249	£0
Total cost of uses	£250	£250	£0
Delivered energy	100 kWh/m²	100 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	22 kg/m²	22 kg/m²	0 kg/m²
Primary energy	117 kWh/m²	117 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	30.5300	(1b)	x 1.8900	(2b) =	57.7017	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.5300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		57.7017	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.3466 (8)
Pressure test		No

Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	1.0966	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.9321	(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	1.1885	1.1651	1.1418	1.0253	1.0020	0.8855	0.8855	0.8622	0.9321	1.0020	1.0486	1.0952	(22b)
Effective ac	1.1885	1.1651	1.1418	1.0253	1.0020	0.8921	0.8921	0.8717	0.9344	1.0020	1.0486	1.0952	(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								
Window			1.8900	1.1450	2.1641			(27)
Rooflight			1.6000	1.2357	1.9772			(27a)
External Wall upgraded	26.9800	1.8900	25.0900	0.2100	5.2689	0.0000	0.0000	(29a)
Ashlar	3.2200		3.2200	0.1800	0.5796	18.0000	57.9600	(29a)
External Roof 1	45.0000	1.6000	43.4000	0.1400	6.0760	9.0000	390.6000	(30)
Total net area of external elements Aum(A, m2)			75.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.0658			(33)
Main dwelling								
Party Wall Solid			5.5100	0.0000	0.0000	180.0000	991.8000	(32)
Party Wall Timber			4.8100	0.0000	0.0000	20.0000	96.2000	(32)
Party Floor 1			30.5300			30.0000	915.9000	(32d)
Internal Wall - Timber			26.9600			9.0000	242.6400	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	2695.1000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	88.2771	(35)
Thermal bridges (Default value 0.200 * total exposed area)	15.0400	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	31.1058	(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	22.6300	22.1862	21.7425	19.5239	19.0802	16.9863	16.9863	16.5986	17.7929	19.0802	19.9676	20.8551	(38)
Heat transfer coeff	53.7358	53.2921	52.8483	50.6297	50.1860	48.0921	48.0921	47.7044	48.8987	50.1860	51.0734	51.9609	(39)
Average = Sum(39)m / 12 =												50.5583	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7601	1.7456	1.7310	1.6584	1.6438	1.5752	1.5752	1.5625	1.6017	1.6438	1.6729	1.7020	(40)
HLP (average)												1.6560	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.1836	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.0976	66.0893	64.6199	61.8086	59.7339	57.4202	56.1051	57.5633	59.1618	61.6460	64.5178	66.8406	(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	26.7507	25.7780	24.8052	23.8325	22.8597	21.8870	21.8870	22.8597	23.8325	24.8052	25.7780	26.7507	(42c)
Average daily hot water use (litres/day)												86.1806	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.8484	91.8673	89.4252	85.6411	82.5936	79.3072	77.9920	80.4230	82.9943	86.4513	90.2958	93.5913	(44)
Energy conte	148.6329	130.8178	137.4432	117.2383	111.1869	97.5174	94.3246	99.5805	102.3403	117.3135	128.6429	146.5414	(45)
Energy content (annual)										Total = Sum(45)m =		1431.5797	
Distribution loss (46)m = 0.15 x (45)m	22.2949	19.6227	20.6165	17.5858	16.6780	14.6276	14.1487	14.9371	15.3510	17.5970	19.2964	21.9812	(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	(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	17.7794	16.0425	17.7330	17.1090	17.6460	17.0444	17.5948	17.6131	17.0657	17.6728	17.1531	17.7729	(61)
Total heat required for water heating calculated for each month	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(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	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(64)
									Total per year (kWh/year) = Sum(64)m =			1639.8064	(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	53.8653	47.5076	50.1331	43.2590	41.3811	36.6856	35.7616	37.5138	38.2946	43.4250	47.0620	53.1682	(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	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.9481	12.3886	10.0751	7.6275	5.7016	4.8136	5.2012	6.7607	9.0743	11.5218	13.4477	14.3358	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2317	148.7595	144.9095	136.7132	126.3670	116.6429	110.1467	108.6189	112.4689	120.6651	131.0114	140.7354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	(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)													
	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	(71)
Water heating gains (Table 5)													
	72.3996	70.6958	67.3832	60.0820	55.6198	50.9523	48.0667	50.4218	53.1869	58.3669	65.3639	71.4627	(72)
Total internal gains													
	300.5352	298.7997	289.3236	271.3785	254.6442	239.3646	230.3705	232.7572	241.6859	257.5097	276.7789	293.4897	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.0600	46.7521	0.6300	0.7000	0.7700	15.1453	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
South	0.8000	42.0754	0.6300	0.7000	1.0000	13.3598	(82)

Solar gains	38.8205	69.4510	104.3991	145.9494	179.2606	185.0783	175.4621	149.4100	118.5394	79.2332	47.0905	32.8460	(83)
Total gains	339.3557	368.2507	393.7227	417.3280	433.9049	424.4429	405.8326	382.1673	360.2253	336.7429	323.8694	326.3357	(84)

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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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	13.9319	14.0479	14.1658	14.7866	14.9173	15.5668	15.5668	15.6933	15.3100	14.9173	14.6581	14.4077	
alpha	1.9288	1.9365	1.9444	1.9858	1.9945	2.0378	2.0378	2.0462	2.0207	1.9945	1.9772	1.9605	
util living area													
	0.8988	0.8790	0.8450	0.7819	0.6900	0.5590	0.4446	0.4779	0.6468	0.7974	0.8725	0.9038	(86)
MIT	17.5401	17.8645	18.4435	19.2718	19.9852	20.5627	20.8066	20.7707	20.3581	19.4630	18.4325	17.5600	(87)
Th 2	19.4981	19.5084	19.5187	19.5708	19.5814	19.6315	19.6315	19.6409	19.6121	19.5814	19.5603	19.5394	(88)
util rest of house													
	0.8837	0.8609	0.8209	0.7464	0.6348	0.4748	0.3293	0.3642	0.5686	0.7572	0.8509	0.8896	(89)
MIT 2	16.4796	16.8003	17.3678	18.1899	18.8530	19.3808	19.5562	19.5448	19.2142	18.3941	17.3926	16.5235	(90)
Living area fraction									fLA = Living area / (4) =			0.3875	(91)
MIT	16.8905	17.2127	17.7846	18.6092	19.2917	19.8387	20.0408	20.0198	19.6574	18.8083	17.7955	16.9252	(92)
Temperature adjustment												-0.1500	
adjusted MIT	16.7405	17.0627	17.6346	18.4592	19.1417	19.6887	19.8908	19.8698	19.5074	18.6583	17.6455	16.7752	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8457	0.8216	0.7816	0.7130	0.6151	0.4787	0.3529	0.3851	0.5618	0.7249	0.8130	0.8528	(94)
Useful gains	286.9779	302.5543	307.7408	297.5456	266.8743	203.1900	143.2312	147.1550	202.3914	244.0927	263.3173	278.3088	(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													
	668.5013	648.1731	588.4465	483.9774	373.4684	244.7282	158.2596	165.5260	264.4167	404.4141	538.5950	653.4169	(97)
Space heating kWh													
	283.8534	232.2558	208.8451	134.2309	79.3060	0.0000	0.0000	0.0000	0.0000	119.2792	198.1999	279.0804	(98a)
Space heating requirement - total per year (kWh/year)												1535.0506	
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													
	283.8534	232.2558	208.8451	134.2309	79.3060	0.0000	0.0000	0.0000	0.0000	119.2792	198.1999	279.0804	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1535.0506	
Space heating per m2											(98c) / (4) =	50.2801	(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 %) 89.0000 (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													
	283.8534	232.2558	208.8451	134.2309	79.3060	0.0000	0.0000	0.0000	0.0000	119.2792	198.1999	279.0804	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	318.9364	260.9616	234.6574	150.8212	89.1079	0.0000	0.0000	0.0000	0.0000	134.0215	222.6965	313.5735	(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													
	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(64)
Efficiency of water heater												78.9000	(216)
(217)m	84.9795	84.7952	84.3947	83.6440	82.4658	78.9000	78.9000	78.9000	78.9000	83.3365	84.4198	84.9692	(217)
Fuel for water heating, kWh/month													
	195.8263	173.1942	183.8695	160.6180	156.2257	145.1988	141.8497	148.5343	151.3384	161.9774	172.7035	193.3809	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	12.2087	9.7943	8.8187	6.4609	4.9906	4.0774	4.5526	5.9176	7.6864	10.0850	11.3910	12.5480	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.3287	-11.9558	-20.1012	-25.8477	-30.2812	-29.1526	-28.6565	-25.6971	-20.7619	-14.8394	-8.5193	-6.1039	(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	-2.1733	-5.3953	-13.0918	-23.3798	-34.2553	-35.7244	-34.7671	-27.3106	-17.3703	-8.3635	-3.0542	-1.6389	(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	1724.7760	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	1984.7169	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	98.5312	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-435.7700	(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	3417.2540	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1724.7760	3.6400	62.7818	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1984.7169	3.6400	72.2437	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	98.5312	16.4900	16.2478	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-229.2455	16.4900	-37.8026	
PV Unit electricity exported	-206.5245	5.5900	-11.5447	
Total			-49.3473	(252)
Total energy cost			201.3465	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600	(256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.9597	(257)
SAP value	84.4436	
SAP rating (Section 12)	84	(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	1724.7760	0.2100	362.2030	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1984.7169	0.2100	416.7905	(264)
Space and water heating			778.9935	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	98.5312	0.1443	14.2211	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-229.2455	0.1320	-30.2661	
PV Unit electricity exported	-206.5245	0.1219	-25.1673	
Total			-55.4334	(269)
Total CO2, kg/year			744.0232	(272)
CO2 emissions per m2			24.3700	(273)
EI value			86.8001	
EI rating			87	(274)
EI band			B	

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

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1. Overall dwelling characteristics

Area	Storey height	Volume

Main dwelling	(m2)	(m)	(m3)	
Ground floor	30.5300 (1b)	x 1.8900 (2b)	= 57.7017	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	30.5300			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	57.7017	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.3466	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.0966	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9321	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	1.0020	0.9554	0.9554	0.8855	0.9088	0.7923	0.7923	0.7690	0.7923	0.8855	0.8622	0.9321	(22b)
Effective ac	1.0020	0.9564	0.9564	0.8921	0.9130	0.8139	0.8139	0.7957	0.8139	0.8921	0.8717	0.9344	(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								
Window			1.8900	1.1450	2.1641			(27)
Rooflight			1.6000	1.2357	1.9772			(27a)
External Wall upgraded	26.9800	1.8900	25.0900	0.2100	5.2689	0.0000	0.0000	(29a)
Ashlar	3.2200		3.2200	0.1800	0.5796	18.0000	57.9600	(29a)
External Roof 1	45.0000	1.6000	43.4000	0.1400	6.0760	9.0000	390.6000	(30)
Total net area of external elements Aum(A, m2)			75.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.0658			(33)
Main dwelling								
Party Wall Solid			5.5100	0.0000	0.0000	180.0000	991.8000	(32)
Party Wall Timber			4.8100	0.0000	0.0000	20.0000	96.2000	(32)
Party Floor 1			30.5300			30.0000	915.9000	(32d)
Internal Wall - Timber			26.9600			9.0000	242.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	2695.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		88.2771 (35)
Thermal bridges (Default value 0.200 * total exposed area)		15.0400 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	31.1058 (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	19.0802	18.2116	18.2116	16.9863	17.3844	15.4974	15.4974	15.1510	15.4974	16.9863	16.5986	17.7929	(38)
Heat transfer coeff	50.1860	49.3174	49.3174	48.0921	48.4902	46.6032	46.6032	46.2568	46.6032	48.0921	47.7044	48.8987	(39)
Average = Sum(39)m / 12 =												48.0137	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6438	1.6154	1.6154	1.5752	1.5883	1.5265	1.5265	1.5151	1.5265	1.5752	1.5625	1.6017	(40)
HLP (average)												1.5727	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.1836 (42)

Hot water usage for mixer showers

67.0976	66.0893	64.6199	61.8086	59.7339	57.4202	56.1051	57.5633	59.1618	61.6460	64.5178	66.8406	(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

26.7507	25.7780	24.8052	23.8325	22.8597	21.8870	21.8870	22.8597	23.8325	24.8052	25.7780	26.7507	(42c)

Average daily hot water use (litres/day)		86.1806 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.8484	91.8673	89.4252	85.6411	82.5936	79.3072	77.9920	80.4230	82.9943	86.4513	90.2958	93.5913	(44)
Energy conte	148.6329	130.8178	137.4432	117.2383	111.1869	97.5174	94.3246	99.5805	102.3403	117.3135	128.6429	146.5414	(45)
Energy content (annual)										Total = Sum(45)m =		1431.5797	

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

22.2949	19.6227	20.6165	17.5858	16.6780	14.6276	14.1487	14.9371	15.3510	17.5970	19.2964	21.9812	(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	(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 17.7794	16.0425	17.7330	17.1090	17.6460	17.0444	17.5948	17.6131	17.0657	17.6728	17.1531	17.7729	(61)

Total heat required for water heating calculated for each month

166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(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													
	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142	(64)
									Total per year (kWh/year) = Sum(64)m =			1639.8064	(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													
	53.8653	47.5076	50.1331	43.2590	41.3811	36.6856	35.7616	37.5138	38.2946	43.4250	47.0620	53.1682	(65)

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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	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	71.0131	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.9481	12.3886	10.0751	7.6275	5.7016	4.8136	5.2012	6.7607	9.0743	11.5218	13.4477	14.3358	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2317	148.7595	144.9095	136.7132	126.3670	116.6429	110.1467	108.6189	112.4689	120.6651	131.0114	140.7354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	43.2849	(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)													
	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	-47.3420	(71)
Water heating gains (Table 5)													
	72.3996	70.6958	67.3832	60.0820	55.6198	50.9523	48.0667	50.4218	53.1869	58.3669	65.3639	71.4627	(72)
Total internal gains													
	300.5352	298.7997	289.3236	271.3785	254.6442	239.3646	230.3705	232.7572	241.6859	257.5097	276.7789	293.4897	(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	0.8300	23.8018	0.6300	0.7000	0.7700	6.0375	(76)
South	1.0600	54.2217	0.6300	0.7000	0.7700	17.5651	(78)
North	0.8000	20.0851	0.6300	0.7000	1.0000	6.3774	(82)
South	0.8000	50.2348	0.6300	0.7000	1.0000	15.9506	(82)

Solar gains	45.9306	72.0686	108.2711	154.7441	185.8255	203.1136	190.6038	166.0349	131.4448	88.4535	54.9374	39.0540	(83)
Total gains	346.4658	370.8683	397.5947	426.1226	440.4697	442.4782	420.9743	398.7922	373.1307	345.9632	331.7163	332.5438	(84)

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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	14.9173	15.1800	15.1800	15.5668	15.4390	16.0641	16.0641	16.1844	16.0641	15.5668	15.6933	15.3100	
alpha	1.9945	2.0120	2.0120	2.0378	2.0293	2.0709	2.0709	2.0790	2.0709	2.0378	2.0462	2.0207	
util living area													
	0.8832	0.8619	0.8207	0.7428	0.6308	0.4632	0.3351	0.3578	0.5736	0.7585	0.8481	0.8886	(86)
MIT	18.0163	18.3378	18.8916	19.6524	20.2903	20.7644	20.9199	20.9077	20.5866	19.7939	18.8899	18.0362	(87)
Th 2	19.5814	19.6021	19.6021	19.6315	19.6219	19.6677	19.6677	19.6762	19.6677	19.6315	19.6409	19.6121	(88)
util rest of house													
	0.8660	0.8418	0.7933	0.7017	0.5655	0.3672	0.2105	0.2312	0.4847	0.7109	0.8228	0.8722	(89)
MIT 2	16.9933	17.3162	17.8491	18.5834	19.1471	19.5558	19.6483	19.6520	19.4367	18.7316	17.8823	17.0321	(90)
Living area fraction										fLA = Living area / (4) =		0.3875	(91)
MIT	17.3897	17.7121	18.2531	18.9976	19.5901	20.0241	20.1410	20.1385	19.8822	19.1432	18.2727	17.4212	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.2397	17.5621	18.1031	18.8476	19.4401	19.8741	19.9910	19.9885	19.7322	18.9932	18.1227	17.2712	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8284	0.8040	0.7570	0.6741	0.5558	0.3832	0.2424	0.2629	0.4895	0.6844	0.7869	0.8355	(94)
Useful gains	287.0208	298.1899	300.9613	287.2434	244.8024	169.5599	102.0486	104.8375	182.6476	236.7740	261.0405	277.8542	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	609.2441	585.0072	527.8483	430.3091	317.1314	189.8663	106.7691	110.4862	220.5368	360.3637	482.8977	595.1531	(97)
Space heating kWh													
	239.7341	192.7413	168.8039	103.0073	53.8128	0.0000	0.0000	0.0000	0.0000	91.9507	159.7372	236.0704	(98a)
Space heating requirement - total per year (kWh/year)												1245.8578	
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													
	239.7341	192.7413	168.8039	103.0073	53.8128	0.0000	0.0000	0.0000	0.0000	91.9507	159.7372	236.0704	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1245.8578	
Space heating per m2											(98c) / (4) =	40.8077	(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 %)												89.0000	(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

	239.7341	192.7413	168.8039	103.0073	53.8128	0.0000	0.0000	0.0000	0.0000	91.9507	159.7372	236.0704 (98)
Space heating efficiency (main heating system 1)												
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)												
	269.3642	216.5632	189.6673	115.7386	60.4638	0.0000	0.0000	0.0000	0.0000	103.3154	179.4800	265.2477 (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

	166.4123	146.8603	155.1761	134.3474	128.8328	114.5618	111.9194	117.1936	119.4060	134.9863	145.7960	164.3142 (64)
Efficiency of water heater												78.9000 (216)
(217)m	84.5646	84.3316	83.8584	82.9871	81.6293	78.9000	78.9000	78.9000	78.9000	82.7028	83.8764	84.5578 (217)
Fuel for water heating, kWh/month												
	196.7873	174.1463	185.0454	161.8895	157.8267	145.1988	141.8497	148.5343	151.3384	163.2186	173.8223	194.3217 (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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219 (231)
Lighting	12.2087	9.7943	8.8187	6.4609	4.9906	4.0774	4.5526	5.9176	7.6864	10.0850	11.3910	12.5480 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-8.7069	-12.6044	-20.9601	-27.0503	-31.0177	-30.7948	-30.1168	-27.5479	-22.5149	-16.4610	-9.9475	-7.3039 (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	-2.9024	-5.9214	-14.1639	-25.6615	-36.1145	-40.4967	-38.9301	-31.7611	-20.4472	-10.1179	-3.9841	-2.2088 (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	1399.8402 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	78.9000
Water heating fuel used	1993.9792 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	45.0000 (231)
Electricity for lighting (calculated in Appendix L)	98.5312 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-477.7360 (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	3059.6146 (238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1399.8402	5.6000	78.3911	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1993.9792	5.6000	111.6628	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	98.5312	26.0600	25.6772	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-245.0264	26.0600	-63.8539	
PV Unit electricity exported	-232.7096	5.8100	-13.5204	
Total			-77.3743	(252)
Total energy cost			249.0838	(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	1399.8402	0.2100	293.9664	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1993.9792	0.2100	418.7356	(264)
Space and water heating			712.7021	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	98.5312	0.1443	14.2211	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-245.0264	0.1323	-32.4072	
PV Unit electricity exported	-232.7096	0.1218	-28.3395	
Total			-60.7467	(269)
Total CO2, kg/year			672.4185	(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	1399.8402	1.1300	1581.8194	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1993.9792	1.1300	2253.1965	(278)
Space and water heating			3835.0159	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	98.5312	1.5338	151.1304	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-245.0264	1.4887	-364.7635	
PV Unit electricity exported	-232.7096	0.4467	-103.9624	
Total			-468.7259	(283)
Total Primary energy kWh/year			3585.4964	(286)

Predicted Energy Assessment

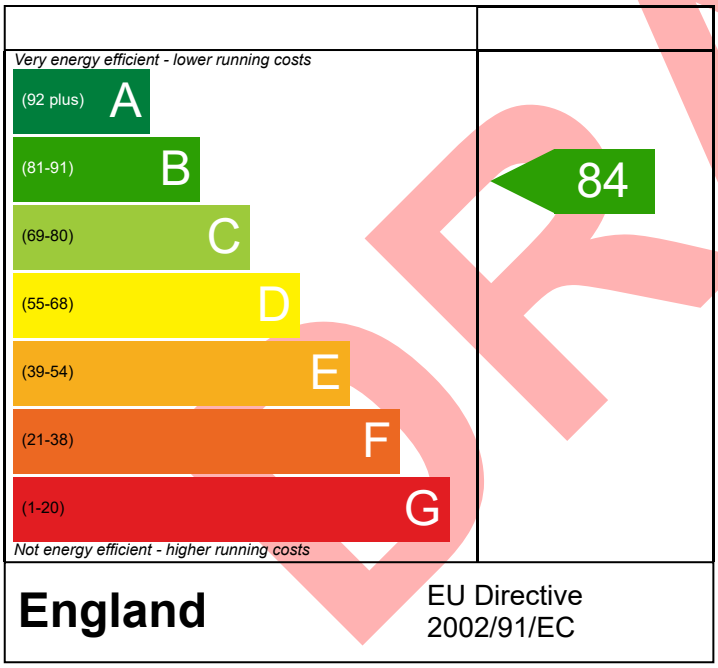
Flat 5, 99 London Road, Reading, RG1 5BY

Dwelling type:	Flat, Semi-Detached
Date of assessment:	17/02/2025
Produced by:	Sammit Pancholi
Total floor area:	30.53 m²
DRRN:	

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.

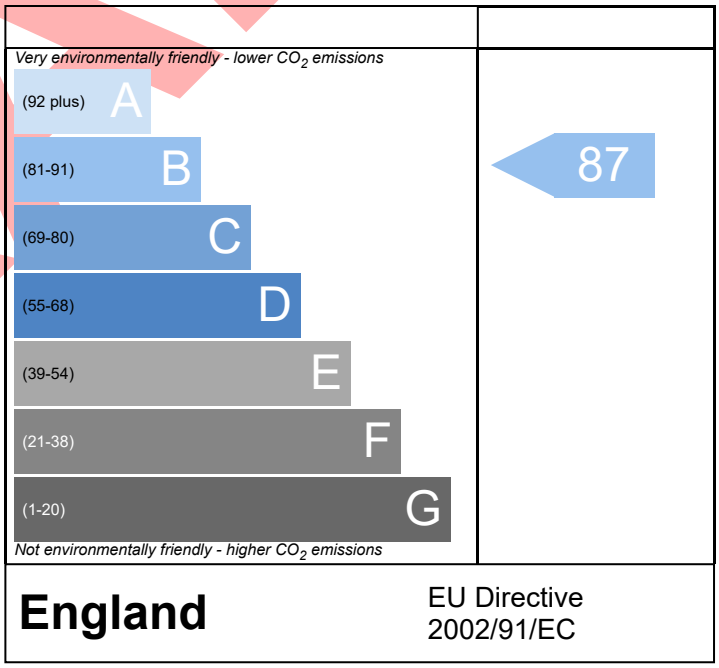
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

elmhurst energy

Property Reference	Flat 5 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Top Floor Flat	**Prop Type Ref**	Top Floor Flat
Property	Flat 5, 99 London Road, Reading, RG1 5BY		

SAP Rating	84 B	**DER**	24.81	**TER**	
Environmental	87 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.67	**DFEE**	58.43	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	132.66	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North	
Property Tenture	ND	
Transaction Type	5	
Terrain Type	Suburban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Top-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2025	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	88.28	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	19.14 m	30.53 m²	1.89 m

8.0 Living Area	11.83	m²

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
External Wall upgraded	Solid Wall	Other	0.21	0.00	26.98	25.09	0.00	None	1.89	Enter Gross Area
Ashlar	Timber Frame	Timber framed wall (two layers of plasterboard)	0.18	18.00	3.22	3.22	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 Solid	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	5.51		None
Party Wall Timber	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	20.00	4.81		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall - Timber	Plasterboard on timber frame	9.00	26.96

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
External Roof 1	External Slope Roof	Plasterboard, insulated slope	0.14	9.00	45.00	43.40	None	0.00	Enter Gross Area	1.60

11.1 Party Floors

Summary for Input Data

elmhurst energy

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Timber I-joists, carpeted	20.00	30.53

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	SAP table	Solid Door				0.00			3.00
Window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Rooflight	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening 1	Window	External Wall upgraded	East	0.83	
Opening 2	Window	External Wall upgraded	South	1.06	
Opening 3	Rooflight	External Roof 1	South	0.80	30
Opening 4	Rooflight	External Roof 1	North	0.80	30

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.20	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	2	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	No	
Test Method	Blower Door	
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
LED	66.00	8.00	528.00	15

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18830	
Fuel Type	Mains gas	
In Winter	89.00	
In Summer	78.90	
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Flue Type	Open	

Summary for Input Data

Fan Assisted Flue	Yes
Is MHS Pumped	No pump
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	Yes
Combi boiler type	Standard Combi
Combi keep hot type	None

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	0

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.50		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder — None

In Airing Cupboard	No

32.0 Photovoltaic Unit — One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.60	West	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro — None

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

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
			0	0
			0	0
			0	0

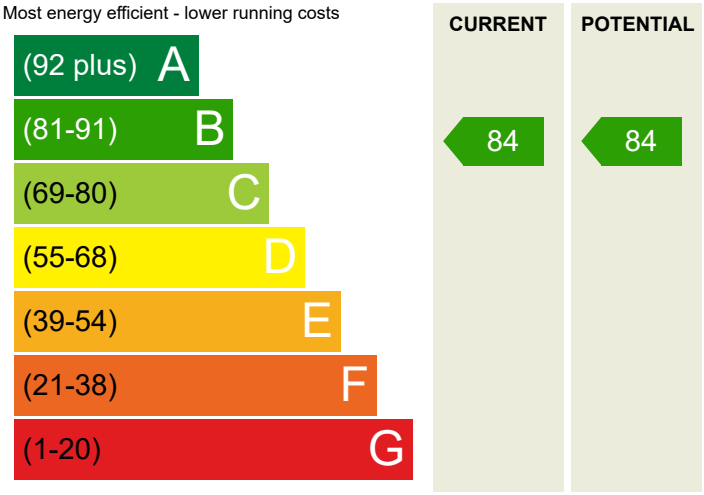
Energy Report

Dwelling Address	Flat 5, 99 London Road, Reading, RG1 5BY
Reference	Flat 5 - Gas + Solar-Top Floor Flat
Assessment Date	29/01/2025
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	31

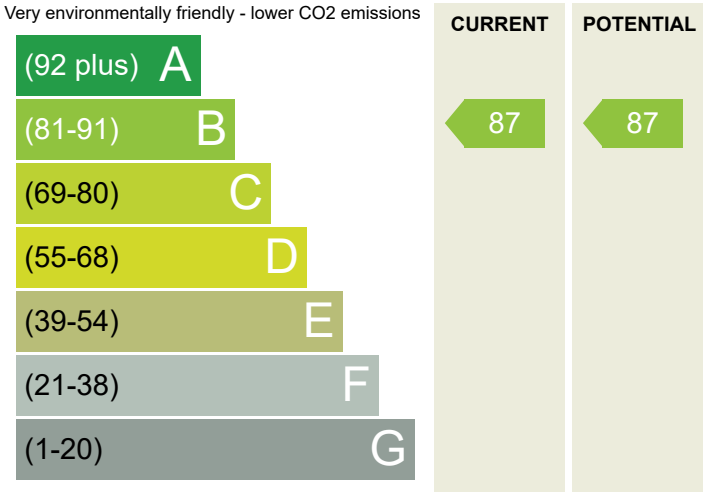
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

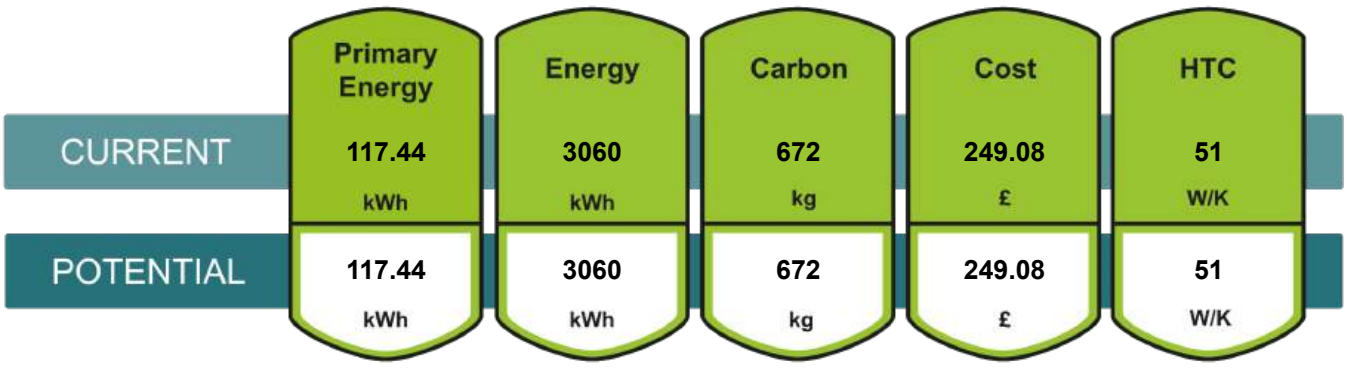
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.21 W/m²K	Very Good
Roof	Average thermal transmittance 0.14 W/m²K	Very Good
Windows	High performance glazing	Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total

energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£26	£26	
Heating	£189	£189	
Hot Water	£112	£112	
New Technologies e.g. Impact of PV	-(£77)	-(£77)	
TOTAL	£249	£249	

Estimated energy use and potential savings

Space Heating
1400
kWh per year

Water Heating
1994
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report

Property Reference	Flat 5 - Gas + Solar	Issued on Date	17/02/2025
Assessment Reference	Top Floor Flat	Prop Type Ref	Semi-Detached Flat
Property	Flat 5, 99 London Road, Reading, RG1 5BY		

SAP Rating	84 B	DER	24.81	TER	
Environmental	87 B	% DER < TER			N/A
CO_2 Emissions (t/year)	0.67	DFEE	58.43	TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER	132.66	TPER	

Assessor Details	Mr. Sammit Pancholi	Assessor ID	DB55-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	Flat 5, 99 London Road	
House Number		
Postcode	RG1 5BY	
Street		
Town	Reading	
County		

Dwelling Orientation North (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Suburban

Property Type Flat, Semi-Detached

Comments

Electricity Tariff Standard

Smart electricity meter fitted: No

Smart gas meter fitted: No

Comments

Section 2: Dwelling Construction Details

External Walls

Description	External Wall upgraded		
Type	Solid Wall		
Construction	Other		
U-value	0.21	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	26.98	m²	

Description	Ashlar		
Type	Timber Frame		
Construction	Timber framed wall (two layers of plasterboard)		
U-value	0.18	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	3.22	m²	

Comments

Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall Solid	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	5.51
Party Wall Timber	Filled Cavity with Edge Sealing	Double plasterboard on both sides, twin timber f rame with/without sheathing board	0.00	4.81

Comments

External Roofs

Description	External Roof 1		
Type	External Slope Roof		
Construction	Plasterboard, insulated slope		
U-value	0.14	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	45.00	m²	

Comments

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
Door	SAP table	Solid Door		0.00		3.00
Window	Manufacturer	Window	Double Low-E Soft 0.05	0.63		1.20
Rooflight	Manufacturer	Roof Window	Double Low-E Soft 0.05	0.63		1.30

Comments

Openings

Name	Opening Type	Location	Orientation	Area (m²)
Opening 1	Window	External Wall upgraded	East	0.83
Opening 2	Window	External Wall upgraded	South	1.06
Opening 3	Rooflight	External Roof 1	South	0.80
Opening 4	Rooflight	External Roof 1	North	0.80

Comments

Thermal Bridging Default

Y-value 0.200

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing No

Designed AP_{50} 5.00 $m^3/(h.m^2)$ @ 50 Pa

Property Tested? Yes

Test Method Blower Door

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

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	2
Number of passive vents	0
Number of flueless gas fires	0

Comments

Fixed Cooling System No

Comments

Lighting

No Fixed Lighting No

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
LED	66.00	8.00	528.00	15

Comments

Main Heating 1

	Database	
Fuel Type	Mains gas	
Winter Efficiency	89.00	%
Summer Efficiency	78.90	%
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Flue Type	Open	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Programmer, room thermostat and TRVs
Boiler Interlock	Yes
Delayed Start Stat	Yes
PCDF Control Description	

Comments

Main Heating 2 None

Secondary Heating None

Water Heating System

Water Heating	Main Heating 1
Supplementary Immersion	No
SAP Code	901
Water use <= 125 l/p/day	Yes
Cold Water Source	From mains
Number of baths	0

Comments

Hot Water Cylinder None

Comments

Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.50		No	

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit One Dwelling

Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.60	West	30°	None Or Little	No	1.00		

Comments

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed .....

Date .....

Full SAP Calculation Printout

Property Reference	Flat 6 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Top Floor Flat	**Prop Type Ref**	Top Floor Flat
Property	Flat 6, 99 London Road, Reading, RG1 5BY		

SAP Rating	79 C	**DER**	32.03	**TER**	
Environmental	84 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.83	**DFEE**	66.06	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	175.94	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

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

---

1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		28.8700	(1b)	x 1.9700	(2b) =	56.8739	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.8700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		56.8739	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.3517	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.1017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9364	(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	1.1939	1.1705	1.1471	1.0300	1.0066	0.8896	0.8896	0.8662	0.9364	1.0066	1.0535	1.1003	(22b)
Effective ac	1.1939	1.1705	1.1471	1.0300	1.0066	0.8957	0.8957	0.8751	0.9384	1.0066	1.0535	1.1003	(25)

---

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			2.2100	1.5918	3.5178			(27)
Rooflight			1.6000	2.0221	3.2353			(27a)
External Wall upgraded	26.1200	2.2100	23.9100	0.3000	7.1730	0.0000	0.0000	(29a)
Ashlar	3.1400		3.1400	0.3000	0.9420	18.0000	56.5200	(29a)
External Roof 1	36.0900	1.6000	34.4900	0.1600	5.5184	9.0000	310.4100	(30)
Total net area of external elements Aum(A, m2)			65.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.3865			(33)
Main dwelling								
Party Wall Solid			8.5500	0.0000	0.0000	180.0000	1539.0000	(32)
Party Floor 1			28.8700			30.0000	866.1000	(32d)
Internal Wall - Timber			37.6700			9.0000	339.0300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3111.0600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		107.7610 (35)
Thermal bridges (Default value 0.200 * total exposed area)		13.0700 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.4565 (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	22.4079	21.9686	21.5292	19.3323	18.8930	16.8105	16.8105	16.4248	17.6128	18.8930	19.7717	20.6504	(38)
Heat transfer coeff													
	55.8644	55.4250	54.9857	52.7888	52.3494	50.2670	50.2670	49.8813	51.0693	52.3494	53.2282	54.1069	(39)
Average = Sum(39)m / 12 =												52.7152	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9350	1.9198	1.9046	1.8285	1.8133	1.7411	1.7411	1.7278	1.7689	1.8133	1.8437	1.8742	(40)
HLP (average)												1.8260	
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												1.1519	(42)
Hot water usage for mixer showers													
	76.7505	75.5971	73.9164	70.7006	68.3274	65.6808	64.1765	65.8446	67.6730	70.5146	73.7995	76.4565	(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													
	26.4263	25.4653	24.5044	23.5434	22.5825	21.6215	21.6215	22.5825	23.5434	24.5044	25.4653	26.4263	(42c)
Average daily hot water use (litres/day)												94.7853	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	103.1768	101.0625	98.4207	94.2440	90.9098	87.3023	85.7980	88.4270	91.2164	95.0190	99.2648	102.8828	(44)
Energy conte	163.4069	143.9116	151.2690	129.0153	122.3821	107.3484	103.7653	109.4911	112.4790	128.9399	141.4209	161.0895	(45)
Energy content (annual)										Total = Sum(45)m =		1574.5191	
Distribution loss (46)m = 0.15 x (45)m													
	24.5110	21.5867	22.6904	19.3523	18.3573	16.1023	15.5648	16.4237	16.8718	19.3410	21.2131	24.1634	(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	(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	17.8318	16.1053	17.8057	17.1683	17.7004	17.0903	17.6381	17.6599	17.1152	17.7319	17.2210	17.8269	(61)
Total heat required for water heating calculated for each month													
	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(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													
	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(64)
										Total per year (kWh/year) = Sum(64)m =		1783.4138	(64)
12Total per year (kWh/year)												1783	(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													
	58.7907	51.8769	54.7484	47.1897	45.1171	39.9659	38.9115	40.8208	41.6781	47.3055	51.3277	58.0190	(65)

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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	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.0690	56.5407	51.0690	52.7713	51.0690	52.7713	51.0690	51.0690	52.7713	51.0690	52.7713	51.0690	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	94.8583	95.8426	93.3621	88.0815	81.4156	75.1506	70.9652	69.9809	72.4613	77.7420	84.4079	90.6729	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	(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)													
	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	(71)
Water heating gains (Table 5)													
	79.0198	77.1978	73.5865	65.5412	60.6413	55.5082	52.3004	54.8666	57.8862	63.5826	71.2885	77.9825	(72)
Total internal gains													
	265.2251	269.8591	258.2957	246.6720	233.4040	223.7082	214.6126	216.1945	223.3969	232.6717	248.7457	260.0024	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.3800	46.7521	0.6300	0.7000	0.7700	19.7175	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
West	0.8000	26.6072	0.6300	0.7000	1.0000	8.4483	(82)

Solar gains	38.4812	69.3369	105.4813	149.3762	185.0103	191.6291	181.4270	153.5117	120.4122	79.4404	46.7684	32.5011	(83)
Total gains	303.7063	339.1960	363.7770	396.0482	418.4142	415.3373	396.0396	369.7062	343.8091	312.1121	295.5141	292.5036	(84)

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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	15.4693	15.5919	15.7165	16.3706	16.5080	17.1919	17.1919	17.3248	16.9218	16.5080	16.2354	15.9718	
alpha	2.0313	2.0395	2.0478	2.0914	2.1005	2.1461	2.1461	2.1550	2.1281	2.1005	2.0824	2.0648	
util living area													
	0.9286	0.9090	0.8800	0.8188	0.7272	0.5918	0.4744	0.5124	0.6887	0.8386	0.9056	0.9327	(86)
MIT	17.5140	17.8595	18.4236	19.2672	19.9896	20.5717	20.8121	20.7733	20.3525	19.4358	18.4082	17.5369	(87)
Th 2	20.0325	20.0401	20.0477	20.0857	20.0934	20.1294	20.1294	20.1361	20.1155	20.0934	20.0781	20.0629	(88)
util rest of house													

	0.9213	0.8997	0.8671	0.7986	0.6939	0.5389	0.4000	0.4395	0.6413	0.8166	0.8947	0.9259	(89)
MIT 2	16.8240	17.1687	17.7288	18.5747	19.2686	19.8239	20.0222	20.0009	19.6298	18.7538	17.7379	16.8650	(90)
Living area fraction										fLA = Living area / (4) =		0.4105	(91)
MIT	17.1072	17.4522	18.0140	18.8589	19.5645	20.1309	20.3464	20.3179	19.9264	19.0337	18.0130	17.1408	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1072	17.4522	18.0140	18.8589	19.5645	20.1309	20.3464	20.3179	19.9264	19.0337	18.0130	17.1408	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8909	0.8666	0.8322	0.7662	0.6720	0.5390	0.4195	0.4558	0.6300	0.7853	0.8626	0.8969	(94)
Useful gains	270.5779	293.9330	302.7423	303.4428	281.1670	223.8613	166.1478	168.5078	216.6067	245.1034	254.9199	262.3376	(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													
	715.4673	695.7075	633.1023	525.7197	411.7041	278.0195	188.3210	195.4308	297.5521	441.5006	580.8819	700.1864	(97)
Space heating kWh													
	330.9978	269.9925	245.7879	160.0394	97.1197	0.0000	0.0000	0.0000	0.0000	146.1195	234.6926	325.7596	(98a)
Space heating requirement - total per year (kWh/year)												1810.5087	
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													
	330.9978	269.9925	245.7879	160.0394	97.1197	0.0000	0.0000	0.0000	0.0000	146.1195	234.6926	325.7596	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1810.5087	
Space heating per m2											(98c) / (4) =	62.7125	(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 %)	84.0000	(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													
	330.9978	269.9925	245.7879	160.0394	97.1197	0.0000	0.0000	0.0000	0.0000	146.1195	234.6926	325.7596	(98)
Space heating efficiency (main heating system 1)													
	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)													
	394.0450	321.4196	292.6046	190.5231	115.6186	0.0000	0.0000	0.0000	0.0000	173.9518	279.3959	387.8090	(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													
	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.1436	84.9532	84.5871	83.8745	82.7447	78.9000	78.9000	78.9000	78.9000	83.6367	84.6305	85.1364	(217)
Fuel for water heating, kWh/month													
	212.8622	188.3588	199.8824	174.2885	169.2949	157.7170	153.8700	161.1547	164.2512	175.3676	187.4523	210.1528	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	11.3932	9.1401	8.2296	6.0294	4.6573	3.8050	4.2485	5.5224	7.1730	9.4114	10.6302	11.7099	(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)
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	2155.3676	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2154.6524	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	91.9500	(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	4446.9699	(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	2155.3676	0.2100	452.6272	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2154.6524	0.2100	452.4770	(264)
Space and water heating			905.1042	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	91.9500	0.1443	13.2712	(268)
Total CO2, kg/year			924.6175	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			32.0300	(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	2155.3676	1.1300	2435.5653	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2154.6524	1.1300	2434.7572	(278)
Space and water heating			4870.3225	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	91.9500	1.5338	141.0360	(282)
Total Primary energy kWh/year			5079.4345	(286)
Dwelling Primary energy Rate (DPER)			175.9400	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	28.8700	(1b)	x 1.9700	(2b) =	56.8739	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		56.8739	(5)

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2. Ventilation rate

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		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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.3517	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.1017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9364	(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	1.1939	1.1705	1.1471	1.0300	1.0066	0.8896	0.8896	0.8662	0.9364	1.0066	1.0535	1.1003	(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	1.1939	1.1705	1.1471	1.0300	1.0066	0.8957	0.8957	0.8751	0.9384	1.0066	1.0535	1.1003	(25)

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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								
Window			2.2100	1.5918	3.5178			(27)
Rooflight			1.6000	2.0221	3.2353			(27a)
External Wall upgraded	26.1200	2.2100	23.9100	0.3000	7.1730	0.0000	0.0000	(29a)
Ashlar	3.1400		3.1400	0.3000	0.9420	18.0000	56.5200	(29a)
External Roof 1	36.0900	1.6000	34.4900	0.1600	5.5184	9.0000	310.4100	(30)
Total net area of external elements Aum(A, m2)			65.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.3865			(33)
Main dwelling								
Party Wall Solid			8.5500	0.0000	0.0000	180.0000	1539.0000	(32)
Party Floor 1			28.8700			30.0000	866.1000	(32d)
Internal Wall - Timber			37.6700			9.0000	339.0300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		3111.0600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							107.7610	(35)
Thermal bridges (Default value 0.200 * total exposed area)							13.0700	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		33.4565	(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	22.4079	21.9686	21.5292	19.3323	18.8930	16.8105	16.8105	16.4248	17.6128	18.8930	19.7717	20.6504	(38)
Heat transfer coeff	55.8644	55.4250	54.9857	52.7888	52.3494	50.2670	50.2670	49.8813	51.0693	52.3494	53.2282	54.1069	(39)
Average = Sum(39)m / 12 =												52.7152	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9350	1.9198	1.9046	1.8285	1.8133	1.7411	1.7411	1.7278	1.7689	1.8133	1.8437	1.8742	(40)
HLP (average)												1.8260	
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 1.1519 (42)

Hot water usage for mixer showers

	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

	18.8436	18.5637	18.1696	17.4430	16.8989	16.2956	15.9697	16.3610	16.7871	17.4327	18.1743	18.7799	(42b)

Hot water usage for other uses

	26.4263	25.4653	24.5044	23.5434	22.5825	21.6215	21.6215	22.5825	23.5434	24.5044	25.4653	26.4263	(42c)

Average daily hot water use (litres/day) 41.4948 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	45.2698	44.0290	42.6740	40.9864	39.4813	37.9171	37.5912	38.9435	40.3305	41.9371	43.6396	45.2061	(44)
Energy conte	71.6964	62.6968	65.5883	56.1083	53.1495	46.6235	45.4633	48.2202	49.7316	56.9082	62.1726	70.7819	(45)
Energy content (annual)										Total = Sum(45)m =		689.1405	

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	(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

	60.9419	53.2923	55.7501	47.6921	45.1771	39.6299	38.6438	40.9871	42.2718	48.3720	52.8467	60.1646	(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

	60.9419	53.2923	55.7501	47.6921	45.1771	39.6299	38.6438	40.9871	42.2718	48.3720	52.8467	60.1646	(64)
										Total per year (kWh/year) = Sum(64)m =		585.7695	(64)
12Total per year (kWh/year)												586	(64)

Electric shower(s)

	34.8622	31.0625	33.9190	32.3685	32.9759	31.4558	32.5043	32.9759	32.3685	33.9190	33.2812	34.8622	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		396.5551	(64a)

Heat gains from water heating, kWh/month

	23.9510	21.0887	22.4173	20.0152	19.5382	17.7714	17.7870	18.4908	18.6601	20.5728	21.5320	23.7567	(65)

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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	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.0690	56.5407	51.0690	52.7713	51.0690	52.7713	51.0690	51.0690	52.7713	51.0690	52.7713	51.0690	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	94.8583	95.8426	93.3621	88.0815	81.4156	75.1506	70.9652	69.9809	72.4613	77.7420	84.4079	90.6729	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	(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)	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	(71)
Water heating gains (Table 5)	32.1922	31.3820	30.1308	27.7988	26.2611	24.6826	23.9073	24.8532	25.9168	27.6515	29.9055	31.9310	(72)
Total internal gains	218.3976	224.0433	214.8399	208.9296	199.0237	192.8825	186.2195	186.1811	191.4275	196.7406	207.3628	213.9510	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.3800	46.7521	0.6300	0.7000	0.7700	19.7175	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
West	0.8000	26.6072	0.6300	0.7000	1.0000	8.4483	(82)

Solar gains	38.4812	69.3369	105.4813	149.3762	185.0103	191.6291	181.4270	153.5117	120.4122	79.4404	46.7684	32.5011	(83)
Total gains	256.8788	293.3802	320.3212	358.3058	384.0340	384.5116	367.6465	339.6928	311.8397	276.1810	254.1312	246.4521	(84)

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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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.4693	15.5919	15.7165	16.3706	16.5080	17.1919	17.1919	17.3248	16.9218	16.5080	16.2354	15.9718	
alpha	2.0313	2.0395	2.0478	2.0914	2.1005	2.1461	2.1461	2.1550	2.1281	2.1005	2.0824	2.0648	
util living area	0.9462	0.9281	0.9014	0.8426	0.7536	0.6196	0.5007	0.5429	0.7208	0.8651	0.9263	0.9498	(86)

MIT	17.3052	17.6657	18.2542	19.1438	19.9075	20.5290	20.7906	20.7449	20.2854	19.3095	18.2315	17.3262	(87)
Th 2	19.3770	19.3873	19.3977	19.4501	19.4607	19.5115	19.5115	19.5210	19.4918	19.4607	19.4396	19.4185	(88)
util rest of house													
	0.9360	0.9146	0.8818	0.8095	0.6963	0.5240	0.3630	0.4078	0.6371	0.8297	0.9103	0.9405	(89)
MIT 2	16.1538	16.5123	17.0937	17.9794	18.6924	19.2552	19.4386	19.4238	19.0624	18.1620	17.1045	16.1979	(90)
Living area fraction										fLA = Living area / (4) =		0.4105	(91)
MIT	16.6264	16.9857	17.5700	18.4573	19.1911	19.7780	19.9935	19.9661	19.5644	18.6330	17.5671	16.6610	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.6264	16.9857	17.5700	18.4573	19.1911	19.7780	19.9935	19.9661	19.5644	18.6330	17.5671	16.6610	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9109	0.8864	0.8518	0.7830	0.6845	0.5430	0.4114	0.4525	0.6418	0.8052	0.8836	0.9168	(94)
Useful gains	233.9959	260.0548	272.8563	280.5492	262.8853	208.8029	151.2623	153.7240	200.1504	222.3729	224.5432	225.9396	(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													
	688.6080	669.8528	608.6920	504.5207	392.1565	260.2830	170.5822	177.8792	279.0611	420.5251	557.1444	674.2276	(97)
Space heating kWh													
	338.2314	275.3842	249.8618	161.2595	96.1777	0.0000	0.0000	0.0000	0.0000	147.4252	239.4729	333.5263	(98a)
Space heating requirement - total per year (kWh/year)												1841.3390	
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													
	338.2314	275.3842	249.8618	161.2595	96.1777	0.0000	0.0000	0.0000	0.0000	147.4252	239.4729	333.5263	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1841.3390	
Space heating per m2											(98c) / (4) =	63.7804	(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	472.5097	371.9758	379.0977	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6342	0.7020	0.6716	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	299.6848	261.1422	254.6128	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	411.8749	394.5921	366.7136	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	80.7768	99.2867	83.4030	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	20.1942	24.8217	20.8508	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												65.8666	(107)
Energy for space heating												63.7804	(99)
Energy for space cooling												2.2815	(108)
Total												66.0618	(109)
Fabric Energy Efficiency (DFEE)												66.1	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	28.8700	(1b)	x 1.9700	(2b) =	56.8739	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		56.8739	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.3517	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.1017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9364	(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	1.1939	1.1705	1.1471	1.0300	1.0066	0.8896	0.8896	0.8662	0.9364	1.0066	1.0535	1.1003	(22b)
Effective ac	1.1939	1.1705	1.1471	1.0300	1.0066	0.8957	0.8957	0.8751	0.9384	1.0066	1.0535	1.1003	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			2.2100	1.5918	3.5178			(27)
Rooflight			1.6000	2.0221	3.2353			(27a)
External Wall upgraded	26.1200	2.2100	23.9100	0.3000	7.1730	0.0000	0.0000	(29a)
Ashlar	3.1400		3.1400	0.3000	0.9420	18.0000	56.5200	(29a)
External Roof 1	36.0900	1.6000	34.4900	0.1600	5.5184	9.0000	310.4100	(30)
Total net area of external elements Aum(A, m2)			65.3500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.3865			(33)
Main dwelling								
Party Wall Solid			8.5500	0.0000	0.0000	180.0000	1539.0000	(32)
Party Floor 1			28.8700			30.0000	866.1000	(32d)
Internal Wall - Timber			37.6700			9.0000	339.0300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3111.0600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		107.7610 (35)
Thermal bridges (Default value 0.200 * total exposed area)		13.0700 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.4565 (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	22.4079	21.9686	21.5292	19.3323	18.8930	16.8105	16.8105	16.4248	17.6128	18.8930	19.7717	20.6504	(38)
Heat transfer coeff	55.8644	55.4250	54.9857	52.7888	52.3494	50.2670	50.2670	49.8813	51.0693	52.3494	53.2282	54.1069	(39)
Average = Sum(39)m / 12 =												52.7152	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9350	1.9198	1.9046	1.8285	1.8133	1.7411	1.7411	1.7278	1.7689	1.8133	1.8437	1.8742	(40)
HLP (average)												1.8260	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.1519 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	76.7505	75.5971	73.9164	70.7006	68.3274	65.6808	64.1765	65.8446	67.6730	70.5146	73.7995	76.4565	(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	26.4263	25.4653	24.5044	23.5434	22.5825	21.6215	21.6215	22.5825	23.5434	24.5044	25.4653	26.4263	(42c)
Average daily hot water use (litres/day)												94.7853	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.1768	101.0625	98.4207	94.2440	90.9098	87.3023	85.7980	88.4270	91.2164	95.0190	99.2648	102.8828	(44)
Energy conte	163.4069	143.9116	151.2690	129.0153	122.3821	107.3484	103.7653	109.4911	112.4790	128.9399	141.4209	161.0895	(45)
Energy content (annual)										Total = Sum(45)m =		1574.5191	
Distribution loss (46)m = 0.15 x (45)m	24.5110	21.5867	22.6904	19.3523	18.3573	16.1023	15.5648	16.4237	16.8718	19.3410	21.2131	24.1634	(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	(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	17.8318	16.1053	17.8057	17.1683	17.7004	17.0903	17.6381	17.6599	17.1152	17.7319	17.2210	17.8269	(61)
Total heat required for water heating calculated for each month	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(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	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(64)
									Total per year (kWh/year) = Sum(64)m =			1783.4138	(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	58.7907	51.8769	54.7484	47.1897	45.1171	39.9659	38.9115	40.8208	41.6781	47.3055	51.3277	58.0190	(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	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.0165	11.5611	9.4021	7.1180	5.3208	4.4920	4.8538	6.3092	8.4682	10.7523	12.5495	13.3782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5795	143.0487	139.3465	131.4649	121.5158	112.1651	105.9182	104.4490	108.1513	116.0328	125.9819	135.3327	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	(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)	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	(71)
Water heating gains (Table 5)	79.0198	77.1978	73.5865	65.5412	60.6413	55.5082	52.3004	54.8666	57.8862	63.5826	71.2885	77.9825	(72)
Total internal gains	299.7162	297.9080	288.4355	270.2245	253.5783	238.2658	229.1728	231.7253	240.6060	256.4682	275.9203	292.7938	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.3800	46.7521	0.6300	0.7000	0.7700	19.7175	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
West	0.8000	26.6072	0.6300	0.7000	1.0000	8.4483	(82)

Solar gains	38.4812	69.3369	105.4813	149.3762	185.0103	191.6291	181.4270	153.5117	120.4122	79.4404	46.7684	32.5011	(83)
Total gains	338.1974	367.2449	393.9168	419.6007	438.5886	429.8949	410.5998	385.2369	361.0182	335.9085	322.6887	325.2950	(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	15.4693	15.5919	15.7165	16.3706	16.5080	17.1919	17.1919	17.3248	16.9218	16.5080	16.2354	15.9718	
alpha	2.0313	2.0395	2.0478	2.0914	2.1005	2.1461	2.1461	2.1550	2.1281	2.1005	2.0824	2.0648	
util living area	0.9149	0.8968	0.8648	0.8041	0.7121	0.5794	0.4618	0.4977	0.6720	0.8211	0.8914	0.9196	(86)
MIT	17.6607	17.9726	18.5345	19.3393	20.0342	20.5900	20.8219	20.7862	20.3853	19.5136	18.5182	17.6803	(87)
Th 2	20.0325	20.0401	20.0477	20.0857	20.0934	20.1294	20.1294	20.1361	20.1155	20.0934	20.0781	20.0629	(88)
util rest of house	0.9064	0.8865	0.8508	0.7828	0.6781	0.5265	0.3884	0.4257	0.6240	0.7976	0.8792	0.9117	(89)
MIT 2	16.9673	17.2784	17.8351	18.6419	19.3077	19.8381	20.0283	20.0093	19.6567	18.8258	17.8440	17.0052	(90)
Living area fraction										fLA = Living area / (4) =		0.4105	(91)
MIT	17.2519	17.5633	18.1222	18.9282	19.6059	20.1467	20.3540	20.3282	19.9557	19.1081	18.1207	17.2823	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2519	17.5633	18.1222	18.9282	19.6059	20.1467	20.3540	20.3282	19.9557	19.1081	18.1207	17.2823	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8738	0.8521	0.8153	0.7511	0.6576	0.5276	0.4083	0.4426	0.6144	0.7669	0.8460	0.8804	(94)
Useful gains	295.5149	312.9354	321.1661	315.1711	288.4278	226.8086	167.6540	170.4980	221.8136	257.6049	272.9927	286.4009	(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	723.5504	701.8666	639.0537	529.3753	413.8700	278.8171	188.7045	195.9440	299.0476	445.3953	586.6132	707.8436	(97)
Space heating kWh	318.4585	261.3618	236.5084	154.2270	93.3290	0.0000	0.0000	0.0000	0.0000	139.7161	225.8067	313.5534	(98a)
Space heating requirement - total per year (kWh/year)												1742.9608	
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	318.4585	261.3618	236.5084	154.2270	93.3290	0.0000	0.0000	0.0000	0.0000	139.7161	225.8067	313.5534	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1742.9608	
Space heating per m2										(98c) / (4) =		60.3727	(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 %)	84.0000	(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	318.4585	261.3618	236.5084	154.2270	93.3290	0.0000	0.0000	0.0000	0.0000	139.7161	225.8067	313.5534	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	379.1172	311.1450	281.5576	183.6036	111.1059	0.0000	0.0000	0.0000	0.0000	166.3287	268.8176	373.2778	(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	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.0512	84.8742	84.4913	83.7812	82.6503	78.9000	78.9000	78.9000	78.9000	83.5242	84.5346	85.0448	(217)
Fuel for water heating, kWh/month	213.0936	188.5343	200.1091	174.4827	169.4881	157.7170	153.8700	161.1547	164.2512	175.6039	187.6650	210.3789	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	11.3932	9.1401	8.2296	6.0294	4.6573	3.8050	4.2485	5.5224	7.1730	9.4114	10.6302	11.7099	(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)
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	2074.9534	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2156.3486	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	91.9500	(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	4368.2519	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2074.9534	3.6400	75.5283	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2156.3486	3.6400	78.4911	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	91.9500	16.4900	15.1626	(250)
Additional standing charges			92.0000	(251)
Total energy cost			268.6024	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3090	(257)
SAP value		78.7809	
SAP rating (Section 12)		79	(258)
SAP band		C	

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	2074.9534	0.2100	435.7402	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2156.3486	0.2100	452.8332	(264)
Space and water heating			888.5734	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	91.9500	0.1443	13.2712	(268)
Total CO2, kg/year			908.0867	(272)
CO2 emissions per m2			31.4500	(273)
EI value			83.5273	
EI rating			84	(274)
EI band			B	

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	28.8700	(1b)	x 1.9700	(2b) =	56.8739	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.8700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	56.8739	(5)

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2. Ventilation rate

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	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	2 * 10 = 20.0000	(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) =	20.0000 / (5) =	0.3517 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		1.1017 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9364 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	1.0066	0.9598	0.9598	0.8896	0.9130	0.7959	0.7959	0.7725	0.7959	0.8896	0.8662	0.9364	(22b)
Effective ac	1.0066	0.9606	0.9606	0.8957	0.9168	0.8168	0.8168	0.7984	0.8168	0.8957	0.8751	0.9384	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			2.2100	1.5918	3.5178			(27)
Rooflight			1.6000	2.0221	3.2353			(27a)
External Wall upgraded	26.1200	2.1000	23.9100	0.3000	7.1730	0.0000	0.0000	(29a)
Ashlar	3.1400		3.1400	0.3000	0.9420	18.0000	56.5200	(29a)
External Roof 1	36.0900	1.6000	34.4900	0.1600	5.5184	9.0000	310.4100	(30)
Total net area of external elements Aum(A, m2)			65.3500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.3865			(33)
Main dwelling								
Party Wall Solid			8.5500	0.0000	0.0000	180.0000	1539.0000	(32)
Party Floor 1			28.8700			30.0000	866.1000	(32d)
Internal Wall - Timber			37.6700			9.0000	339.0300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3111.0600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		107.7610 (35)
Thermal bridges (Default value 0.200 * total exposed area)		13.0700 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.4565 (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	18.8930	18.0294	18.0294	16.8105	17.2065	15.3294	15.3294	14.9848	15.3294	16.8105	16.4248	17.6128	(38)
Heat transfer coeff	52.3494	51.4859	51.4859	50.2670	50.6630	48.7858	48.7858	48.4413	48.7858	50.2670	49.8813	51.0693	(39)
Average = Sum(39)m / 12 =												50.1890	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8133	1.7834	1.7834	1.7411	1.7549	1.6898	1.6898	1.6779	1.6898	1.7411	1.7278	1.7689	(40)
HLP (average)												1.7384	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.1519 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	76.7505	75.5971	73.9164	70.7006	68.3274	65.6808	64.1765	65.8446	67.6730	70.5146	73.7995	76.4565	(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	26.4263	25.4653	24.5044	23.5434	22.5825	21.6215	21.6215	22.5825	23.5434	24.5044	25.4653	26.4263	(42c)
Average daily hot water use (litres/day)												94.7853	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.1768	101.0625	98.4207	94.2440	90.9098	87.3023	85.7980	88.4270	91.2164	95.0190	99.2648	102.8828	(44)
Energy conte	163.4069	143.9116	151.2690	129.0153	122.3821	107.3484	103.7653	109.4911	112.4790	128.9399	141.4209	161.0895	(45)
Energy content (annual)										Total = Sum(45)m =		1574.5191	
Distribution loss (46)m = 0.15 x (45)m	24.5110	21.5867	22.6904	19.3523	18.3573	16.1023	15.5648	16.4237	16.8718	19.3410	21.2131	24.1634	(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	(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	17.8318	16.1053	17.8057	17.1683	17.7004	17.0903	17.6381	17.6599	17.1152	17.7319	17.2210	17.8269	(61)
Total heat required for water heating calculated for each month	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(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	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(64)
									Total per year (kWh/year) = Sum(64)m =			1783.4138	(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	58.7907	51.8769	54.7484	47.1897	45.1171	39.9659	38.9115	40.8208	41.6781	47.3055	51.3277	58.0190	(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	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	(66)

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

13.0165	11.5611	9.4021	7.1180	5.3208	4.4920	4.8538	6.3092	8.4682	10.7523	12.5495	13.3782	(67)

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

141.5795	143.0487	139.3465	131.4649	121.5158	112.1651	105.9182	104.4490	108.1513	116.0328	125.9819	135.3327	(68)

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

43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	(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)

-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	(71)

Water heating gains (Table 5)

79.0198	77.1978	73.5865	65.5412	60.6413	55.5082	52.3004	54.8666	57.8862	63.5826	71.2885	77.9825	(72)

Total internal gains

299.7162	297.9080	288.4355	270.2245	253.5783	238.2658	229.1728	231.7253	240.6060	256.4682	275.9203	292.7938	(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	0.8300	23.8018	0.6300	0.7000	0.7700	6.0375	(76)
South	1.3800	54.2217	0.6300	0.7000	0.7700	22.8678	(78)
North	0.8000	20.0851	0.6300	0.7000	1.0000	6.3774	(82)
West	0.8000	32.5082	0.6300	0.7000	1.0000	10.3220	(82)

Solar gains	45.6047	72.0969	109.6439	158.6992	192.0853	210.5785	197.3637	170.9079	133.8219	88.8783	54.6587	38.7035	(83)
Total gains	345.3209	370.0049	398.0794	428.9238	445.6636	448.8443	426.5365	402.6331	374.4279	345.3464	330.5790	331.4973	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	16.5080	16.7849	16.7849	17.1919	17.0575	17.7138	17.7138	17.8398	17.7138	17.1919	17.3248	16.9218	
alpha	2.1005	2.1190	2.1190	2.1461	2.1372	2.1809	2.1809	2.1893	2.1809	2.1461	2.1550	2.1281	
util living area	0.9014	0.8819	0.8426	0.7663	0.6527	0.4806	0.3481	0.3728	0.5981	0.7840	0.8697	0.9064	(86)
MIT	18.1165	18.4258	18.9648	19.7061	20.3283	20.7827	20.9282	20.9162	20.6063	19.8329	18.9552	18.1350	(87)
Th 2	20.0934	20.1083	20.1083	20.1294	20.1226	20.1551	20.1551	20.1610	20.1551	20.1294	20.1361	20.1155	(88)
util rest of house	0.8917	0.8704	0.8266	0.7415	0.6121	0.4196	0.2679	0.2915	0.5427	0.7559	0.8553	0.8973	(89)
MIT 2	17.4541	17.7665	18.2937	19.0224	19.5989	20.0169	20.1236	20.1227	19.8787	19.1545	18.3085	17.4865	(90)
Living area fraction									fLA = Living area / (4) =			0.4105	(91)
MIT	17.7260	18.0371	18.5692	19.3030	19.8983	20.3312	20.4539	20.4484	20.1773	19.4330	18.5739	17.7527	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7260	18.0371	18.5692	19.3030	19.8983	20.3312	20.4539	20.4484	20.1773	19.4330	18.5739	17.7527	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8591	0.8369	0.7932	0.7146	0.6007	0.4329	0.2972	0.3204	0.5443	0.7297	0.8231	0.8657	(94)
Useful gains	296.6504	309.6707	315.7421	306.5080	267.7216	194.3081	126.7490	128.9873	203.8056	251.9935	272.1039	286.9726	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	660.9631	635.1876	575.0562	472.6604	354.5525	221.0590	134.3503	137.9791	252.5811	398.7657	527.4418	646.1638	(97)
Space heating kWh	271.0487	218.7473	192.9297	119.6297	64.6022	0.0000	0.0000	0.0000	0.0000	109.1985	183.8432	267.2382	(98a)
Space heating requirement - total per year (kWh/year)												1427.2376	
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	271.0487	218.7473	192.9297	119.6297	64.6022	0.0000	0.0000	0.0000	0.0000	109.1985	183.8432	267.2382	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1427.2376	
Space heating per m2											(98c) / (4) =	49.4367	(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 %)	84.0000 (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	271.0487	218.7473	192.9297	119.6297	64.6022	0.0000	0.0000	0.0000	0.0000	109.1985	183.8432	267.2382	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	322.6770	260.4135	229.6782	142.4163	76.9074	0.0000	0.0000	0.0000	0.0000	129.9982	218.8610	318.1407	(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	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(64)
Efficiency of water heater												78.9000	(216)
(217)m	84.6574	84.4338	83.9791	83.1466	81.8310	78.9000	78.9000	78.9000	78.9000	82.9157	84.0181	84.6543	(217)
Fuel for water heating, kWh/month	214.0847	189.5176	201.3295	175.8144	171.1852	157.7170	153.8700	161.1547	164.2512	176.8925	188.8187	211.3495	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	11.3932	9.1401	8.2296	6.0294	4.6573	3.8050	4.2485	5.5224	7.1730	9.4114	10.6302	11.7099	(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)
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	1699.0924	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2165.9849	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	91.9500	(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	4002.0273	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1699.0924	5.6000	95.1492	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2165.9849	5.6000	121.2952	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	91.9500	26.0600	23.9622	(250)
Additional standing charges			99.0000	(251)
Total energy cost			351.1335	(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	1699.0924	0.2100	356.8094	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2165.9849	0.2100	454.8568	(264)
Space and water heating			811.6662	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	91.9500	0.1443	13.2712	(268)
Total CO2, kg/year			831.1795	(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	1699.0924	1.1300	1919.9744	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2165.9849	1.1300	2447.5630	(278)
Space and water heating			4367.5373	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	91.9500	1.5338	141.0360	(282)
Total Primary energy kWh/year			4576.6493	(286)

SAP 10 EPC IMPROVEMENTS

Top Floor Flat

Current energy efficiency rating:	C 79
Current environmental impact rating:	B 84

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

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

	Energy	Environmental

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

Potential energy efficiency rating: C 79
Potential environmental impact rating: B 84

Fuel prices for cost data on this page from database revision number 561 TEST (31 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£36	£36	£0
Mains gas	£315	£315	£0
Space heating	£206	£206	£0
Water heating	£121	£121	£0
Lighting	£24	£24	£0
Total cost of fuels	£351	£351	£0
Total cost of uses	£351	£351	£0
Delivered energy	139 kWh/m²	139 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	29 kg/m²	29 kg/m²	0 kg/m²
Primary energy	159 kWh/m²	159 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	28.8700	(1b) x	1.9700	(2b) =	56.8739	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		56.8739	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.3517 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		1.1017 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9364 (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	1.1939	1.1705	1.1471	1.0300	1.0066	0.8896	0.8896	0.8662	0.9364	1.0066	1.0535	1.1003	(22b)
Effective ac	1.1939	1.1705	1.1471	1.0300	1.0066	0.8957	0.8957	0.8751	0.9384	1.0066	1.0535	1.1003	(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								
Window			2.2100	1.5918	3.5178			(27)
Rooflight			1.6000	2.0221	3.2353			(27a)
External Wall upgraded	26.1200	2.2100	23.9100	0.3000	7.1730	0.0000	0.0000	(29a)
Ashlar	3.1400		3.1400	0.3000	0.9420	18.0000	56.5200	(29a)
External Roof 1	36.0900	1.6000	34.4900	0.1600	5.5184	9.0000	310.4100	(30)
Total net area of external elements Aum(A, m2)			65.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.3865			(33)
Main dwelling								
Party Wall Solid			8.5500	0.0000	0.0000	180.0000	1539.0000	(32)
Party Floor 1			28.8700			30.0000	866.1000	(32d)
Internal Wall - Timber			37.6700			9.0000	339.0300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		3111.0600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							107.7610	(35)
Thermal bridges (Default value 0.200 * total exposed area)							13.0700	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 33.4565 (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	22.4079	21.9686	21.5292	19.3323	18.8930	16.8105	16.8105	16.4248	17.6128	18.8930	19.7717	20.6504	(38)
Heat transfer coeff	55.8644	55.4250	54.9857	52.7888	52.3494	50.2670	50.2670	49.8813	51.0693	52.3494	53.2282	54.1069	(39)
Average = Sum(39)m / 12 =												52.7152	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9350	1.9198	1.9046	1.8285	1.8133	1.7411	1.7411	1.7278	1.7689	1.8133	1.8437	1.8742	(40)
HLP (average)												1.8260	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.1519 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
76.7505	75.5971	73.9164	70.7006	68.3274	65.6808	64.1765	65.8446	67.6730	70.5146	73.7995	76.4565	(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

26.4263	25.4653	24.5044	23.5434	22.5825	21.6215	21.6215	22.5825	23.5434	24.5044	25.4653	26.4263	(42c)

Average daily hot water use (litres/day) 94.7853 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.1768	101.0625	98.4207	94.2440	90.9098	87.3023	85.7980	88.4270	91.2164	95.0190	99.2648	102.8828	(44)
Energy conte	163.4069	143.9116	151.2690	129.0153	122.3821	107.3484	103.7653	109.4911	112.4790	128.9399	141.4209	161.0895	(45)
Energy content (annual)										Total = Sum(45)m =		1574.5191	
Distribution loss (46)m = 0.15 x (45)m	24.5110	21.5867	22.6904	19.3523	18.3573	16.1023	15.5648	16.4237	16.8718	19.3410	21.2131	24.1634	(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	(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	17.8318	16.1053	17.8057	17.1683	17.7004	17.0903	17.6381	17.6599	17.1152	17.7319	17.2210	17.8269	(61)
Total heat required for water heating calculated for each month	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(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	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(64)
										Total per year (kWh/year) = Sum(64)m =		1783.4138	(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	58.7907	51.8769	54.7484	47.1897	45.1171	39.9659	38.9115	40.8208	41.6781	47.3055	51.3277	58.0190	(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	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.0165	11.5611	9.4021	7.1180	5.3208	4.4920	4.8538	6.3092	8.4682	10.7523	12.5495	13.3782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5795	143.0487	139.3465	131.4649	121.5158	112.1651	105.9182	104.4490	108.1513	116.0328	125.9819	135.3327	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	(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)	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	(71)
Water heating gains (Table 5)	79.0198	77.1978	73.5865	65.5412	60.6413	55.5082	52.3004	54.8666	57.8862	63.5826	71.2885	77.9825	(72)
Total internal gains	299.7162	297.9080	288.4355	270.2245	253.5783	238.2658	229.1728	231.7253	240.6060	256.4682	275.9203	292.7938	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.3800	46.7521	0.6300	0.7000	0.7700	19.7175	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
West	0.8000	26.6072	0.6300	0.7000	1.0000	8.4483	(82)

Solar gains	38.4812	69.3369	105.4813	149.3762	185.0103	191.6291	181.4270	153.5117	120.4122	79.4404	46.7684	32.5011	(83)
Total gains	338.1974	367.2449	393.9168	419.6007	438.5886	429.8949	410.5998	385.2369	361.0182	335.9085	322.6887	325.2950	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	15.4693	15.5919	15.7165	16.3706	16.5080	17.1919	17.1919	17.3248	16.9218	16.5080	16.2354	15.9718	
alpha	2.0313	2.0395	2.0478	2.0914	2.1005	2.1461	2.1461	2.1550	2.1281	2.1005	2.0824	2.0648	
util living area	0.9149	0.8968	0.8648	0.8041	0.7121	0.5794	0.4618	0.4977	0.6720	0.8211	0.8914	0.9196	(86)

MIT	17.6607	17.9726	18.5345	19.3393	20.0342	20.5900	20.8219	20.7862	20.3853	19.5136	18.5182	17.6803	(87)
Th 2	20.0325	20.0401	20.0477	20.0857	20.0934	20.1294	20.1294	20.1361	20.1155	20.0934	20.0781	20.0629	(88)
util rest of house													
	0.9064	0.8865	0.8508	0.7828	0.6781	0.5265	0.3884	0.4257	0.6240	0.7976	0.8792	0.9117	(89)
MIT 2	16.9673	17.2784	17.8351	18.6419	19.3077	19.8381	20.0283	20.0093	19.6567	18.8258	17.8440	17.0052	(90)
Living area fraction										fLA = Living area / (4) =		0.4105	(91)
MIT	17.2519	17.5633	18.1222	18.9282	19.6059	20.1467	20.3540	20.3282	19.9557	19.1081	18.1207	17.2823	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2519	17.5633	18.1222	18.9282	19.6059	20.1467	20.3540	20.3282	19.9557	19.1081	18.1207	17.2823	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8738	0.8521	0.8153	0.7511	0.6576	0.5276	0.4083	0.4426	0.6144	0.7669	0.8460	0.8804	(94)
Useful gains	295.5149	312.9354	321.1661	315.1711	288.4278	226.8086	167.6540	170.4980	221.8136	257.6049	272.9927	286.4009	(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													
	723.5504	701.8666	639.0537	529.3753	413.8700	278.8171	188.7045	195.9440	299.0476	445.3953	586.6132	707.8436	(97)
Space heating kWh													
	318.4585	261.3618	236.5084	154.2270	93.3290	0.0000	0.0000	0.0000	0.0000	139.7161	225.8067	313.5534	(98a)
Space heating requirement - total per year (kWh/year)												1742.9608	
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													
	318.4585	261.3618	236.5084	154.2270	93.3290	0.0000	0.0000	0.0000	0.0000	139.7161	225.8067	313.5534	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1742.9608	
Space heating per m2											(98c) / (4) =	60.3727	(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 %)	84.0000	(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													
	318.4585	261.3618	236.5084	154.2270	93.3290	0.0000	0.0000	0.0000	0.0000	139.7161	225.8067	313.5534	(98)
Space heating efficiency (main heating system 1)													
	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)													
	379.1172	311.1450	281.5576	183.6036	111.1059	0.0000	0.0000	0.0000	0.0000	166.3287	268.8176	373.2778	(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													
	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(64)
Efficiency of water heater												78.9000	(216)
(217)m	85.0512	84.8742	84.4913	83.7812	82.6503	78.9000	78.9000	78.9000	78.9000	83.5242	84.5346	85.0448	(217)
Fuel for water heating, kWh/month													
	213.0936	188.5343	200.1091	174.4827	169.4881	157.7170	153.8700	161.1547	164.2512	175.6039	187.6650	210.3789	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	11.3932	9.1401	8.2296	6.0294	4.6573	3.8050	4.2485	5.5224	7.1730	9.4114	10.6302	11.7099	(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)
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	2074.9534	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2156.3486	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	91.9500	(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	4368.2519	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2074.9534	3.6400	75.5283	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2156.3486	3.6400	78.4911	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	91.9500	16.4900	15.1626	(250)
Additional standing charges			92.0000	(251)
Total energy cost			268.6024	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3090	(257)
SAP value		78.7809	
SAP rating (Section 12)		79	(258)
SAP band		C	

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	2074.9534	0.2100	435.7402	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2156.3486	0.2100	452.8332	(264)
Space and water heating			888.5734	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	91.9500	0.1443	13.2712	(268)
Total CO2, kg/year			908.0867	(272)
CO2 emissions per m2			31.4500	(273)
EI value			83.5273	
EI rating			84	(274)
EI band			B	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	28.8700 (1b)	x 1.9700 (2b)	= 56.8739	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.8700			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	56.8739	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.3517	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.1017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9364	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	1.0066	0.9598	0.9598	0.8896	0.9130	0.7959	0.7959	0.7725	0.7959	0.8896	0.8662	0.9364	(22b)
Effective ac	1.0066	0.9606	0.9606	0.8957	0.9168	0.8168	0.8168	0.7984	0.8168	0.8957	0.8751	0.9384	(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								
Window			2.2100	1.5918	3.5178			(27)

Rooflight			1.6000	2.0221	3.2353			(27a)
External Wall upgraded	26.1200	2.2100	23.9100	0.3000	7.1730	0.0000	0.0000	(29a)
Ashlar	3.1400		3.1400	0.3000	0.9420	18.0000	56.5200	(29a)
External Roof 1	36.0900	1.6000	34.4900	0.1600	5.5184	9.0000	310.4100	(30)
Total net area of external elements Aum(A, m2)			65.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.3865			(33)
Main dwelling								
Party Wall Solid			8.5500	0.0000	0.0000	180.0000	1539.0000	(32)
Party Floor 1			28.8700			30.0000	866.1000	(32d)
Internal Wall - Timber			37.6700			9.0000	339.0300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3111.0600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		107.7610 (35)
Thermal bridges (Default value 0.200 * total exposed area)		13.0700 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	33.4565 (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	18.8930	18.0294	18.0294	16.8105	17.2065	15.3294	15.3294	14.9848	15.3294	16.8105	16.4248	17.6128	(38)
Heat transfer coeff	52.3494	51.4859	51.4859	50.2670	50.6630	48.7858	48.7858	48.4413	48.7858	50.2670	49.8813	51.0693	(39)
Average = Sum(39)m / 12 =												50.1890	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8133	1.7834	1.7834	1.7411	1.7549	1.6898	1.6898	1.6779	1.6898	1.7411	1.7278	1.7689	(40)
HLP (average)												1.7384	
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												1.1519 (42)
Hot water usage for mixer showers	76.7505	75.5971	73.9164	70.7006	68.3274	65.6808	64.1765	65.8446	67.6730	70.5146	73.7995	76.4565 (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	26.4263	25.4653	24.5044	23.5434	22.5825	21.6215	21.6215	22.5825	23.5434	24.5044	25.4653	26.4263 (42c)
Average daily hot water use (litres/day)												94.7853 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	103.1768	101.0625	98.4207	94.2440	90.9098	87.3023	85.7980	88.4270	91.2164	95.0190	99.2648	102.8828	(44)
Energy conte	163.4069	143.9116	151.2690	129.0153	122.3821	107.3484	103.7653	109.4911	112.4790	128.9399	141.4209	161.0895	(45)
Energy content (annual)										Total = Sum(45)m =		1574.5191	
Distribution loss (46)m = 0.15 x (45)m	24.5110	21.5867	22.6904	19.3523	18.3573	16.1023	15.5648	16.4237	16.8718	19.3410	21.2131	24.1634	(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	(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	17.8318	16.1053	17.8057	17.1683	17.7004	17.0903	17.6381	17.6599	17.1152	17.7319	17.2210	17.8269	(61)
Total heat required for water heating calculated for each month	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(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	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(64)
										Total per year (kWh/year) = Sum(64)m =		1783.4138	(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	58.7907	51.8769	54.7484	47.1897	45.1171	39.9659	38.9115	40.8208	41.6781	47.3055	51.3277	58.0190	(65)

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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	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.0165	11.5611	9.4021	7.1180	5.3208	4.4920	4.8538	6.3092	8.4682	10.7523	12.5495	13.3782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5795	143.0487	139.3465	131.4649	121.5158	112.1651	105.9182	104.4490	108.1513	116.0328	125.9819	135.3327	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	(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)	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	(71)
Water heating gains (Table 5)	79.0198	77.1978	73.5865	65.5412	60.6413	55.5082	52.3004	54.8666	57.8862	63.5826	71.2885	77.9825	(72)
Total internal gains	299.7162	297.9080	288.4355	270.2245	253.5783	238.2658	229.1728	231.7253	240.6060	256.4682	275.9203	292.7938	(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	0.8300	23.8018	0.6300	0.7000	0.7700	6.0375	(76)
South	1.3800	54.2217	0.6300	0.7000	0.7700	22.8678	(78)
North	0.8000	20.0851	0.6300	0.7000	1.0000	6.3774	(82)
West	0.8000	32.5082	0.6300	0.7000	1.0000	10.3220	(82)

Solar gains	45.6047	72.0969	109.6439	158.6992	192.0853	210.5785	197.3637	170.9079	133.8219	88.8783	54.6587	38.7035	(83)

Total gains	345.3209	370.0049	398.0794	428.9238	445.6636	448.8443	426.5365	402.6331	374.4279	345.3464	330.5790	331.4973	(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	16.5080	16.7849	16.7849	17.1919	17.0575	17.7138	17.7138	17.8398	17.7138	17.1919	17.3248	16.9218	
alpha	2.1005	2.1190	2.1190	2.1461	2.1372	2.1809	2.1809	2.1893	2.1809	2.1461	2.1550	2.1281	
util living area	0.9014	0.8819	0.8426	0.7663	0.6527	0.4806	0.3481	0.3728	0.5981	0.7840	0.8697	0.9064	(86)
MIT	18.1165	18.4258	18.9648	19.7061	20.3283	20.7827	20.9282	20.9162	20.6063	19.8329	18.9552	18.1350	(87)
Th 2	20.0934	20.1083	20.1083	20.1294	20.1226	20.1551	20.1551	20.1610	20.1551	20.1294	20.1361	20.1155	(88)
util rest of house	0.8917	0.8704	0.8266	0.7415	0.6121	0.4196	0.2679	0.2915	0.5427	0.7559	0.8553	0.8973	(89)
MIT 2	17.4541	17.7665	18.2937	19.0224	19.5989	20.0169	20.1236	20.1227	19.8787	19.1545	18.3085	17.4865	(90)
Living area fraction									fLA = Living area / (4) =			0.4105	(91)
MIT	17.7260	18.0371	18.5692	19.3030	19.8983	20.3312	20.4539	20.4484	20.1773	19.4330	18.5739	17.7527	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7260	18.0371	18.5692	19.3030	19.8983	20.3312	20.4539	20.4484	20.1773	19.4330	18.5739	17.7527	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8591	0.8369	0.7932	0.7146	0.6007	0.4329	0.2972	0.3204	0.5443	0.7297	0.8231	0.8657	(94)
Useful gains	296.6504	309.6707	315.7421	306.5080	267.7216	194.3081	126.7490	128.9873	203.8056	251.9935	272.1039	286.9726	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	660.9631	635.1876	575.0562	472.6604	354.5525	221.0590	134.3503	137.9791	252.5811	398.7657	527.4418	646.1638	(97)
Space heating kWh	271.0487	218.7473	192.9297	119.6297	64.6022	0.0000	0.0000	0.0000	0.0000	109.1985	183.8432	267.2382	(98a)
Space heating requirement - total per year (kWh/year)												1427.2376	
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	271.0487	218.7473	192.9297	119.6297	64.6022	0.0000	0.0000	0.0000	0.0000	109.1985	183.8432	267.2382	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1427.2376	
Space heating per m2											(98c) / (4) =	49.4367	(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 %)												84.0000	(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	271.0487	218.7473	192.9297	119.6297	64.6022	0.0000	0.0000	0.0000	0.0000	109.1985	183.8432	267.2382	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	322.6770	260.4135	229.6782	142.4163	76.9074	0.0000	0.0000	0.0000	0.0000	129.9982	218.8610	318.1407	(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	181.2386	160.0169	169.0747	146.1837	140.0825	124.4387	121.4034	127.1510	129.5942	146.6718	158.6419	178.9164	(64)
Efficiency of water heater												78.9000	(216)
(217)m	84.6574	84.4338	83.9791	83.1466	81.8310	78.9000	78.9000	78.9000	78.9000	82.9157	84.0181	84.6543	(217)
Fuel for water heating, kWh/month	214.0847	189.5176	201.3295	175.8144	171.1852	157.7170	153.8700	161.1547	164.2512	176.8925	188.8187	211.3495	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	11.3932	9.1401	8.2296	6.0294	4.6573	3.8050	4.2485	5.5224	7.1730	9.4114	10.6302	11.7099	(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)
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												1699.0924	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												78.9000	
Water heating fuel used												2165.9849	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												45.0000	(231)
Electricity for lighting (calculated in Appendix L)												91.9500	(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	4002.0273	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1699.0924	5.6000	95.1492	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2165.9849	5.6000	121.2952	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	91.9500	26.0600	23.9622	(250)
Additional standing charges			99.0000	(251)
Total energy cost			351.1335	(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	1699.0924	0.2100	356.8094	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2165.9849	0.2100	454.8568	(264)
Space and water heating			811.6662	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	91.9500	0.1443	13.2712	(268)
Total CO2, kg/year			831.1795	(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	1699.0924	1.1300	1919.9744	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2165.9849	1.1300	2447.5630	(278)
Space and water heating			4367.5373	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	91.9500	1.5338	141.0360	(282)
Total Primary energy kWh/year			4576.6493	(286)

Predicted Energy Assessment

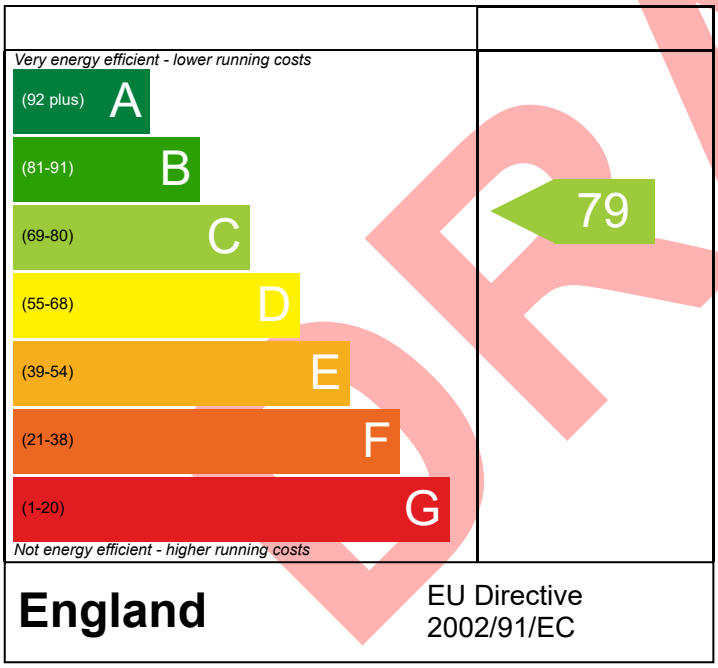
Flat 6, 99 London Road, Reading, RG1 5BY

Dwelling type:	Flat, Semi-Detached
Date of assessment:	17/02/2025
Produced by:	Sammit Pancholi
Total floor area:	28.87 m²
DRRN:	

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.

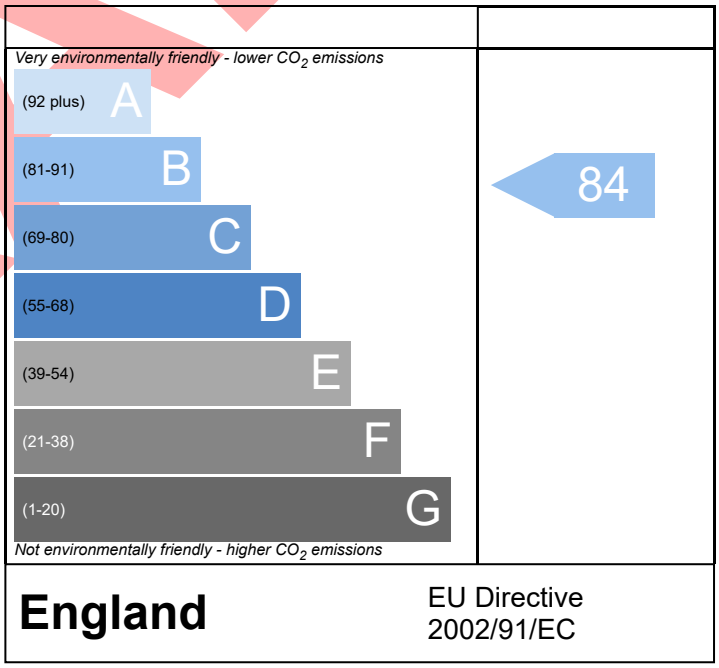
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

elmhurst energy

Property Reference	Flat 6 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Top Floor Flat	**Prop Type Ref**	Top Floor Flat
Property	Flat 6, 99 London Road, Reading, RG1 5BY		

SAP Rating	79 C	**DER**	32.03	**TER**	
Environmental	84 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.83	**DFEE**	66.06	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	175.94	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	5	
Terrain Type	Suburban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Top-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2025	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	107.76	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	18.23 m	28.87 m²	1.97 m

8.0 Living Area	11.85	m²

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
External Wall upgraded	Solid Wall	Other	0.30	0.00	26.12	23.91	0.00	None	2.21	Enter Gross Area
Ashlar	Timber Frame	Timber framed wall (two layers of plasterboard)	0.30	18.00	3.14	3.14	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 Solid	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	8.55		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall - Timber	Plasterboard on timber frame	9.00	37.67

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
External Roof 1	External Slope Roof	Plasterboard, insulated slope	0.16	9.00	36.09	34.49	None	0.00	Enter Gross Area	1.60

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)

Party Floor 1	Lowest occupied	Timber I-joists, carpeted		20.00	28.87

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	SAP table	Solid Door				0.00			3.00
Window	SAP table	Window	Double Low-E Soft 0.05	≥ 16 mm	Argon Filled	0.63	PVC	0.70	1.70
Rooflight	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	2.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening 1	Window	External Wall upgraded	East	0.83	
Opening 2	Window	External Wall upgraded	South	1.38	
Opening 3	Rooflight	External Roof 1	West	0.80	30
Opening 4	Rooflight	External Roof 1	North	0.80	30

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.20	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	2	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	No	
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting	No				
	Name	**Efficacy**	**Power**	**Capacity**	**Count**
	LED	66.00	8.00	528.00	15

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18830	
Fuel Type	Mains gas	
In Winter	84.00	
In Summer	78.90	
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Controls SAP Code	2104	
Delayed Start Stat	No	
Flue Type	Open	

Summary for Input Data

Fan Assisted Flue	Yes
Is MHS Pumped	No pump
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	No
Combi boiler type	Standard Combi
Combi keep hot type	None

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	0

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder — None

In Airing Cupboard — No

34.0 Small-scale Hydro — None

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

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
			0	0
			0	0
			0	0

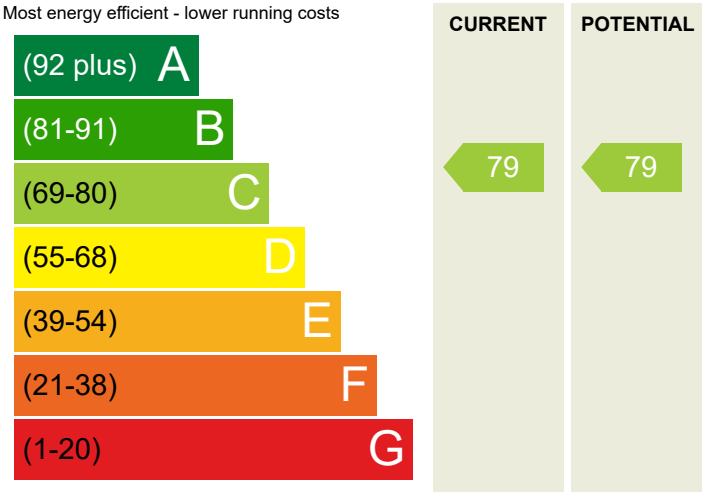
Energy Report

Dwelling Address	Flat 6, 99 London Road, Reading, RG1 5BY
Reference	Flat 6 - Baseline-Top Floor Flat
Assessment Date	17/02/2025
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	29

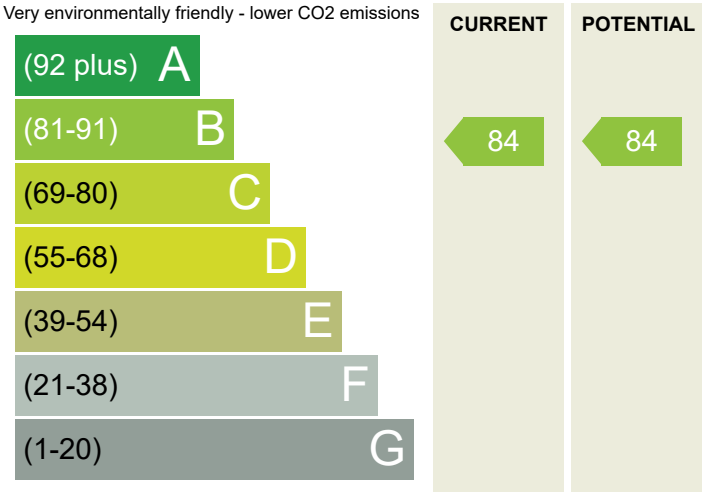
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

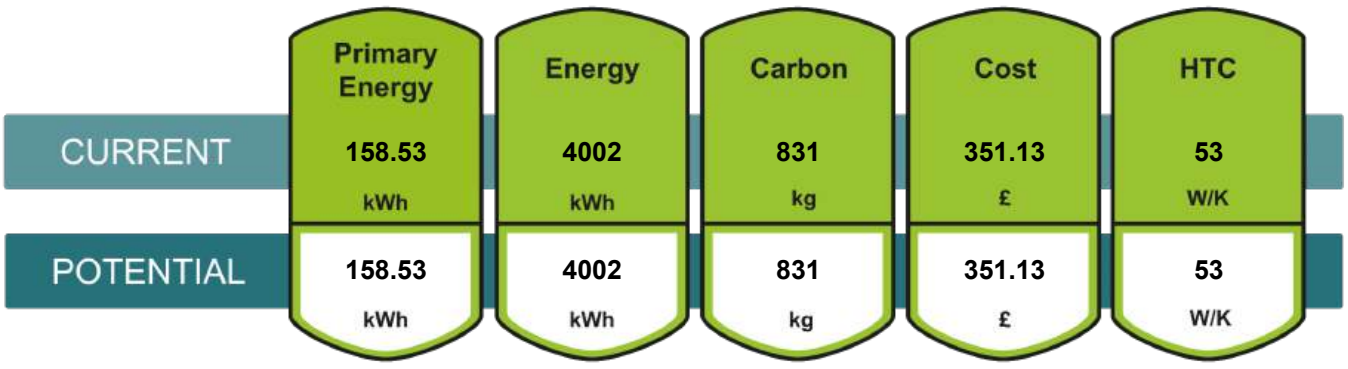
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.3 W/m²K	Good
Roof	Average thermal transmittance 0.16 W/m²K	Very Good
Windows	Fully double glazed	Average
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer and room thermostat	Average
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total

energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£24	£24	You could save £0
Heating	£206	£206	
Hot Water	£121	£121	
New Technologies e.g. Impact of PV	£0	£0	
TOTAL	£351	£351	

Estimated energy use and potential savings

Space Heating
1699
kWh per year

Water Heating
2166
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report

Property Reference	Flat 6 - Baseline	**Issued on Date**	17/02/2025
Assessment Reference	Top Floor Flat	**Prop Type Ref**	Semi-Detached Flat
Property	Flat 6, 99 London Road, Reading, RG1 5BY		

SAP Rating	79 C	**DER**	32.03	**TER**	
Environmental	84 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.83	**DFEE**	66.06	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	175.94	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	Flat 6, 99 London Road	
House Number		
Postcode	RG1 5BY	
Street		
Town	Reading	
County		

Dwelling Orientation South (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Suburban

Property Type Flat, Semi-Detached

Comments

Electricity Tariff Standard

Smart electricity meter fitted: No

Smart gas meter fitted: No

Comments

Section 2: Dwelling Construction Details

External Walls

Description	External Wall upgraded		
Type	Solid Wall		
Construction	Other		
U-value	0.30	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	26.12	m²	

Description	Ashlar		
Type	Timber Frame		
Construction	Timber framed wall (two layers of plasterboard)		
U-value	0.30	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	3.14	m²	

Comments

Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall Solid	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	8.55

Comments

External Roofs

Description	External Roof 1		
Type	External Slope Roof		
Construction	Plasterboard, insulated slope		
U-value	0.16	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	36.09	m²	

Comments

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
Door	SAP table	Solid Door		0.00		3.00
Window	SAP table	Window	Double Low-E Soft 0.05	0.63	PVC	1.70
Rooflight	Manufacturer	Roof Window	Double Low-E Soft 0.05	0.63		2.20

Comments

Openings

Name	Opening Type	Location	Orientation	Area (m²)
Opening 1	Window	External Wall upgraded	East	0.83
Opening 2	Window	External Wall upgraded	South	1.38
Opening 3	Rooflight	External Roof 1	West	0.80
Opening 4	Rooflight	External Roof 1	North	0.80

Comments

Thermal Bridging	Default
Y-value	0.200

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing	No	
Designed AP_{50}	5.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

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	2
Number of passive vents	0
Number of flueless gas fires	0

Comments

Fixed Cooling System	No

Comments

Lighting

No Fixed Lighting	No

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
LED	66.00	8.00	528.00	15

Comments

Dwelling Sign Off Report

Main Heating 1	Database	
Fuel Type	Mains gas	
Winter Efficiency	84.00	%
Summer Efficiency	78.90	%
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Flue Type	Open	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Programmer and room thermostat
Boiler Interlock	No
Delayed Start Stat	No
PCDF Control Description	

Comments

Main Heating 2	None
Secondary Heating	None

Water Heating System

Water Heating	Main Heating 1
Supplementary Immersion	No
SAP Code	901
Water use <= 125 l/p/day	Yes
Cold Water Source	From mains
Number of baths	0

Comments

Hot Water Cylinder	None

Comments

Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.00		No	

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit None

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed .....

Date .....

Full SAP Calculation Printout

Property Reference	Flat 6 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Top Floor Flat	**Prop Type Ref**	Top Floor Flat
Property	Flat 6, 99 London Road, Reading, RG1 5BY		

SAP Rating	85 B	**DER**	25.19	**TER**	
Environmental	87 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.64	**DFEE**	58.22	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	134.57	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	28.8700	(1b)	x 1.9700	(2b) =	56.8739	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.8700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	56.8739	(5)

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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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.3517	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.1017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9364	(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	1.1939	1.1705	1.1471	1.0300	1.0066	0.8896	0.8896	0.8662	0.9364	1.0066	1.0535	1.1003	(22b)
Effective ac	1.1939	1.1705	1.1471	1.0300	1.0066	0.8957	0.8957	0.8751	0.9384	1.0066	1.0535	1.1003	(25)

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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								
Window			2.2100	1.1450	2.5305			(27)
Rooflight			1.6000	1.2357	1.9772			(27a)
External Wall upgraded	26.1200	2.2100	23.9100	0.2100	5.0211	0.0000	0.0000	(29a)
Ashlar	3.1400		3.1400	0.1800	0.5652	18.0000	56.5200	(29a)
External Roof 1	36.0900	1.6000	34.4900	0.1400	4.8286	9.0000	310.4100	(30)
Total net area of external elements Aum(A, m2)			65.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.9226			(33)
Main dwelling								
Party Wall Solid			8.5500	0.0000	0.0000	180.0000	1539.0000	(32)
Party Floor 1			28.8700			30.0000	866.1000	(32d)
Internal Wall - Timber			37.6700			9.0000	339.0300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3111.0600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		107.7610 (35)
Thermal bridges (Default value 0.200 * total exposed area)		13.0700 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.9926 (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	22.4079	21.9686	21.5292	19.3323	18.8930	16.8105	16.8105	16.4248	17.6128	18.8930	19.7717	20.6504	(38)
Heat transfer coeff													
	50.4006	49.9612	49.5218	47.3250	46.8856	44.8031	44.8031	44.4174	45.6054	46.8856	47.7643	48.6431	(39)
Average = Sum(39)m / 12 =												47.2513	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7458	1.7306	1.7153	1.6392	1.6240	1.5519	1.5519	1.5385	1.5797	1.6240	1.6545	1.6849	(40)
HLP (average)												1.6367	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.1519	(42)
Hot water usage for mixer showers													
	66.2846	65.2884	63.8369	61.0596	59.0100	56.7244	55.4252	56.8658	58.4449	60.8990	63.7359	66.0306	(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													
	26.4263	25.4653	24.5044	23.5434	22.5825	21.6215	21.6215	22.5825	23.5434	24.5044	25.4653	26.4263	(42c)
Average daily hot water use (litres/day)												85.1360	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	92.7108	90.7538	88.3412	84.6030	81.5925	78.3459	77.0467	79.4482	81.9883	85.4034	89.2013	92.4569	(44)
Energy conte	146.8313	129.2321	135.7772	115.8173	109.8392	96.3354	93.1813	98.3735	101.0998	115.8916	127.0835	144.7651	(45)
Energy content (annual)										Total = Sum(45)m =		1414.2272	
Distribution loss (46)m = 0.15 x (45)m													
	22.0247	19.3848	20.3666	17.3726	16.4759	14.4503	13.9772	14.7560	15.1650	17.3837	19.0625	21.7148	(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	(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	17.7700	16.0344	17.7247	17.1023	17.6398	17.0392	17.5899	17.6077	17.0600	17.6660	17.1453	17.7636	(61)
Total heat required for water heating calculated for each month													
	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(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													
	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(64)
										Total per year (kWh/year) = Sum(64)m =		1622.3699	(64)
12Total per year (kWh/year)												1622	(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													
	53.2639	46.9783	49.5771	42.7848	40.9315	36.2913	35.3802	37.1111	37.8807	42.9504	46.5416	52.5753	(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	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.0690	56.5407	51.0690	52.7713	51.0690	52.7713	51.0690	51.0690	52.7713	51.0690	52.7713	51.0690	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	94.8583	95.8426	93.3621	88.0815	81.4156	75.1506	70.9652	69.9809	72.4613	77.7420	84.4079	90.6729	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	(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)													
	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	(71)
Water heating gains (Table 5)													
	71.5913	69.9082	66.6359	59.4233	55.0154	50.4046	47.5541	49.8805	52.6120	57.7291	64.6411	70.6657	(72)
Total internal gains													
	257.7966	262.5695	251.3450	240.5542	227.7780	218.6045	209.8663	211.2084	218.1227	226.8181	242.0984	252.6856	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.3800	46.7521	0.6300	0.7000	0.7700	19.7175	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
West	0.8000	26.6072	0.6300	0.7000	1.0000	8.4483	(82)

Solar gains	38.4812	69.3369	105.4813	149.3762	185.0103	191.6291	181.4270	153.5117	120.4122	79.4404	46.7684	32.5011	(83)
Total gains	296.2778	331.9064	356.8263	389.9303	412.7883	410.2337	391.2933	364.7201	338.5350	306.2585	288.8668	285.1868	(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	17.1463	17.2971	17.4506	18.2606	18.4318	19.2885	19.2885	19.4560	18.9491	18.4318	18.0927	17.7658	
alpha	2.1431	2.1531	2.1634	2.2174	2.2288	2.2859	2.2859	2.2971	2.2633	2.2288	2.2062	2.1844	
util living area													
	0.9282	0.9070	0.8756	0.8082	0.7090	0.5648	0.4455	0.4838	0.6679	0.8303	0.9032	0.9323	(86)
MIT	17.8057	18.1508	18.6941	19.5046	20.1637	20.6722	20.8642	20.8334	20.4766	19.6390	18.6695	17.8392	(87)
Th 2	19.5082	19.5190	19.5299	19.5847	19.5958	19.6488	19.6488	19.6587	19.6283	19.5958	19.5736	19.5517	(88)
util rest of house													

	0.9158	0.8911	0.8534	0.7730	0.6519	0.4775	0.3279	0.3668	0.5868	0.7917	0.8843	0.9208	(89)
MIT 2	16.7170	17.0588	17.5929	18.3985	19.0061	19.4683	19.5995	19.5931	19.3124	18.5498	17.6056	16.7759	(90)
Living area fraction										fLA = Living area / (4) =		0.4105	(91)
MIT	17.1638	17.5070	18.0449	18.8525	19.4813	19.9625	20.1186	20.1022	19.7903	18.9969	18.0422	17.2124	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.0138	17.3570	17.8949	18.7025	19.3313	19.8125	19.9686	19.9522	19.6403	18.8469	17.8922	17.0624	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8871	0.8602	0.8218	0.7466	0.6397	0.4890	0.3576	0.3944	0.5876	0.7662	0.8548	0.8935	(94)
Useful gains	262.8218	285.5031	293.2350	291.1312	264.0565	200.6165	139.9394	143.8375	198.9273	234.6428	246.9270	254.8016	(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	640.7850	622.3676	564.2957	463.9040	357.7960	233.5344	150.9233	157.7798	252.6663	386.6585	515.4842	625.6650	(97)
Space heating kWh	281.2046	226.3730	201.6692	124.3964	69.7421	0.0000	0.0000	0.0000	0.0000	113.0997	193.3612	275.9224	(98a)
Space heating requirement - total per year (kWh/year)												1485.7685	
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	281.2046	226.3730	201.6692	124.3964	69.7421	0.0000	0.0000	0.0000	0.0000	113.0997	193.3612	275.9224	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1485.7685	
Space heating per m2											(98c) / (4) =	51.4641	(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 %)												89.0000	(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	281.2046	226.3730	201.6692	124.3964	69.7421	0.0000	0.0000	0.0000	0.0000	113.0997	193.3612	275.9224	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	315.9602	254.3516	226.5946	139.7712	78.3619	0.0000	0.0000	0.0000	0.0000	127.0783	217.2598	310.0251	(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	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(64)
Efficiency of water heater												78.9000	(216)
(217)m	84.9833	84.7589	84.3342	83.4799	82.1987	78.9000	78.9000	78.9000	78.9000	83.2310	84.3850	84.9681	(217)
Fuel for water heating, kWh/month	193.6865	171.3879	182.0161	159.2234	155.0864	143.6941	140.3944	146.9977	149.7589	160.4662	170.9177	191.2820	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	11.3932	9.1401	8.2296	6.0294	4.6573	3.8050	4.2485	5.5224	7.1730	9.4114	10.6302	11.7099	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.2924	-11.8717	-19.9137	-25.5443	-29.8725	-28.7431	-28.2580	-25.3674	-20.5332	-14.7163	-8.4700	-6.0763	(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	-2.2096	-5.4795	-13.2793	-23.6832	-34.6640	-36.1340	-35.1657	-27.6403	-17.5990	-8.4866	-3.1035	-1.6666	(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	1669.4028	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	1964.9112	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	91.9500	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-435.7700	(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	3335.4939	(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	1669.4028	0.2100	350.5746	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1964.9112	0.2100	412.6313	(264)
Space and water heating			763.2059	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	91.9500	0.1443	13.2712	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-226.6588	0.1321	-29.9338	
PV Unit electricity exported	-209.1113	0.1219	-25.4891	
Total			-55.4228	(269)
Total CO2, kg/year			727.2964	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			25.1900	(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	1669.4028	1.1300	1886.4252	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1964.9112	1.1300	2220.3496	(278)
Space and water heating			4106.7748	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	91.9500	1.5338	141.0360	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-226.6588	1.4880	-337.2570	
PV Unit electricity exported	-209.1113	0.4472	-93.5212	
Total			-430.7782	(283)
Total Primary energy kWh/year			3885.1085	(286)
Dwelling Primary energy Rate (DPER)			134.5700	(287)

SAP 10 WORKSHEET FOR Conversion (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						
Ground floor	28.8700 (1b)	x	1.9700 (2b)	=	56.8739	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	56.8739	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.3517	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.1017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9364	(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	1.1939	1.1705	1.1471	1.0300	1.0066	0.8896	0.8896	0.8662	0.9364	1.0066	1.0535	1.1003	(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	1.1939	1.1705	1.1471	1.0300	1.0066	0.8957	0.8957	0.8751	0.9384	1.0066	1.0535	1.1003	(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								
Window			2.2100	1.1450	2.5305			(27)
Rooflight			1.6000	1.2357	1.9772			(27a)
External Wall upgraded	26.1200	2.2100	23.9100	0.2100	5.0211	0.0000	0.0000	(29a)
Ashlar	3.1400		3.1400	0.1800	0.5652	18.0000	56.5200	(29a)
External Roof 1	36.0900	1.6000	34.4900	0.1400	4.8286	9.0000	310.4100	(30)
Total net area of external elements Aum(A, m2)			65.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.9226			(33)

Main dwelling

Party Wall Solid	8.5500	0.0000	0.0000	180.0000	1539.0000 (32)
Party Floor 1	28.8700			30.0000	866.1000 (32d)
Internal Wall - Timber	37.6700			9.0000	339.0300 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3111.0600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 107.7610 (35)
Thermal bridges (Default value 0.200 * total exposed area) 13.0700 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.9926 (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	22.4079	21.9686	21.5292	19.3323	18.8930	16.8105	16.8105	16.4248	17.6128	18.8930	19.7717	20.6504	(38)
Heat transfer coeff	50.4006	49.9612	49.5218	47.3250	46.8856	44.8031	44.8031	44.4174	45.6054	46.8856	47.7643	48.6431	(39)
Average = Sum(39)m / 12 =												47.2513	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7458	1.7306	1.7153	1.6392	1.6240	1.5519	1.5519	1.5385	1.5797	1.6240	1.6545	1.6849	(40)
HLP (average)												1.6367	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.1519 (42)
Hot water usage for mixer showers

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

18.8436	18.5637	18.1696	17.4430	16.8989	16.2956	15.9697	16.3610	16.7871	17.4327	18.1743	18.7799	(42b)

Hot water usage for other uses

26.4263	25.4653	24.5044	23.5434	22.5825	21.6215	21.6215	22.5825	23.5434	24.5044	25.4653	26.4263	(42c)

Average daily hot water use (litres/day) 41.4948 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	45.2698	44.0290	42.6740	40.9864	39.4813	37.9171	37.5912	38.9435	40.3305	41.9371	43.6396	45.2061	(44)
Energy conte	71.6964	62.6968	65.5883	56.1083	53.1495	46.6235	45.4633	48.2202	49.7316	56.9082	62.1726	70.7819	(45)
Energy content (annual)										Total = Sum(45)m =		689.1405	
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	(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	60.9419	53.2923	55.7501	47.6921	45.1771	39.6299	38.6438	40.9871	42.2718	48.3720	52.8467	60.1646	(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	60.9419	53.2923	55.7501	47.6921	45.1771	39.6299	38.6438	40.9871	42.2718	48.3720	52.8467	60.1646	(64)
									Total per year (kWh/year) = Sum(64)m =			585.7695	(64)
12Total per year (kWh/year)												586	(64)
Electric shower(s)	34.8622	31.0625	33.9190	32.3685	32.9759	31.4558	32.5043	32.9759	32.3685	33.9190	33.2812	34.8622	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			396.5551	(64a)
Heat gains from water heating, kWh/month	23.9510	21.0887	22.4173	20.0152	19.5382	17.7714	17.7870	18.4908	18.6601	20.5728	21.5320	23.7567	(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	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	57.5934	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.0690	56.5407	51.0690	52.7713	51.0690	52.7713	51.0690	51.0690	52.7713	51.0690	52.7713	51.0690	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	94.8583	95.8426	93.3621	88.0815	81.4156	75.1506	70.9652	69.9809	72.4613	77.7420	84.4079	90.6729	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	28.7593	(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)	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	(71)
Water heating gains (Table 5)	32.1922	31.3820	30.1308	27.7988	26.2611	24.6826	23.9073	24.8532	25.9168	27.6515	29.9055	31.9310	(72)
Total internal gains	218.3976	224.0433	214.8399	208.9296	199.0237	192.8825	186.2195	186.1811	191.4275	196.7406	207.3628	213.9510	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.3800	46.7521	0.6300	0.7000	0.7700	19.7175	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
West	0.8000	26.6072	0.6300	0.7000	1.0000	8.4483	(82)

Solar gains	38.4812	69.3369	105.4813	149.3762	185.0103	191.6291	181.4270	153.5117	120.4122	79.4404	46.7684	32.5011	(83)
Total gains	256.8788	293.3802	320.3212	358.3058	384.0340	384.5116	367.6465	339.6928	311.8397	276.1810	254.1312	246.4521	(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	17.1463	17.2971	17.4506	18.2606	18.4318	19.2885	19.2885	19.4560	18.9491	18.4318	18.0927	17.7658	
alpha	2.1431	2.1531	2.1634	2.2174	2.2288	2.2859	2.2859	2.2971	2.2633	2.2288	2.2062	2.1844	
util living area	0.9440	0.9244	0.8952	0.8301	0.7329	0.5890	0.4675	0.5098	0.6967	0.8547	0.9222	0.9479	(86)
MIT	17.6226	17.9820	18.5482	19.4016	20.0982	20.6411	20.8496	20.8137	20.4244	19.5326	18.5160	17.6542	(87)
Th 2	19.5082	19.5190	19.5299	19.5847	19.5958	19.6488	19.6488	19.6587	19.6283	19.5958	19.5736	19.5517	(88)
util rest of house	0.9340	0.9110	0.8758	0.7973	0.6775	0.5010	0.3463	0.3894	0.6172	0.8197	0.9064	0.9387	(89)
MIT 2	16.5401	16.8976	17.4565	18.3072	18.9541	19.4489	19.5935	19.5843	19.2758	18.4561	17.4603	16.5968	(90)
Living area fraction										fLA = Living area / (4) =		0.4105	(91)
MIT	16.9844	17.3427	17.9046	18.7564	19.4237	19.9382	20.1091	20.0889	19.7473	18.8979	17.8936	17.0308	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.9844	17.3427	17.9046	18.7564	19.4237	19.9382	20.1091	20.0889	19.7473	18.8979	17.8936	17.0308	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9101	0.8843	0.8478	0.7742	0.6698	0.5215	0.3902	0.4309	0.6250	0.7980	0.8812	0.9162	(94)
Useful gains	233.7893	259.4437	271.5595	277.3869	257.2209	200.5096	143.4662	146.3813	194.9109	220.3970	223.9444	225.7877	(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	639.3000	621.6523	564.7769	466.4535	362.1312	239.1691	157.2170	163.8510	257.5474	389.0540	515.5504	624.1288	(97)
Space heating kWh	301.7000	243.4042	218.1538	136.1280	78.0532	0.0000	0.0000	0.0000	0.0000	125.4808	209.9563	296.3657	(98a)
Space heating requirement - total per year (kWh/year)												1609.2419	
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	301.7000	243.4042	218.1538	136.1280	78.0532	0.0000	0.0000	0.0000	0.0000	125.4808	209.9563	296.3657	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1609.2419	
Space heating per m2											(98c) / (4) =	55.7410	(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	421.1494	331.5432	337.5723	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6879	0.7536	0.7250	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	289.7033	249.8638	244.7368	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	411.8749	394.5921	366.7136	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	87.9635	107.6778	90.7508	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	21.9909	26.9195	22.6877	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												71.5980	(107)
Energy for space heating												55.7410	(99)
Energy for space cooling												2.4800	(108)
Total												58.2210	(109)
Fabric Energy Efficiency (DFEE)												58.2	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	28.8700	(1b)	x 1.9700	(2b) =	56.8739	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.8700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		56.8739	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.3517	(8)

Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	1.1017	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.9364	(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	1.1939	1.1705	1.1471	1.0300	1.0066	0.8896	0.8896	0.8662	0.9364	1.0066	1.0535	1.1003	(22b)
Effective ac	1.1939	1.1705	1.1471	1.0300	1.0066	0.8957	0.8957	0.8751	0.9384	1.0066	1.0535	1.1003	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			2.2100	1.1450	2.5305			(27)
Rooflight			1.6000	1.2357	1.9772			(27a)
External Wall upgraded	26.1200	2.1000	23.9100	0.2100	5.0211	0.0000	0.0000	(29a)
Ashlar	3.1400		3.1400	0.1800	0.5652	18.0000	56.5200	(29a)
External Roof 1	36.0900	1.6000	34.4900	0.1400	4.8286	9.0000	310.4100	(30)
Total net area of external elements Aum(A, m2)			65.3500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.9226			(33)
Main dwelling								
Party Wall Solid			8.5500	0.0000	0.0000	180.0000	1539.0000	(32)
Party Floor 1			28.8700			30.0000	866.1000	(32d)
Internal Wall - Timber			37.6700			9.0000	339.0300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 3111.0600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	107.7610	(35)
Thermal bridges (Default value 0.200 * total exposed area)	13.0700	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 27.9926	(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	22.4079	21.9686	21.5292	19.3323	18.8930	16.8105	16.8105	16.4248	17.6128	18.8930	19.7717	20.6504	(38)
Heat transfer coeff	50.4006	49.9612	49.5218	47.3250	46.8856	44.8031	44.8031	44.4174	45.6054	46.8856	47.7643	48.6431	(39)
Average = Sum(39)m / 12 =												47.2513	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7458	1.7306	1.7153	1.6392	1.6240	1.5519	1.5519	1.5385	1.5797	1.6240	1.6545	1.6849	(40)
HLP (average)												1.6367	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.1519	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	66.2846	65.2884	63.8369	61.0596	59.0100	56.7244	55.4252	56.8658	58.4449	60.8990	63.7359	66.0306	(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	26.4263	25.4653	24.5044	23.5434	22.5825	21.6215	21.6215	22.5825	23.5434	24.5044	25.4653	26.4263	(42c)
Average daily hot water use (litres/day)												85.1360	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	92.7108	90.7538	88.3412	84.6030	81.5925	78.3459	77.0467	79.4482	81.9883	85.4034	89.2013	92.4569	(44)
Energy conte	146.8313	129.2321	135.7772	115.8173	109.8392	96.3354	93.1813	98.3735	101.0998	115.8916	127.0835	144.7651	(45)
Energy content (annual)										Total = Sum(45)m =		1414.2272	
Distribution loss (46)m = 0.15 x (45)m	22.0247	19.3848	20.3666	17.3726	16.4759	14.4503	13.9772	14.7560	15.1650	17.3837	19.0625	21.7148	(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	(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	17.7700	16.0344	17.7247	17.1023	17.6398	17.0392	17.5899	17.6077	17.0600	17.6660	17.1453	17.7636	(61)
Total heat required for water heating calculated for each month	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(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	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(64)
								Total per year (kWh/year) = Sum(64)m =				1622.3699	(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	53.2639	46.9783	49.5771	42.7848	40.9315	36.2913	35.3802	37.1111	37.8807	42.9504	46.5416	52.5753	(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	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.0165	11.5611	9.4021	7.1180	5.3208	4.4920	4.8538	6.3092	8.4682	10.7523	12.5495	13.3782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5795	143.0487	139.3465	131.4649	121.5158	112.1651	105.9182	104.4490	108.1513	116.0328	125.9819	135.3327	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													

	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	(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)													
	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	(71)
Water heating gains (Table 5)													
	71.5913	69.9082	66.6359	59.4233	55.0154	50.4046	47.5541	49.8805	52.6120	57.7291	64.6411	70.6657	(72)
Total internal gains													
	292.2877	290.6184	281.4849	264.1067	247.9524	233.1621	224.4265	226.7391	235.3319	250.6146	269.2729	285.4770	(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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.3800	46.7521	0.6300	0.7000	0.7700	19.7175	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
West	0.8000	26.6072	0.6300	0.7000	1.0000	8.4483	(82)

Solar gains	38.4812	69.3369	105.4813	149.3762	185.0103	191.6291	181.4270	153.5117	120.4122	79.4404	46.7684	32.5011	(83)
Total gains	330.7689	359.9553	386.9662	413.4828	432.9627	424.7913	405.8535	380.2508	355.7441	330.0550	316.0414	317.9782	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	17.1463	17.2971	17.4506	18.2606	18.4318	19.2885	19.2885	19.4560	18.9491	18.4318	18.0927	17.7658	
alpha	2.1431	2.1531	2.1634	2.2174	2.2288	2.2859	2.2859	2.2971	2.2633	2.2288	2.2062	2.1844	
util living area													
	0.9134	0.8938	0.8590	0.7921	0.6927	0.5518	0.4329	0.4688	0.6500	0.8110	0.8877	0.9182	(86)
MIT	17.9586	18.2679	18.8077	19.5763	20.2060	20.6883	20.8722	20.8442	20.5071	19.7171	18.7831	17.9888	(87)
Th 2	19.5082	19.5190	19.5299	19.5847	19.5958	19.6488	19.6488	19.6587	19.6283	19.5958	19.5736	19.5517	(88)
util rest of house													
	0.8989	0.8762	0.8348	0.7552	0.6348	0.4650	0.3175	0.3539	0.5684	0.7698	0.8666	0.9048	(89)
MIT 2	16.8637	17.1699	17.6982	18.4616	19.0394	19.4781	19.6027	19.5979	19.3333	18.6176	17.7121	16.9198	(90)
Living area fraction										fLA = Living area / (4) =		0.4105	(91)
MIT	17.3131	17.6206	18.1536	18.9191	19.5183	19.9749	20.1238	20.1095	19.8151	19.0689	18.1517	17.3586	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.1631	17.4706	18.0036	18.7691	19.3683	19.8249	19.9738	19.9595	19.6651	18.9189	18.0017	17.2086	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8683	0.8443	0.8032	0.7300	0.6241	0.4773	0.3470	0.3815	0.5709	0.7457	0.8364	0.8754	(94)
Useful gains	287.2144	303.9187	310.7939	301.8518	270.2259	202.7527	140.8335	145.0774	203.0781	246.1108	264.3255	278.3646	(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													
	648.3067	628.0401	569.6781	467.0561	359.5322	234.0901	151.1568	158.1022	253.8000	390.0361	520.7124	632.7770	(97)
Space heating kWh													
	268.6526	217.8095	192.6098	118.9471	66.4438	0.0000	0.0000	0.0000	0.0000	107.0804	184.5985	263.6828	(98a)
Space heating requirement - total per year (kWh/year)												1419.8247	
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													
	268.6526	217.8095	192.6098	118.9471	66.4438	0.0000	0.0000	0.0000	0.0000	107.0804	184.5985	263.6828	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1419.8247	
Space heating per m2											(98c) / (4) =	49.1799	(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 %)												89.0000	(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													
	268.6526	217.8095	192.6098	118.9471	66.4438	0.0000	0.0000	0.0000	0.0000	107.0804	184.5985	263.6828	(98)
Space heating efficiency (main heating system 1)													
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)													
	301.8569	244.7298	216.4155	133.6485	74.6560	0.0000	0.0000	0.0000	0.0000	120.3150	207.4141	296.2728	(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													
	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(64)
Efficiency of water heater												78.9000	(216)
(217)m	84.8724	84.6638	84.2187	83.3680	82.0920	78.9000	78.9000	78.9000	78.9000	83.0962	84.2686	84.8577	(217)
Fuel for water heating, kWh/month													
	193.9398	171.5805	182.2659	159.4371	155.2879	143.6941	140.3944	146.9977	149.7589	160.7263	171.1538	191.5309	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	11.3932	9.1401	8.2296	6.0294	4.6573	3.8050	4.2485	5.5224	7.1730	9.4114	10.6302	11.7099	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.2924	-11.8717	-19.9137	-25.5443	-29.8725	-28.7431	-28.2580	-25.3674	-20.5332	-14.7163	-8.4700	-6.0763	(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	-2.2096	-5.4795	-13.2793	-23.6832	-34.6640	-36.1340	-35.1657	-27.6403	-17.5990	-8.4866	-3.1035	-1.6666	(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	1595.3086	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	1966.7672	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	91.9500	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-435.7700	(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	3263.2558	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1595.3086	3.6400	58.0692	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1966.7672	3.6400	71.5903	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	91.9500	16.4900	15.1626	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-226.6588	16.4900	-37.3760	
PV Unit electricity exported	-209.1113	5.5900	-11.6893	
Total			-49.0654	(252)
Total energy cost			195.1773	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9512	(257)
SAP value		84.5813	
SAP rating (Section 12)		85	(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	1595.3086	0.2100	335.0148	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1966.7672	0.2100	413.0211	(264)
Space and water heating			748.0359	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	91.9500	0.1443	13.2712	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-226.6588	0.1321	-29.9338	
PV Unit electricity exported	-209.1113	0.1219	-25.4891	
Total			-55.4228	(269)
Total CO2, kg/year			712.1264	(272)
CO2 emissions per m2			24.6700	(273)
EI value			87.0820	
EI rating			87	(274)
EI band			B	

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

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1. Overall dwelling characteristics

	Area	Storey height	Volume

Main dwelling		(m2)	(m)		(m3)
Ground floor		28.8700 (1b)	x 1.9700 (2b)	=	56.8739 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.8700				(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	56.8739 (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	2 * 10	= 20.0000	(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) =	20.0000 / (5) =	0.3517	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.1017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9364	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	1.0066	0.9598	0.9598	0.8896	0.9130	0.7959	0.7959	0.7725	0.7959	0.8896	0.8662	0.9364	(22b)
Effective ac	1.0066	0.9606	0.9606	0.8957	0.9168	0.8168	0.8168	0.7984	0.8168	0.8957	0.8751	0.9384	(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								
Window			2.2100	1.1450	2.5305			(27)
Rooflight			1.6000	1.2357	1.9772			(27a)
External Wall upgraded	26.1200	2.2100	23.9100	0.2100	5.0211	0.0000	0.0000	(29a)
Ashlar	3.1400		3.1400	0.1800	0.5652	18.0000	56.5200	(29a)
External Roof 1	36.0900	1.6000	34.4900	0.1400	4.8286	9.0000	310.4100	(30)
Total net area of external elements Aum(A, m2)			65.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.9226			(33)
Main dwelling								
Party Wall Solid			8.5500	0.0000	0.0000	180.0000	1539.0000	(32)
Party Floor 1			28.8700			30.0000	866.1000	(32d)
Internal Wall - Timber			37.6700			9.0000	339.0300	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	3111.0600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		107.7610 (35)
Thermal bridges (Default value 0.200 * total exposed area)		13.0700 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.9926 (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	18.8930	18.0294	18.0294	16.8105	17.2065	15.3294	15.3294	14.9848	15.3294	16.8105	16.4248	17.6128	(38)
Heat transfer coeff	46.8856	46.0220	46.0220	44.8031	45.1991	43.3220	43.3220	42.9774	43.3220	44.8031	44.4174	45.6054	(39)
Average = Sum(39)m / 12 =												44.7251	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6240	1.5941	1.5941	1.5519	1.5656	1.5006	1.5006	1.4887	1.5006	1.5519	1.5385	1.5797	(40)
HLP (average)												1.5492	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.1519 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
66.2846	65.2884	63.8369	61.0596	59.0100	56.7244	55.4252	56.8658	58.4449	60.8990	63.7359	66.0306	(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

26.4263	25.4653	24.5044	23.5434	22.5825	21.6215	21.6215	22.5825	23.5434	24.5044	25.4653	26.4263	(42c)

Average daily hot water use (litres/day)		85.1360 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	92.7108	90.7538	88.3412	84.6030	81.5925	78.3459	77.0467	79.4482	81.9883	85.4034	89.2013	92.4569	(44)
Energy conte	146.8313	129.2321	135.7772	115.8173	109.8392	96.3354	93.1813	98.3735	101.0998	115.8916	127.0835	144.7651	(45)
Energy content (annual)										Total = Sum(45)m =		1414.2272	
Distribution loss (46)m = 0.15 x (45)m	22.0247	19.3848	20.3666	17.3726	16.4759	14.4503	13.9772	14.7560	15.1650	17.3837	19.0625	21.7148	(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	(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	17.7700	16.0344	17.7247	17.1023	17.6398	17.0392	17.5899	17.6077	17.0600	17.6660	17.1453	17.7636	(61)
Total heat required for water heating calculated for each month	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(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													
	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(64)
									Total per year (kWh/year) = Sum(64)m =			1622.3699	(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													
	53.2639	46.9783	49.5771	42.7848	40.9315	36.2913	35.3802	37.1111	37.8807	42.9504	46.5416	52.5753	(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	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.0165	11.5611	9.4021	7.1180	5.3208	4.4920	4.8538	6.3092	8.4682	10.7523	12.5495	13.3782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	141.5795	143.0487	139.3465	131.4649	121.5158	112.1651	105.9182	104.4490	108.1513	116.0328	125.9819	135.3327	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	(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)													
	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	(71)
Water heating gains (Table 5)													
	71.5913	69.9082	66.6359	59.4233	55.0154	50.4046	47.5541	49.8805	52.6120	57.7291	64.6411	70.6657	(72)
Total internal gains													
	292.2877	290.6184	281.4849	264.1067	247.9524	233.1621	224.4265	226.7391	235.3319	250.6146	269.2729	285.4770	(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	0.8300	23.8018	0.6300	0.7000	0.7700	6.0375	(76)
South	1.3800	54.2217	0.6300	0.7000	0.7700	22.8678	(78)
North	0.8000	20.0851	0.6300	0.7000	1.0000	6.3774	(82)
West	0.8000	32.5082	0.6300	0.7000	1.0000	10.3220	(82)

Solar gains	45.6047	72.0969	109.6439	158.6992	192.0853	210.5785	197.3637	170.9079	133.8219	88.8783	54.6587	38.7035	(83)
Total gains	337.8924	362.7152	391.1287	422.8059	440.0377	443.7407	421.7902	397.6470	369.1538	339.4929	323.9316	324.1805	(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	18.4318	18.7776	18.7776	19.2885	19.1195	19.9479	19.9479	20.1079	19.9479	19.2885	19.4560	18.9491	
alpha	2.2288	2.2518	2.2518	2.2859	2.2746	2.3299	2.3299	2.3405	2.3299	2.2859	2.2971	2.2633	
util living area													
	0.8984	0.8769	0.8339	0.7499	0.6287	0.4501	0.3204	0.3443	0.5706	0.7698	0.8633	0.9036	(86)
MIT	18.4222	18.7286	19.2364	19.9264	20.4692	20.8456	20.9528	20.9442	20.7020	20.0215	19.2195	18.4466	(87)
Th 2	19.5958	19.6177	19.6177	19.6488	19.6387	19.6871	19.6871	19.6960	19.6871	19.6488	19.6587	19.6283	(88)
util rest of house													
	0.8817	0.8570	0.8060	0.7069	0.5604	0.3538	0.2001	0.2211	0.4788	0.7205	0.8381	0.8878	(89)
MIT 2	17.3691	17.6780	18.1642	18.8275	19.2947	19.6182	19.6768	19.6828	19.5281	18.9313	18.1855	17.4142	(90)
Living area fraction										fLA = Living area / (4) =		0.4105	(91)
MIT	17.8014	18.1092	18.6043	19.2785	19.7768	20.1220	20.2005	20.2006	20.0099	19.3788	18.6099	17.8380	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.6514	17.9592	18.4543	19.1285	19.6268	19.9720	20.0505	20.0506	19.8599	19.2288	18.4599	17.6880	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8516	0.8268	0.7775	0.6879	0.5597	0.3760	0.2347	0.2561	0.4920	0.7025	0.8099	0.8587	(94)
Useful gains	287.7518	299.8779	304.0846	290.8331	246.3093	166.8267	98.9873	101.8230	181.6353	238.4997	262.3442	278.3696	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
	588.4783	564.1928	508.7417	413.4678	304.0451	180.7408	101.8296	105.3191	210.5416	346.2728	464.6038	574.0797	(97)
Space heating kWh													
	223.7406	177.6196	152.2648	88.2970	42.9554	0.0000	0.0000	0.0000	0.0000	80.1832	145.6269	220.0083	(98a)
Space heating requirement - total per year (kWh/year)												1130.6959	
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													
	223.7406	177.6196	152.2648	88.2970	42.9554	0.0000	0.0000	0.0000	0.0000	80.1832	145.6269	220.0083	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1130.6959	
Space heating per m2											(98c) / (4) =	39.1651	(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 %)	89.0000	(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												

	223.7406	177.6196	152.2648	88.2970	42.9554	0.0000	0.0000	0.0000	0.0000	80.1832	145.6269	220.0083 (98)
Space heating efficiency (main heating system 1)												
	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)												
	251.3939	199.5726	171.0841	99.2101	48.2645	0.0000	0.0000	0.0000	0.0000	90.0935	163.6257	247.2004 (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												
	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287 (64)
Efficiency of water heater												78.9000 (216)
(217)m	84.4196	84.1535	83.6259	82.6434	81.2231	78.9000	78.9000	78.9000	78.9000	82.4083	83.6705	84.4092 (217)
Fuel for water heating, kWh/month												
	194.9800	172.6210	183.5579	160.8350	156.9491	143.6941	140.3944	146.9977	149.7589	162.0680	172.3772	192.5486 (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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219 (231)
Lighting	11.3932	9.1401	8.2296	6.0294	4.6573	3.8050	4.2485	5.5224	7.1730	9.4114	10.6302	11.7099 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-8.6592	-12.5127	-20.7589	-26.7216	-30.5906	-30.3409	-29.6795	-27.1738	-22.2514	-16.3147	-9.8842	-7.2671 (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	-2.9502	-6.0131	-14.3651	-25.9903	-36.5416	-40.9506	-39.3675	-32.1353	-20.7108	-10.2642	-4.0474	-2.2456 (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	1270.4448	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	1976.7818	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	91.9500	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-477.7360	(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	2906.4406	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1270.4448	5.6000	71.1449	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1976.7818	5.6000	110.6998	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	91.9500	26.0600	23.9622	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-242.1545	26.0600	-63.1055	
PV Unit electricity exported	-235.5815	5.8100	-13.6873	
Total			-76.7928	(252)
Total energy cost			239.7411	(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	1270.4448	0.2100	266.7934	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1976.7818	0.2100	415.1242	(264)
Space and water heating			681.9176	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	91.9500	0.1443	13.2712	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-242.1545	0.1323	-32.0381	
PV Unit electricity exported	-235.5815	0.1218	-28.6972	
Total			-60.7352	(269)
Total CO2, kg/year			640.6957	(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	1270.4448	1.1300	1435.6027	(275)

Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1976.7818	1.1300	2233.7634	(278)
Space and water heating			3669.3661	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	91.9500	1.5338	141.0360	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-242.1545	1.4888	-360.5284	
PV Unit electricity exported	-235.5815	0.4469	-105.2751	
Total			-465.8035	(283)
Total Primary energy kWh/year			3412.6746	(286)

SAP 10 EPC IMPROVEMENTS

Top Floor Flat

Current energy efficiency rating: B 85
Current environmental impact rating: B 87

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

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

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

Potential energy efficiency rating: B 85
Potential environmental impact rating: B 87

Fuel prices for cost data on this page from database revision number 561 TEST (31 Jan 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£36	£36	£0
Mains gas	£281	£281	£0
Space heating	£182	£182	£0
Water heating	£111	£111	£0
Lighting	£24	£24	£0
Generated (PV)	-£77	-£77	£0
Total cost of fuels	£240	£240	£0
Total cost of uses	£240	£240	£0
Delivered energy	101 kWh/m²	101 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	22 kg/m²	22 kg/m²	0 kg/m²
Primary energy	118 kWh/m²	118 kWh/m²	0 kWh/m²

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	28.8700	(1b)	x 1.9700	(2b) =	56.8739	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.8700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	56.8739	(5)

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2. Ventilation rate

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	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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.3517	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.1017	(18)
Number of sides sheltered		2	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.9364 (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	1.1939	1.1705	1.1471	1.0300	1.0066	0.8896	0.8896	0.8662	0.9364	1.0066	1.0535	1.1003	(22b)
Effective ac	1.1939	1.1705	1.1471	1.0300	1.0066	0.8957	0.8957	0.8751	0.9384	1.0066	1.0535	1.1003	(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								
Window			2.2100	1.1450	2.5305			(27)
Rooflight			1.6000	1.2357	1.9772			(27a)
External Wall upgraded	26.1200	2.1100	23.9100	0.2100	5.0211	0.0000	0.0000	(29a)
Ashlar	3.1400		3.1400	0.1800	0.5652	18.0000	56.5200	(29a)
External Roof 1	36.0900	1.6000	34.4900	0.1400	4.8286	9.0000	310.4100	(30)
Total net area of external elements Aum(A, m2)			65.3500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.9226			(33)
Main dwelling								
Party Wall Solid			8.5500	0.0000	0.0000	180.0000	1539.0000	(32)
Party Floor 1			28.8700			30.0000	866.1000	(32d)
Internal Wall - Timber			37.6700			9.0000	339.0300	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3111.0600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 107.7610 (35)
Thermal bridges (Default value 0.200 * total exposed area) 13.0700 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.9926 (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	22.4079	21.9686	21.5292	19.3323	18.8930	16.8105	16.8105	16.4248	17.6128	18.8930	19.7717	20.6504	(38)
Heat transfer coeff	50.4006	49.9612	49.5218	47.3250	46.8856	44.8031	44.8031	44.4174	45.6054	46.8856	47.7643	48.6431	(39)
Average = Sum(39)m / 12 =												47.2513	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7458	1.7306	1.7153	1.6392	1.6240	1.5519	1.5519	1.5385	1.5797	1.6240	1.6545	1.6849	(40)
HLP (average)												1.6367	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.1519 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	66.2846	65.2884	63.8369	61.0596	59.0100	56.7244	55.4252	56.8658	58.4449	60.8990	63.7359	66.0306	(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	26.4263	25.4653	24.5044	23.5434	22.5825	21.6215	21.6215	22.5825	23.5434	24.5044	25.4653	26.4263	(42c)
Average daily hot water use (litres/day)												85.1360	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	92.7108	90.7538	88.3412	84.6030	81.5925	78.3459	77.0467	79.4482	81.9883	85.4034	89.2013	92.4569	(44)
Energy conte	146.8313	129.2321	135.7772	115.8173	109.8392	96.3354	93.1813	98.3735	101.0998	115.8916	127.0835	144.7651	(45)
Energy content (annual)										Total = Sum(45)m =		1414.2272	
Distribution loss (46)m = 0.15 x (45)m	22.0247	19.3848	20.3666	17.3726	16.4759	14.4503	13.9772	14.7560	15.1650	17.3837	19.0625	21.7148	(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	(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	17.7700	16.0344	17.7247	17.1023	17.6398	17.0392	17.5899	17.6077	17.0600	17.6660	17.1453	17.7636	(61)
Total heat required for water heating calculated for each month	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(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	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(64)
									Total per year (kWh/year) = Sum(64)m =			1622.3699	(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	53.2639	46.9783	49.5771	42.7848	40.9315	36.2913	35.3802	37.1111	37.8807	42.9504	46.5416	52.5753	(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	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.0165	11.5611	9.4021	7.1180	5.3208	4.4920	4.8538	6.3092	8.4682	10.7523	12.5495	13.3782	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5795	143.0487	139.3465	131.4649	121.5158	112.1651	105.9182	104.4490	108.1513	116.0328	125.9819	135.3327	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	(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)	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	(71)
Water heating gains (Table 5)													

	71.5913	69.9082	66.6359	59.4233	55.0154	50.4046	47.5541	49.8805	52.6120	57.7291	64.6411	70.6657 (72)
Total internal gains	292.2877	290.6184	281.4849	264.1067	247.9524	233.1621	224.4265	226.7391	235.3319	250.6146	269.2729	285.4770 (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	0.8300	19.6403	0.6300	0.7000	0.7700	4.9819	(76)
South	1.3800	46.7521	0.6300	0.7000	0.7700	19.7175	(78)
North	0.8000	16.7973	0.6300	0.7000	1.0000	5.3335	(82)
West	0.8000	26.6072	0.6300	0.7000	1.0000	8.4483	(82)

Solar gains	38.4812	69.3369	105.4813	149.3762	185.0103	191.6291	181.4270	153.5117	120.4122	79.4404	46.7684	32.5011	(83)
Total gains	330.7689	359.9553	386.9662	413.4828	432.9627	424.7913	405.8535	380.2508	355.7441	330.0550	316.0414	317.9782	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	17.1463	17.2971	17.4506	18.2606	18.4318	19.2885	19.2885	19.4560	18.9491	18.4318	18.0927	17.7658	
alpha	2.1431	2.1531	2.1634	2.2174	2.2288	2.2859	2.2859	2.2971	2.2633	2.2288	2.2062	2.1844	
util living area	0.9134	0.8938	0.8590	0.7921	0.6927	0.5518	0.4329	0.4688	0.6500	0.8110	0.8877	0.9182	(86)
MIT	17.9586	18.2679	18.8077	19.5763	20.2060	20.6883	20.8722	20.8442	20.5071	19.7171	18.7831	17.9888	(87)
Th 2	19.5082	19.5190	19.5299	19.5847	19.5958	19.6488	19.6488	19.6587	19.6283	19.5958	19.5736	19.5517	(88)
util rest of house	0.8989	0.8762	0.8348	0.7552	0.6348	0.4650	0.3175	0.3539	0.5684	0.7698	0.8666	0.9048	(89)
MIT 2	16.8637	17.1699	17.6982	18.4616	19.0394	19.4781	19.6027	19.5979	19.3333	18.6176	17.7121	16.9198	(90)
Living area fraction										fLA = Living area / (4) =		0.4105	(91)
MIT	17.3131	17.6206	18.1536	18.9191	19.5183	19.9749	20.1238	20.1095	19.8151	19.0689	18.1517	17.3586	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.1631	17.4706	18.0036	18.7691	19.3683	19.8249	19.9738	19.9595	19.6651	18.9189	18.0017	17.2086	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8683	0.8443	0.8032	0.7300	0.6241	0.4773	0.3470	0.3815	0.5709	0.7457	0.8364	0.8754	(94)
Useful gains	287.2144	303.9187	310.7939	301.8518	270.2259	202.7527	140.8335	145.0774	203.0781	246.1108	264.3255	278.3646	(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	648.3067	628.0401	569.6781	467.0561	359.5322	234.0901	151.1568	158.1022	253.8000	390.0361	520.7124	632.7770	(97)
Space heating kWh	268.6526	217.8095	192.6098	118.9471	66.4438	0.0000	0.0000	0.0000	0.0000	107.0804	184.5985	263.6828	(98a)
Space heating requirement - total per year (kWh/year)												1419.8247	
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	268.6526	217.8095	192.6098	118.9471	66.4438	0.0000	0.0000	0.0000	0.0000	107.0804	184.5985	263.6828	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1419.8247	
Space heating per m2											(98c) / (4) =	49.1799	(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 %)	89.0000	(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	268.6526	217.8095	192.6098	118.9471	66.4438	0.0000	0.0000	0.0000	0.0000	107.0804	184.5985	263.6828	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	301.8569	244.7298	216.4155	133.6485	74.6560	0.0000	0.0000	0.0000	0.0000	120.3150	207.4141	296.2728	(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	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(64)
Efficiency of water heater												78.9000	(216)
(217)m	84.8724	84.6638	84.2187	83.3680	82.0920	78.9000	78.9000	78.9000	78.9000	83.0962	84.2686	84.8577	(217)
Fuel for water heating, kWh/month	193.9398	171.5805	182.2659	159.4371	155.2879	143.6941	140.3944	146.9977	149.7589	160.7263	171.1538	191.5309	(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	3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting	11.3932	9.1401	8.2296	6.0294	4.6573	3.8050	4.2485	5.5224	7.1730	9.4114	10.6302	11.7099	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.2924	-11.8717	-19.9137	-25.5443	-29.8725	-28.7431	-28.2580	-25.3674	-20.5332	-14.7163	-8.4700	-6.0763	(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	-2.2096	-5.4795	-13.2793	-23.6832	-34.6640	-36.1340	-35.1657	-27.6403	-17.5990	-8.4866	-3.1035	-1.6666	(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	1595.3086	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	1966.7672	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	91.9500	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-435.7700	(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	3263.2558	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1595.3086	3.6400	58.0692	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1966.7672	3.6400	71.5903	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	16.4900	7.4205	(249)
Energy for lighting	91.9500	16.4900	15.1626	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-226.6588	16.4900	-37.3760	
PV Unit electricity exported	-209.1113	5.5900	-11.6893	
Total			-49.0654	(252)
Total energy cost			195.1773	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9512	(257)
SAP value		84.5813	
SAP rating (Section 12)		85	(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	1595.3086	0.2100	335.0148	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1966.7672	0.2100	413.0211	(264)
Space and water heating			748.0359	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	91.9500	0.1443	13.2712	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-226.6588	0.1321	-29.9338	
PV Unit electricity exported	-209.1113	0.1219	-25.4891	
Total			-55.4228	(269)
Total CO2, kg/year			712.1264	(272)
CO2 emissions per m2			24.6700	(273)
EI value			87.0820	
EI rating			87	(274)
EI band			B	

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		28.8700	(1b)	x 1.9700	(2b) =	56.8739	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.8700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		56.8739	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.3517	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		1.1017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9364	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	1.0066	0.9598	0.9598	0.8896	0.9130	0.7959	0.7959	0.7725	0.7959	0.8896	0.8662	0.9364	(22b)
Effective ac	1.0066	0.9606	0.9606	0.8957	0.9168	0.8168	0.8168	0.7984	0.8168	0.8957	0.8751	0.9384	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Window			2.2100	1.1450	2.5305			(27)
Rooflight			1.6000	1.2357	1.9772			(27a)
External Wall upgraded	26.1200	2.2100	23.9100	0.2100	5.0211	0.0000	0.0000	(29a)
Ashlar	3.1400		3.1400	0.1800	0.5652	18.0000	56.5200	(29a)
External Roof 1	36.0900	1.6000	34.4900	0.1400	4.8286	9.0000	310.4100	(30)
Total net area of external elements Aum(A, m2)			65.3500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.9226			(33)
Main dwelling								
Party Wall Solid			8.5500	0.0000	0.0000	180.0000	1539.0000	(32)
Party Floor 1			28.8700			30.0000	866.1000	(32d)
Internal Wall - Timber			37.6700			9.0000	339.0300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		3111.0600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							107.7610	(35)
Thermal bridges (Default value 0.200 * total exposed area)							13.0700	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		27.9926	(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	18.8930	18.0294	18.0294	16.8105	17.2065	15.3294	15.3294	14.9848	15.3294	16.8105	16.4248	17.6128	(38)
Heat transfer coeff	46.8856	46.0220	46.0220	44.8031	45.1991	43.3220	43.3220	42.9774	43.3220	44.8031	44.4174	45.6054	(39)
Average = Sum(39)m / 12 =												44.7251	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6240	1.5941	1.5941	1.5519	1.5656	1.5006	1.5006	1.4887	1.5006	1.5519	1.5385	1.5797	(40)
HLP (average)												1.5492	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.1519	(42)
Hot water usage for mixer showers	66.2846	65.2884	63.8369	61.0596	59.0100	56.7244	55.4252	56.8658	58.4449	60.8990	63.7359	66.0306	(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	26.4263	25.4653	24.5044	23.5434	22.5825	21.6215	21.6215	22.5825	23.5434	24.5044	25.4653	26.4263	(42c)
Average daily hot water use (litres/day)												85.1360	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	92.7108	90.7538	88.3412	84.6030	81.5925	78.3459	77.0467	79.4482	81.9883	85.4034	89.2013	92.4569	(44)
Energy conte	146.8313	129.2321	135.7772	115.8173	109.8392	96.3354	93.1813	98.3735	101.0998	115.8916	127.0835	144.7651	(45)
Energy content (annual)										Total = Sum(45)m =		1414.2272	
Distribution loss (46)m = 0.15 x (45)m	22.0247	19.3848	20.3666	17.3726	16.4759	14.4503	13.9772	14.7560	15.1650	17.3837	19.0625	21.7148	(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	(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	17.7700	16.0344	17.7247	17.1023	17.6398	17.0392	17.5899	17.6077	17.0600	17.6660	17.1453	17.7636	(61)
Total heat required for water heating calculated for each month	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(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	164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(64)

											Total per year (kWh/year) = Sum(64)m =	1622.3699	(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													
53.2639	46.9783	49.5771	42.7848	40.9315	36.2913	35.3802	37.1111	37.8807	42.9504	46.5416	52.5753		(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	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	69.1120	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.0165	11.5611	9.4021	7.1180	5.3208	4.4920	4.8538	6.3092	8.4682	10.7523	12.5495	13.3782		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
141.5795	143.0487	139.3465	131.4649	121.5158	112.1651	105.9182	104.4490	108.1513	116.0328	125.9819	135.3327		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631	43.0631		(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)													
-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747	-46.0747		(71)
Water heating gains (Table 5)													
71.5913	69.9082	66.6359	59.4233	55.0154	50.4046	47.5541	49.8805	52.6120	57.7291	64.6411	70.6657		(72)
Total internal gains													
292.2877	290.6184	281.4849	264.1067	247.9524	233.1621	224.4265	226.7391	235.3319	250.6146	269.2729	285.4770		(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	0.8300	23.8018	0.6300	0.7000	0.7700	6.0375	(76)
South	1.3800	54.2217	0.6300	0.7000	0.7700	22.8678	(78)
North	0.8000	20.0851	0.6300	0.7000	1.0000	6.3774	(82)
West	0.8000	32.5082	0.6300	0.7000	1.0000	10.3220	(82)

Solar gains	45.6047	72.0969	109.6439	158.6992	192.0853	210.5785	197.3637	170.9079	133.8219	88.8783	54.6587	38.7035	(83)
Total gains	337.8924	362.7152	391.1287	422.8059	440.0377	443.7407	421.7902	397.6470	369.1538	339.4929	323.9316	324.1805	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	18.4318	18.7776	18.7776	19.2885	19.1195	19.9479	19.9479	20.1079	19.9479	19.2885	19.4560	18.9491	
alpha	2.2288	2.2518	2.2518	2.2859	2.2746	2.3299	2.3299	2.3405	2.3299	2.2859	2.2971	2.2633	
util living area													
0.8984	0.8769	0.8339	0.7499	0.6287	0.4501	0.3204	0.3443	0.5706	0.7698	0.8633	0.9036		(86)
MIT	18.4222	18.7286	19.2364	19.9264	20.4692	20.8456	20.9528	20.9442	20.7020	20.0215	19.2195	18.4466	(87)
Th 2	19.5958	19.6177	19.6177	19.6488	19.6387	19.6871	19.6871	19.6960	19.6871	19.6488	19.6587	19.6283	(88)
util rest of house													
0.8817	0.8570	0.8060	0.7069	0.5604	0.3538	0.2001	0.2211	0.4788	0.7205	0.8381	0.8878		(89)
MIT 2	17.3691	17.6780	18.1642	18.8275	19.2947	19.6182	19.6768	19.6828	19.5281	18.9313	18.1855	17.4142	(90)
Living area fraction									fLA = Living area / (4) =			0.4105	(91)
MIT	17.8014	18.1092	18.6043	19.2785	19.7768	20.1220	20.2005	20.2006	20.0099	19.3788	18.6099	17.8380	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.6514	17.9592	18.4543	19.1285	19.6268	19.9720	20.0505	20.0506	19.8599	19.2288	18.4599	17.6880	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8516	0.8268	0.7775	0.6879	0.5597	0.3760	0.2347	0.2561	0.4920	0.7025	0.8099	0.8587	(94)
Useful gains	287.7518	299.8779	304.0846	290.8331	246.3093	166.8267	98.9873	101.8230	181.6353	238.4997	262.3442	278.3696	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W													
588.4783	564.1928	508.7417	413.4678	304.0451	180.7408	101.8296	105.3191	210.5416	346.2728	464.6038	574.0797		(97)
Space heating kWh													
223.7406	177.6196	152.2648	88.2970	42.9554	0.0000	0.0000	0.0000	0.0000	80.1832	145.6269	220.0083		(98a)
Space heating requirement - total per year (kWh/year)												1130.6959	
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													
223.7406	177.6196	152.2648	88.2970	42.9554	0.0000	0.0000	0.0000	0.0000	80.1832	145.6269	220.0083		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1130.6959	
Space heating per m2											(98c) / (4) =	39.1651	(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 %)												89.0000	(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													
223.7406	177.6196	152.2648	88.2970	42.9554	0.0000	0.0000	0.0000	0.0000	80.1832	145.6269	220.0083		(98)
Space heating efficiency (main heating system 1)													
89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000		(210)
Space heating fuel (main heating system)													
251.3939	199.5726	171.0841	99.2101	48.2645	0.0000	0.0000	0.0000	0.0000	90.0935	163.6257	247.2004		(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												
164.6013	145.2666	153.5019	132.9195	127.4789	113.3746	110.7711	115.9812	118.1598	133.5575	144.2289	162.5287	(64)
Efficiency of water heater											78.9000	(216)
(217)m 84.4196	84.1535	83.6259	82.6434	81.2231	78.9000	78.9000	78.9000	78.9000	82.4083	83.6705	84.4092	(217)
Fuel for water heating, kWh/month												
194.9800	172.6210	183.5579	160.8350	156.9491	143.6941	140.3944	146.9977	149.7589	162.0680	172.3772	192.5486	(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 3.8219	3.4521	3.8219	3.6986	3.8219	3.6986	3.8219	3.8219	3.6986	3.8219	3.6986	3.8219	(231)
Lighting 11.3932	9.1401	8.2296	6.0294	4.6573	3.8050	4.2485	5.5224	7.1730	9.4114	10.6302	11.7099	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m -8.6592	-12.5127	-20.7589	-26.7216	-30.5906	-30.3409	-29.6795	-27.1738	-22.2514	-16.3147	-9.8842	-7.2671	(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 -2.9502	-6.0131	-14.3651	-25.9903	-36.5416	-40.9506	-39.3675	-32.1353	-20.7108	-10.2642	-4.0474	-2.2456	(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	1270.4448	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	1976.7818	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	45.0000	(231)
Electricity for lighting (calculated in Appendix L)	91.9500	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-477.7360	(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	2906.4406	(238)

10a. Fuel costs - using BEDF prices (561)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1270.4448	5.6000	71.1449	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1976.7818	5.6000	110.6998	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	45.0000	26.0600	11.7270	(249)
Energy for lighting	91.9500	26.0600	23.9622	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-242.1545	26.0600	-63.1055	
PV Unit electricity exported	-235.5815	5.8100	-13.6873	
Total			-76.7928	(252)
Total energy cost			239.7411	(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	1270.4448	0.2100	266.7934	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1976.7818	0.2100	415.1242	(264)
Space and water heating			681.9176	(265)
Pumps, fans and electric keep-hot	45.0000	0.1387	6.2421	(267)
Energy for lighting	91.9500	0.1443	13.2712	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-242.1545	0.1323	-32.0381	
PV Unit electricity exported	-235.5815	0.1218	-28.6972	
Total			-60.7352	(269)
Total CO2, kg/year			640.6957	(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	1270.4448	1.1300	1435.6027	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1976.7818	1.1300	2233.7634	(278)
Space and water heating			3669.3661	(279)
Pumps, fans and electric keep-hot	45.0000	1.5128	68.0760	(281)
Energy for lighting	91.9500	1.5338	141.0360	(282)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-242.1545	1.4888	-360.5284
PV Unit electricity exported	-235.5815	0.4469	-105.2751
Total			-465.8035 (283)
Total Primary energy kWh/year			3412.6746 (286)

Predicted Energy Assessment

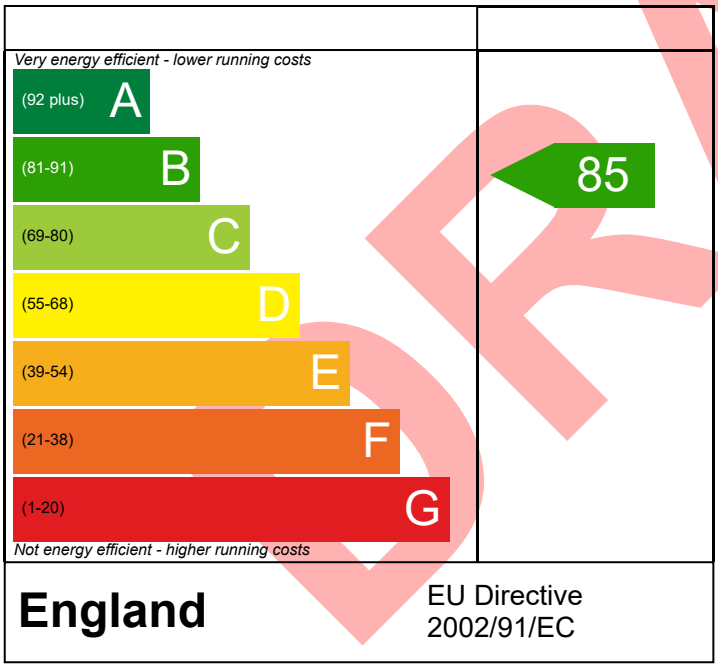
Flat 6, 99 London Road, Reading, RG1 5BY

Dwelling type:	Flat, Semi-Detached
Date of assessment:	17/02/2025
Produced by:	Sammit Pancholi
Total floor area:	28.87 m²
DRRN:	

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.

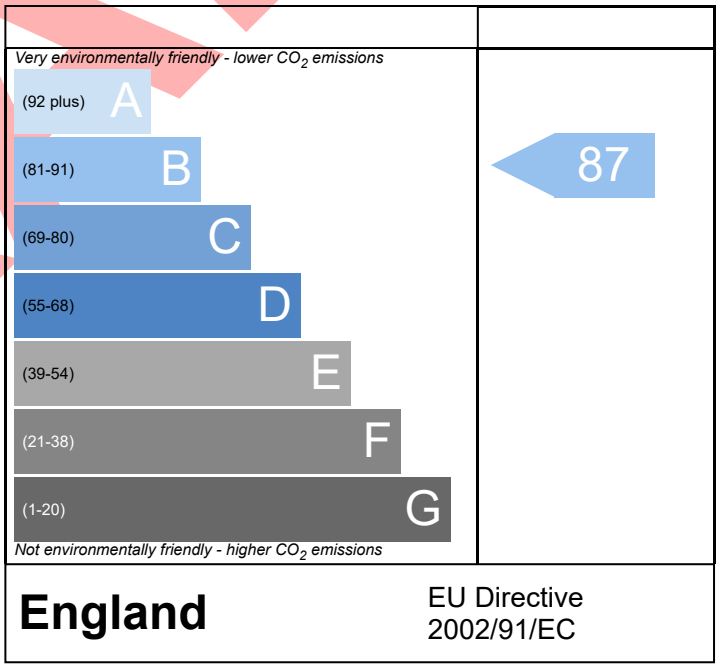
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

elmhurst energy

Property Reference	Flat 6 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Top Floor Flat	**Prop Type Ref**	Top Floor Flat
Property	Flat 6, 99 London Road, Reading, RG1 5BY		

SAP Rating	85 B	**DER**	25.19	**TER**	
Environmental	87 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.64	**DFEE**	58.22	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	134.57	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	5	
Terrain Type	Suburban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Top-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2025	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	107.76	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	18.23 m	28.87 m²	1.97 m

8.0 Living Area	11.85	m²

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
External Wall upgraded	Solid Wall	Other	0.21	0.00	26.12	23.91	0.00	None	2.21	Enter Gross Area
Ashlar	Timber Frame	Timber framed wall (two layers of plasterboard)	0.18	18.00	3.14	3.14	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 Solid	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	8.55		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall - Timber	Plasterboard on timber frame	9.00	37.67

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
External Roof 1	External Slope Roof	Plasterboard, insulated slope	0.14	9.00	36.09	34.49	None	0.00	Enter Gross Area	1.60

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)

Party Floor 1	Lowest occupied	Timber I-joists, carpeted		20.00	28.87

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	SAP table	Solid Door				0.00			3.00
Window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Rooflight	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Opening 1	Window	External Wall upgraded	East	0.83	
Opening 2	Window	External Wall upgraded	South	1.38	
Opening 3	Rooflight	External Roof 1	West	0.80	30
Opening 4	Rooflight	External Roof 1	North	0.80	30

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.20	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	2	
Number of passive vents	0	
Number of flueless gas fires	0	
21.0 Fixed Cooling System	No	
22.0 Pressure Testing	No	
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting	No				
	Name	**Efficacy**	**Power**	**Capacity**	**Count**
	LED	66.00	8.00	528.00	15

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	18830	
Fuel Type	Mains gas	
In Winter	89.00	
In Summer	78.90	
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Flue Type	Open	
Fan Assisted Flue	Yes	

Summary for Input Data

elmhurst energy

Is MHS Pumped	No pump
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	Yes
Combi boiler type	Standard Combi
Combi keep hot type	None

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	0

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.50		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	None
In Airing Cupboard	No

32.0 Photovoltaic Unit	One Dwelling
Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.60	West	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro	None

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

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
			0	0
			0	0
			0	0

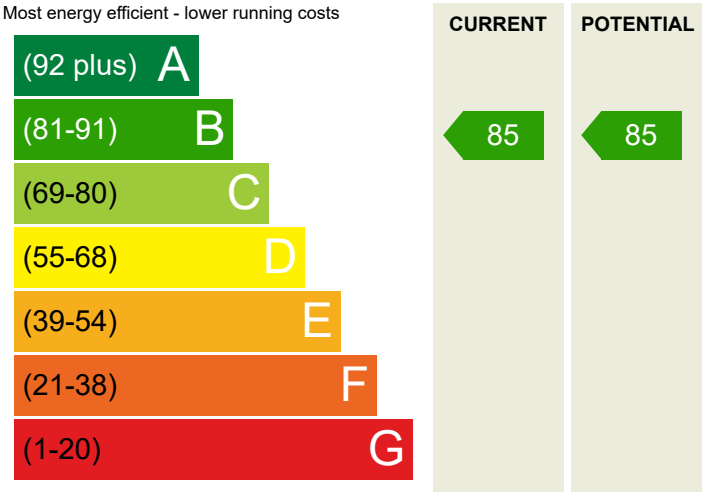
Energy Report

Dwelling Address	Flat 6, 99 London Road, Reading, RG1 5BY
Reference	Flat 6 - Gas + Solar-Top Floor Flat
Assessment Date	17/02/2025
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	29

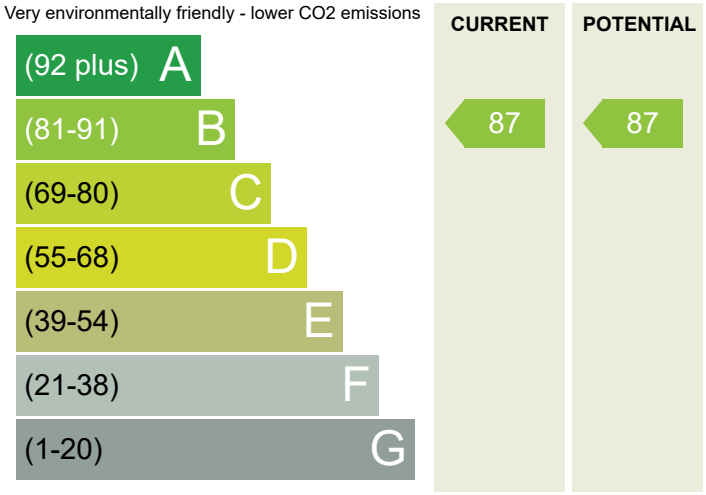
This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

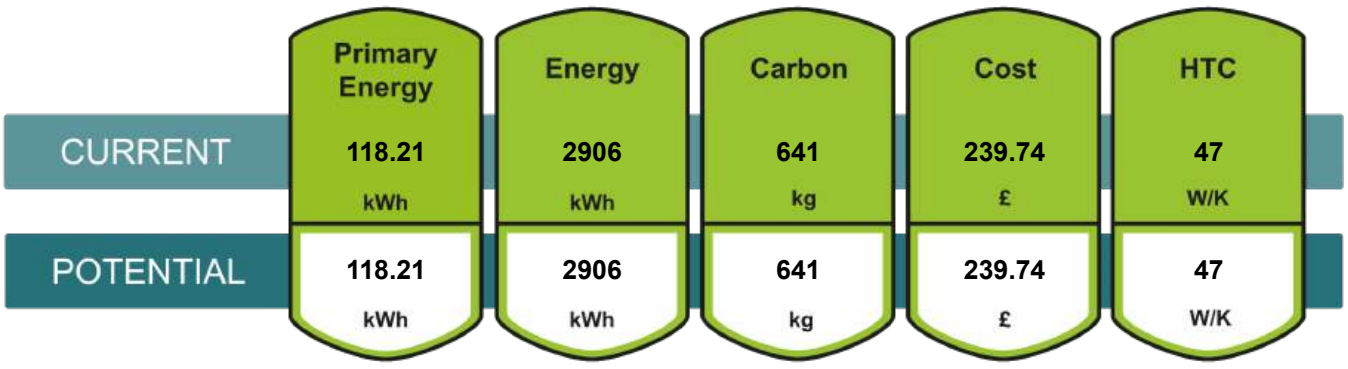
Energy Efficiency Rating



Carbon Dioxide (CO2) Emissions Rating



Additional ratings for your home



Energy Report

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor | Poor | Average | Good | Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.21 W/m²K	Very Good
Roof	Average thermal transmittance 0.14 W/m²K	Very Good
Windows	High performance glazing	Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling.
To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed.
Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total

energy cost if all recommended measures named above were installed.

	Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting	£24	£24	You could save £0
Heating	£182	£182	
Hot Water	£111	£111	
New Technologies e.g. Impact of PV	-(£77)	-(£77)	
TOTAL	£240	£240	

Estimated energy use and potential savings

Space Heating
1270
kWh per year

Water Heating
1977
kWh per year

About this document

Created by:	
Company/Trading name:	
Phone number:	
Email address:	

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g.heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO2)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report

Property Reference	Flat 6 - Gas + Solar	**Issued on Date**	17/02/2025
Assessment Reference	Top Floor Flat	**Prop Type Ref**	Semi-Detached Flat
Property	Flat 6, 99 London Road, Reading, RG1 5BY		

SAP Rating	85 B	**DER**	25.19	**TER**	
Environmental	87 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.64	**DFEE**	58.22	**TFEE**	
Compliance Check	See BREL	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	134.57	**TPER**	

Assessor Details	Mr. Sammit Pancholi	**Assessor ID**	DB55-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name	Flat 6, 99 London Road	
House Number		
Postcode	RG1 5BY	
Street		
Town	Reading	
County		

Dwelling Orientation South (Please confirm orientation of main entrance door of the dwelling.)

Comments

Terrain Type Suburban

Property Type Flat, Semi-Detached

Comments

Electricity Tariff Standard

Smart electricity meter fitted: No

Smart gas meter fitted: No

Comments

Section 2: Dwelling Construction Details

External Walls

Description	External Wall upgraded		
Type	Solid Wall		
Construction	Other		
U-value	0.21	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	26.12	m²	

Description	Ashlar		
Type	Timber Frame		
Construction	Timber framed wall (two layers of plasterboard)		
U-value	0.18	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	3.14	m²	

Comments

Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall Solid	Solid Wall	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	8.55

Comments

External Roofs

Description	External Roof 1		
Type	External Slope Roof		
Construction	Plasterboard, insulated slope		
U-value	0.14	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	36.09	m²	

Comments

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
Door	SAP table	Solid Door		0.00		3.00
Window	Manufacturer	Window	Double Low-E Soft 0.05	0.63		1.20
Rooflight	Manufacturer	Roof Window	Double Low-E Soft 0.05	0.63		1.30

Comments

Openings

Name	Opening Type	Location	Orientation	Area (m²)
Opening 1	Window	External Wall upgraded	East	0.83
Opening 2	Window	External Wall upgraded	South	1.38
Opening 3	Rooflight	External Roof 1	West	0.80
Opening 4	Rooflight	External Roof 1	North	0.80

Comments

Thermal Bridging

Thermal Bridging	Default
Y-value	0.200

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing	No	
Designed AP_{50}	5.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

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	2
Number of passive vents	0
Number of flueless gas fires	0

Comments

Fixed Cooling System	No

Comments

Lighting

No Fixed Lighting	No

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
LED	66.00	8.00	528.00	15

Comments

Dwelling Sign Off Report

Main Heating 1	Database	
Fuel Type	Mains gas	
Winter Efficiency	89.00	%
Summer Efficiency	78.90	%
Model Name	Energy7	
Manufacturer	Vaillant Group UK	
System Type	Combi boiler	
Flue Type	Open	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Programmer, room thermostat and TRVs
Boiler Interlock	Yes
Delayed Start Stat	Yes
PCDF Control Description	

Comments

Main Heating 2	None
Secondary Heating	None

Water Heating System

Water Heating	Main Heating 1
Supplementary Immersion	No
SAP Code	901
Water use <= 125 l/p/day	Yes
Cold Water Source	From mains
Number of baths	0

Comments

Hot Water Cylinder	None

Comments

Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.50		No	

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit One Dwelling

Export Capable Meter? Yes

Connected To Dwelling Yes

Diverter No

Battery Capacity [kWh] 0.00

PV Cells kWp	Orientation	Elevation	Overshading	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.60	West	30°	None Or Little	No	1.00		

Comments

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed .....

Date .....