



Old Hale Way, Ickleford, SG5

Energy Statement for Planning

Job No: 7208

Issue July, 2026

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1.0 Introduction

- 1.1 This Energy Statement has been prepared in relation to a planning application for the proposed development at Old Hale Way, Ickleford, Hitchin SG5 3UW.
- 1.2 The report assesses the predicted energy performance and carbon dioxide emissions of the proposed development.
- 1.3 The methodology used to demonstrate the effects of the proposed energy efficiency measures through passive design and renewable technologies.
- 1.4 The overall effect of these policies is:
 - A reduction in emissions of at least 35% over Building Regulations standards.
 - The other requirements of the SPD Silver Level will be achieved.

2.0 Project Summary

- 2.1 The proposed development is at Old Hale Way, Ickleford, Hitchin SG5 3U.
The site is currently empty.
- 2.2 The proposal is for a two-bed chalet bungalow.
- 2.3 The site location is shown below.



Site Location

3.0 Policy Requirements and Drivers

- 3.1 The relevant planning policy documents for this site, relating to energy are:
- North Hertfordshire Local Plan 2011-2031.
 - North Herts Council Sustainability SPD.
- 3.2 The North Herts Sustainability SPD sets out routes to compliance at bronze, silver and gold levels. Bronze level represents the minimum requirements to comply with building regulations.
- 3.3 Silver SPD level represents a significant improvement over bronze. This proposed development will achieve silver SPD level.
- 3.4 Minor residential developments, such as this, that are targeting silver level, should achieve a minimum of 35% reduction in on-site CO₂ emissions.
- 3.5 In light of these policy requirements, and through the developer and design team's commitment to reducing the impact of the development on the environment, this report sets out the measures that will be adopted to meet the policy targets.

4.0 Energy Strategy and Approach

- 4.1 The energy strategy for the development is to firstly introduce energy efficient measures, and secondly to provide on-site renewable technology.
- 4.2 This is done using SAP (Standard Assessment Procedure) for residential elements.
- 4.3 The energy efficient measures show how proposed development will reduce the energy demand of the building through architectural and building fabric measures (passive design) and energy efficient services (active design).
- 4.4 The introduction of renewable technology will provide the majority of the reduction in emissions. This will involve the consideration of PV panels, Air source heat pumps (ASHPs) or Ground source heat pumps (GSHPs) and wind.

5.0 Baseline Emissions

- 5.1 The baseline emissions on which reduction figures are based are calculated using SAP for residential dwellings.
- 5.2 The emissions are based upon the minimum target U-values set out in Part L of the building regulations.
- 5.3 The baseline emissions are as follows.

Baseline Emissions	
Regulated Emissions	SAP 10 (Tonnes CO ₂ /Year)
	1.0 Tonnes CO ₂

Table 1 – Baseline Emissions

6.0 Energy Efficiency Strategy

- 6.1 The next stage, once the baseline has been established, is to make improvements through energy efficiency measures. This includes improving the U Values and the reduction of thermal bridging.
- 6.2 The U value improvements for each element, with the relevant Part L notional value are shown below.
- 6.3 Improved thermal bridging is proposed.
- 6.4 A Waste Water Heat Recovery system is also proposed.
- 6.5 Lighting will be provided by energy efficient lighting with an efficacy of 120 lumen per circuit watt.
- 6.6 The site layout has also been designed to maximise solar gain through the provision of south facing glazing.

Energy Efficiency Strategy		
Element or system	Limiting values	Proposed Value
External Walls	U = 0.18 W/(m ² k)	U = 0.15 W/(m ² k)
Ground Floor	U = 0.13 W/(m ² k)	U = 0.10 W/(m ² k)
Roofs	U = 0.12 W/(m ² k)	U = 0.10 W/(m ² k)
Windows	U = 1.2 W/(m ² k) G value 0.57	U = 1.0 W/(m ² k)
Air Permeability	5.00 m ³ /(hm ²) at 50 Pa	3.50 m ³ /(hm ²) at 50 Pa

Table 2 – Fabric Specification

Energy Efficiency Emissions			
	Baseline Emissions	Be Lean Emissions	% Reduction
Regulated Emissions	1.0 Tonnes CO ₂	0.7 Tonnes CO ₂	33%

Table 3 – Energy Efficiency Emissions.

7.0 Decentralised Energy

- 7.1 From the information we have the proposal site is not near any existing or proposed decentralised energy network.
- 7.2 It is not considered feasible for the proposed development to connect to a decentralised energy network as there is no available space for a plant room.

8.0 Renewable Energy Strategy

- 8.1 The renewables section of the energy strategy requires the consideration of renewable technologies to reduce emissions.
- 8.2 The technologies that are considered here are wind power and solar panels photovoltaic (PV) and renewable heating technology.
- 8.3 Wind power is not suitable here. Any wind that is received on the site would be too intermittent and turbulent to provide any meaningful reduction in emissions.
- 8.4 Air Source Heat Pumps are considered suitable here. It is proposed that an ASHP with an efficiency of 252% will be installed to provide heating and hot water. The hot water cylinder will have a capacity of 210L and a heat loss of 1.49 kWh/day.
- 8.5 PV panels are also considered suitable here. It is proposed that 3kWp of PV panels will be installed. These should be facing south where they are most effective.

Renewable Energy Emissions			
	Be Lean Emissions	Be Green Emissions	% Reduction
Regulated	0.7	0.0	69%

Table 4 – Renewable Energy Emissions

9.0 Summary Of Results

- 9.1 The table below give the percentage improvement in emissions at each stage of the hierarchy and the overall savings made over Part L of the Building Regulations.
- 9.2 The building will be provided with increased U values (as shown above), a Waste Water with Heat Recovery system and an Air Source Heat Pump and PV panels.

Old Hale Way	CO ₂ Emissions (Tonnes)	% Reduction
Baseline (Part L 2022)	1.0	
After energy demand reduction	0.7	33.00%
After heat network / CHP	0.7	0.00%
After renewable energy	0.0	69.00%
Total Savings	1.0	100.00%

Table 5- Carbon emissions savings

9.0 Summary Of Results

Old Hale Way - Energy Demand			
	Total Energy Demand kWh/year	Energy Provided by LZC kWh/year	% Energy from Renewables
Old Hale Way	2135.87	4552.58	213%

Table 6- Energy provided by Low Carbon/Renewable Technology

Old Hale Way	Energy Use Intensity
Unit One	58.86

Table 7 - Energy Use Intensity

Old Hale Way	Space Heating Demand
Unit One	27.79

Table 8 – Space Heating Demand

10.0 Conclusions

- 10.1 This report has been set out to demonstrate how the proposed development at Old Hale Way, Ickleford, will meet the Silver SPD level.
- 10.2 In doing so, preliminary SAP calculations have been undertaken using the information available and sensible assumptions on construction and M&E parameters.
- 10.3 The baseline figures have been calculated and improvements made to the fabric of the scheme, in addition to other measures listed below.
- 10.4 The measures proposed are detailed above but summarise as:
- Improved fabric
 - WWHRS
 - Individual ASHPs
 - 3 kWp of PV panels
- 10.5 The results in Section 9 show that there will be a 100% reduction in CO₂ emissions.
- 10.6 The results also show that the Energy Use Intensity (EUI) will be less than 75 kWh/M²/yr.
- 10.7 The Specific Heat Demand (SHD) will be less than 30 kWh/M²/yr.
- 10.8 The results show that 213% of the energy to the development will be provided by renewable or low carbon technologies.
- 10.9 Overall, the results show that the Silver SPD level has been achieved for this development.



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Appendix A – SAP Calculations

Summary for Input Data



Plot Reference	OHW		Issued on Date	08/07/2026
Assessment Reference	OHW - Be Lean	Plot Type Ref		
Plot Address			SAP Version	10.2

SAP Rating	83 B	DER	12.22	TER	11.98
Environmental	90 B	% DER < TER			-2.00
CO ₂ Emissions (t/year)	0.93	DFEE	34.30	TFEE	45.45
Compliance Check	See BREL	% DFEE < TFEE			24.53
% DPER < TPER	-15.82	DPER	72.92	TPER	62.96

Assessor Details	Mr. Samuel Westover	Assessor ID	AX13-0001
Client			

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

Orientation	North	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
2.0 Number of Storeys	2	
3.0 Date Built	2026	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Enter TMP value	
Thermal Mass	185.00	kJ/m²

7.0 Electricity Tariff	Standard
Smart electricity meter fitted	Yes
Smart gas meter fitted	Yes

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	36.50 m	60.20 m ²	2.80 m
		13.60 m	26.50 m ²	2.50 m

8.0 Living Area	30.40	m ²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	EW	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.15		136.20	108.67	0.00	None	27.53	Calculate Wall Area

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	Insulation at Ceiling	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	41.40	41.40	None	0.00	Enter Gross Area	0.00
	Sloping Ceiling	External Slope Roof	Plasterboard, insulated slope	0.09	9.00	19.80	19.80	None	0.00	Enter Gross Area	0.00

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
	Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.09	None	0.00	75.00	59.70

12.0 Opening Types	Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
	Ws	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.00
	SD	Manufacturer	Solid Door				0.00			1.00

13.0 Openings	Name	Opening Type	Location	Orientation	Area (m ²)	Pitch
	S	Ws	EW	South	15.49	
	N	Ws	EW	North	3.66	
	FD	SD	EW	North	2.10	

Summary for Input Data

W E	Ws Ws	EW EW	West East	5.25 1.03
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14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

No

17.0 Thermal Bridging

User Input

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E1 Steel lintel with perforated steel base plate		16.39			Yes
E3 Sill		15.39			Yes
E4 Jamb		29.91			Yes
E5 Ground floor (normal)		36.50			Yes
E6 Intermediate floor within a dwelling		13.60			Yes
E16 Corner (normal)		21.20			Yes
E10 Eaves (insulation at ceiling level)		18.40			No
E12 Gable (insulation at ceiling level)		10.00			No
E13 Gable (insulation at rafter level)		4.60			No
E14 Flat roof		8.50			No

Y-value

0.03

W/m²K

Description

RCDs

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

4

Number of passive vents

0

Number of flueless gas fires

0

21.0 Fixed Cooling System

No

22.0 Pressure Testing

Yes

Designed AP₅₀

3.50

m³/(h.m²) @ 50 Pa

Test Method

Blower Door

22.0 Lighting

No Fixed Lighting

No

Name	Efficacy	Power	Capacity	Count
Lighting 1	120.00	5.00	600.00	35

24.0 Main Heating 1

Manufacturer

Percentage of Heat

100.00

%

Fuel Type

Mains gas

SAP Code

104

In Winter

89.50

In Summer

81.00

Model Name

GB

Manufacturer

Gb

Controls SAP Code

2110

Delayed Start Stat

Yes

Burner Control

On/Off

Flue Type

None or Unknown

Summary for Input Data

Fan Assisted Flue	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in Wood
Flow Temperature	Enter value
Flow Temperature Value	35.00
Boiler Interlock	Yes
Combi boiler type	Standard Combi
Combi keep hot type	Electric, time clock

25.0 Main Heating 2	None
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26.0 Heat Networks	None
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27.0 Secondary Heating	None
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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	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Cold Water Source	From mains
Bath Count	1

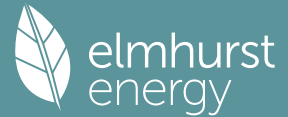
28.1 Showers					
Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
s1	Vented hot water system	8.00		Yes	Instantaneous System 1
s2	Vented hot water system	8.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System Instantaneous System 1	
Database ID	80188
Brand Model	Showersave, Showersave QB1-21 Cyclone
Details	Year: 2021 + current Efficiency: 71.15 Utilisation factor: 0.973

29.0 Hot Water Cylinder	None
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Recommendations				
Lower cost measures				
None				
Further measures to achieve even higher standards				
	Typical Cost	Typical savings per year	Ratings after improvement	Environmental Impact
Solar water heating			SAP rating	
Photovoltaic	£8,000 - £10,000	£230	B 84	B 91
Wind turbine			B 89	B 91
			0	0

Full SAP Calculation Printout



Plot Reference	OHW				Issued on Date	08/07/2026	
Assessment Reference	OHW - Be Lean			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	83 B	DER	12.22	TER	11.98		
Environmental	90 B	% DER < TER				-2.00	
CO ₂ Emissions (t/year)	0.93	DFEE	34.30	TFEE	45.45		
Compliance Check	See BREL	% DFEE < TFEE				24.53	
% DPER < TPER	-15.82	DPER	72.92	TPER	62.96		
Assessor Details	Mr. Samuel Westover				Assessor ID	AX13-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	234.8100 (5)

2. Ventilation rate

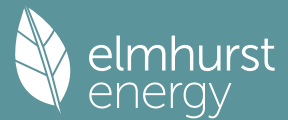
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1704 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3454 (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) = 0.2935 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3743	0.3669	0.3596	0.3229	0.3156	0.2789	0.2789	0.2715	0.2935	0.3156	0.3302	0.3449 (22b)
Effective ac	0.5700	0.5673	0.5647	0.5521	0.5498	0.5389	0.5389	0.5369	0.5431	0.5498	0.5545	0.5595 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Ws			25.4300	0.9615	24.4519		(27)
SD			2.1000	1.0000	2.1000		(26)
Heatloss Floor 1			59.7000	0.0900	5.3730		(28a)
EW	136.2000	27.5300	108.6700	0.1500	16.3005		(29a)
Insulation at Ceiling	41.4000		41.4000	0.0900	3.7260		(30)
Sloping Ceiling	19.8000		19.8000	0.0900	1.7820		(30)
Total net area of external elements Aum(A, m ²)			257.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.7334		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							185.0000 (35)
Thermal bridges (User defined value 0.025 * total exposed area)							6.4275 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	60.1609 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	44.1709	43.9601	43.7536	42.7833	42.6018	41.7567	41.7567
Heat transfer coeff	104.3318	104.1211	103.9145	102.9442	102.7627	101.9176	101.9176
						101.7611	102.2431
							102.7627
							103.1299
							103.5139 (39)

Full SAP Calculation Printout



Average = Sum(39)m / 12 =

102.9434

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2034	1.2009	1.1986	1.1874	1.1853	1.1755	1.1755	1.1737	1.1793	1.1853	1.1895	1.1939 (40)
HLP (average)												1.1874
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers												
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths												
29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses												
41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813 (43)
Daily hot water use												
137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												2100.8276
32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss (or HIU 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	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
268.8764	237.7777	252.4231	221.3080	214.1448	192.5289	189.6118	197.3243	199.7096	223.2306	238.0513	265.8413	(62)
WWHRS	-60.4992	-53.5060	-56.0284	-46.3938	-43.2373	-36.9985	-34.6802	-36.8789	-38.2801	-45.1280	-51.1245	-59.3789 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	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	(63d)
Output from w/h												
208.3772	184.2717	196.3946	174.9143	170.9074	155.5304	154.9317	160.4454	161.4295	178.1026	186.9268	206.4624	(64)
12Total per year (kWh/year)												2138.6939 (64)
Electric shower(s)												2139 (64)
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												
85.1973	75.2638	79.7266	69.5164	66.9990	59.9474	58.8418	61.4062	62.3349	70.0200	75.0836	84.1881	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
117.4582	130.0430	117.4582	121.3734	117.4582	121.3734	117.4582	117.4582	121.3734	117.4582	121.3734	117.4582	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8541	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)												
114.5125	111.9997	107.1594	96.5506	90.0524	83.2602	79.0885	82.5352	86.5763	94.1130	104.2827	113.1561	(72)
Total internal gains												
529.5116	542.0002	518.4855	498.8282	472.0502	450.7929	432.4309	433.4611	447.5070	467.0922	497.5418	517.8802	(73)

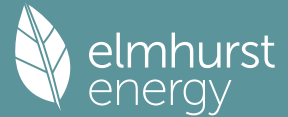
6. Solar gains

[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					3.6600	10.6334	0.6300		0.7000		0.7700	11.8939 (74)		
East					1.0300	19.6403	0.6300		0.7000		0.7700	6.1824 (76)		
South					15.4900	46.7521	0.6300		0.7000		0.7700	221.3217 (78)		
West					5.2500	19.6403	0.6300		0.7000		0.7700	31.5122 (80)		
Solar gains	270.9102	458.9364	621.7804	760.9916	844.4193	834.9868	806.3878	744.5412	669.9952	505.5097	324.0151	232.1559 (83)		
Total gains	800.4219	1000.9366	1140.2659	1259.8198	1316.4696	1285.7798	1238.8187	1178.0023	1117.5022	972.6019	821.5569	750.0361 (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	42.7043	42.7907	42.8758	43.2799	43.3564	43.7159	43.7159	43.7831	43.5767	43.3564	43.2020	43.0417
alpha	3.8470	3.8527	3.8584	3.8853	3.8904	3.9144	3.9144	3.9189	3.9051	3.8904	3.8801	3.8694
util living area	0.9722	0.9398	0.8881	0.7908	0.6536	0.4891	0.3576	0.3909	0.5882	0.8312	0.9473	0.9777 (86)
MIT	19.5176	19.8683	20.2396	20.6152	20.8530	20.9638	20.9917	20.9881	20.9255	20.5981	19.9894	19.4504 (87)
Th 2	19.9173	19.9193	19.9212	19.9301	19.9318	19.9396	19.9396	19.9411	19.9366	19.9318	19.9284	19.9249 (88)
util rest of house	0.9659	0.9271	0.8656	0.7521	0.5961	0.4147	0.2735	0.3038	0.5115	0.7899	0.9339	0.9725 (89)
MIT 2	18.2280	18.6642	19.1161	19.5579	19.8107	19.9178	19.9365	19.9363	19.8867	19.5540	18.8285	18.1487 (90)
Living area fraction												0.3506 (91)
									fLA = Living area / (4) =			

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MIT	18.6802	19.0864	19.5100	19.9286	20.1762	20.2846	20.3065	20.3051	20.2509	19.9201	19.2355	18.6051 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5302	18.9364	19.3600	19.7786	20.0262	20.1346	20.1565	20.1551	20.1009	19.7701	19.0855	18.4551 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9549	0.9128	0.8520	0.7461	0.6015	0.4287	0.2909	0.3217	0.5239	0.7828	0.9204	0.9628	(94)
Useful gains	764.3611	913.6556	971.4849	939.9077	791.8350	551.2616	360.3750	378.9790	585.4560	761.3137	756.1873	722.1100	(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	1484.6614	1461.4827	1336.3436	1119.8884	855.6185	564.0692	362.4678	382.1232	613.5544	942.3424	1236.0669	1475.6031	(97)
Space heating kWh	535.9034	368.1398	271.4549	129.5861	47.4550	0.0000	0.0000	0.0000	0.0000	134.6853	345.5133	560.5988	(98a)
Space heating requirement - total per year (kWh/year)												2393.3366	
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	535.9034	368.1398	271.4549	129.5861	47.4550	0.0000	0.0000	0.0000	0.0000	134.6853	345.5133	560.5988	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2393.3366	
Space heating per m2										(98c) / (4) =		27.6048	(99)

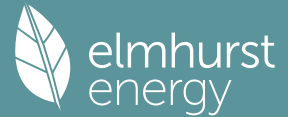
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)												89.5000	(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	535.9034	368.1398	271.4549	129.5861	47.4550	0.0000	0.0000	0.0000	0.0000	134.6853	345.5133	560.5988	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	598.7748	411.3294	303.3015	144.7889	53.0223	0.0000	0.0000	0.0000	0.0000	150.4864	386.0484	626.3674	(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 requirement	208.3772	184.2717	196.3946	174.9143	170.9074	155.5304	154.9317	160.4454	161.4295	178.1026	186.9268	206.4624	(64)
Efficiency of water heater (217)m	86.9456	86.4730	85.7238	84.4117	82.7070	81.0000	81.0000	81.0000	81.0000	84.4537	86.3199	87.0415	(216)
Fuel for water heating, kWh/month	181.0538	159.8699	169.6563	148.7936	145.0282	131.1301	128.3614	135.1685	138.4129	150.5484	159.4207	178.6545	(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	54.4411	49.1726	54.4411	52.6849	54.4411	52.6849	54.4411	54.4411	52.6849	54.4411	52.6849	54.4411	(231)
Lighting	21.5787	17.3113	15.5869	11.4196	8.8208	7.2067	8.0467	10.4594	13.5857	17.8251	20.1335	22.1785	(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												2674.1191	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												81.0000	
Water heating fuel used												1826.0981	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler												600.0000	(230f)
Total electricity for the above, kWh/year												641.0000	(231)
Electricity for lighting (calculated in Appendix L)												174.1529	(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												5315.3700	(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	2674.1191	0.2100	561.5650	(261)
Total CO2 associated with community systems			0.0000	(373)

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Water heating (other fuel)	1826.0981	0.2100	383.4806 (264)
Space and water heating			945.0456 (265)
Pumps, fans and electric keep-hot	641.0000	0.1387	88.9146 (267)
Energy for lighting	174.1529	0.1443	25.1356 (268)
Total CO ₂ , kg/year			1059.0959 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.2200 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	2674.1191	1.1300	3021.7546 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1826.0981	1.1300	2063.4908 (278)
Space and water heating			5085.2454 (279)
Pumps, fans and electric keep-hot	641.0000	1.5128	969.7048 (281)
Energy for lighting	174.1529	1.5338	267.1215 (282)
Total Primary energy kWh/year			6322.0717 (286)
Dwelling Primary energy Rate (DPER)			72.9200 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.8100 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1278 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3778 (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) = 0.3211 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4094	0.4014	0.3933	0.3532	0.3452	0.3050	0.3050	0.2970	0.3211	0.3452	0.3612	0.3773 (22b)
Effective ac	0.5838	0.5806	0.5774	0.5624	0.5596	0.5465	0.5465	0.5441	0.5516	0.5596	0.5652	0.5712 (25)

3. Heat losses and heat loss parameter

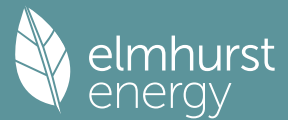
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			19.5600	1.1450	22.3969		(27)
Heatloss Floor 1			59.7000	0.1300	7.7610		(28a)
EW	136.2000	21.6600	114.5400	0.1800	20.6172		(29a)
Insulation at Ceiling	41.4000		41.4000	0.1100	4.5540		(30)
Sloping Ceiling	19.8000		19.8000	0.1100	2.1780		(31)
Total net area of external elements Aum(A, m ²)			257.1000				(32)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.6071		(33)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	16.3900	0.0500	0.8195
E3 Sill	15.3900	0.0500	0.7695
E4 Jamb	29.9100	0.0500	1.4955
E5 Ground floor (normal)	36.5000	0.1600	5.8400
E6 Intermediate floor within a dwelling	13.6000	0.0000	0.0000
E16 Corner (normal)	21.2000	0.0900	1.9080
E10 Eaves (insulation at ceiling level)	18.4000	0.0600	1.1040
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

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E13 Gable (insulation at rafter level)	4.6000	0.0800	0.3680
E14 Flat roof	8.5000	0.0800	0.6800
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.5845 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	73.1916 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	45.2374	44.9853	44.7381	43.5772	43.3599	42.3488	42.3488	42.1616	42.7383	43.3599	43.7994	44.2587 (38)
Average = Sum(39)m / 12 =	118.4291	118.1769	117.9297	116.7688	116.5516	115.5405	115.5405	115.3532	115.9299	116.5516	116.9910	117.4504 (39)
												116.7678
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3660	1.3631	1.3602	1.3468	1.3443	1.3326	1.3326	1.3305	1.3371	1.3443	1.3494	1.3547 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers												
Hot water usage for baths	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for other uses	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Average daily hot water use (litres/day)	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
												126.4813 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386 (44)
Energy content (annual)	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss (or HIU loss):	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324 (46)
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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	268.8764	237.7777	252.4231	221.3080	214.1448	192.5289	189.6118	197.3243	199.7096	223.2306	238.0513	265.8413 (62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603 (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	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810 (64)
12Total per year (kWh/year)												2414.3567 (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	85.1973	75.2638	79.7266	69.5164	66.9990	59.9474	58.8418	61.4062	62.3349	70.0200	75.0836	84.1881 (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	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.4385	130.0212	117.4385	121.3531	117.4385	121.3531	117.4385	117.4385	121.3531	117.4385	121.3531	117.4385 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8541	207.2186	222.5989 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)
Water heating gains (Table 5)	114.5125	111.9997	107.1594	96.5506	90.0524	83.2602	79.0885	82.5352	86.5763	94.1130	104.2827	113.1561 (72)
Total internal gains	529.4920	541.9784	518.4658	498.8078	472.0305	450.7726	432.4112	433.4415	447.4867	467.0726	497.5214	517.8605 (73)

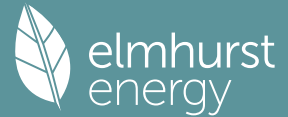
6. Solar gains

[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	2.8100	10.6334	0.6300	0.7000	0.7700	9.1317 (74)
East	0.7900	19.6403	0.6300	0.7000	0.7700	4.7418 (76)
South	11.9200	46.7521	0.6300	0.7000	0.7700	170.3134 (78)
West	4.0400	19.6403	0.6300	0.7000	0.7700	24.2494 (80)
Solar gains	208.4363	353.0935	478.3585	585.4207	649.5658	642.2946
Total gains	737.9283	895.0719	996.8243	1084.2285	1121.5964	1093.0672
						620.3019
						572.7522
						515.4390
						388.9196
						249.2932
						178.6200 (83)
						696.4806 (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

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tau	37.6210	37.7012	37.7803	38.1559	38.2270	38.5615	38.5615	38.6241	38.4320	38.2270	38.0834	37.9345
alpha	3.5081	3.5134	3.5187	3.5437	3.5485	3.5708	3.5708	3.5749	3.5621	3.5485	3.5389	3.5290
util living area	0.9800	0.9613	0.9316	0.8699	0.7666	0.6114	0.4637	0.5006	0.7035	0.8924	0.9645	0.9834 (86)
MIT	19.1396	19.4535	19.8399	20.3005	20.6661	20.8937	20.9697	20.9598	20.8172	20.3321	19.6519	19.0850 (87)
Th 2	19.7895	19.7918	19.7940	19.8043	19.8063	19.8153	19.8153	19.8170	19.8119	19.8063	19.8024	19.7983 (88)
util rest of house	0.9751	0.9520	0.9150	0.8379	0.7090	0.5197	0.3473	0.3833	0.6186	0.8587	0.9544	0.9793 (89)
MIT 2	17.6682	18.0635	18.5448	19.1073	19.5203	19.7492	19.8041	19.8007	19.6844	19.1602	18.3256	17.6047 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	18.1841	18.5509	18.9989	19.5257	19.9221	20.1505	20.2128	20.2071	20.0816	19.5711	18.7906	18.1238 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1841	18.5509	18.9989	19.5257	19.9221	20.1505	20.2128	20.2071	20.0816	19.5711	18.7906	18.1238 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9659	0.9396	0.9014	0.8292	0.7152	0.5471	0.3876	0.4235	0.6395	0.8508	0.9430	0.9712 (94)
Useful gains	712.7776	840.9895	898.5656	899.0884	802.1229	598.0422	408.0239	426.0922	615.8247	728.2688	704.2459	676.3942 (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	1644.2821	1613.2170	1473.9930	1240.7480	958.2966	641.3056	417.4237	439.1619	693.4480	1045.5998	1367.6977	1635.3523 (97)
Space heating kWh	693.0393	518.9369	428.1180	245.9949	116.1932	0.0000	0.0000	0.0000	0.0000	236.0943	477.6853	713.4649 (98a)
Space heating requirement - total per year (kWh/year)												3429.5268
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	693.0393	518.9369	428.1180	245.9949	116.1932	0.0000	0.0000	0.0000	0.0000	236.0943	477.6853	713.4649 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3429.5268
Space heating per m2										(98c) / (4) =		39.5562 (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 %)	92.4000 (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	693.0393	518.9369	428.1180	245.9949	116.1932	0.0000	0.0000	0.0000	0.0000	236.0943	477.6853	713.4649 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	750.0425	561.6200	463.3311	266.2283	125.7502	0.0000	0.0000	0.0000	0.0000	255.5133	516.9755	772.1481 (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	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810 (64)
Efficiency of water heater (217)m	86.5307	86.2347	85.7468	84.8513	83.3384	80.3000	80.3000	80.3000	80.3000	84.7354	86.0667	80.3000 (216)
Fuel for water heating, kWh/month	275.0992	244.1132	261.0830	232.9549	230.5185	216.2814	214.1200	222.3291	224.4104	236.3035	246.3179	272.0404 (219)

Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041 (231)
Lighting	24.4014	19.5757	17.6258	12.9134	9.9747	8.1494	9.0992	11.8275	15.3628	20.1568	22.7671	25.0796 (232)

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

(233a)m -51.2708 -69.8497 -97.0723 -105.4163 -110.6336 -102.1867 -100.8788 -96.6532 -88.8359 -78.0251 -55.4758 -44.6144 (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 -36.8739 -76.4992 -150.1324 -222.7959 -292.0649 -292.5647 -289.1503 -245.9920 -181.8585 -108.5153 -48.9324 -29.2438 (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 3711.6091 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 80.3000

Water heating fuel used 2875.5714 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year 86.0000 (231)

Electricity for lighting (calculated in Appendix L) 196.9332 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation -2975.5359 (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 3894.5779 (238)

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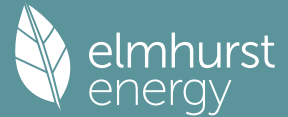
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3711.6091	0.2100	779.4379 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2875.5714	0.2100	603.8700 (264)
Space and water heating			1383.3079 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.9332	0.1443	28.4236 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.9125	0.1353	-135.4468
PV Unit electricity exported	-1974.6233	0.1263	-249.3005
Total			-384.7474 (269)
Total CO2, kg/year			1038.9134 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9800 (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	3711.6091	1.1300	4194.1182 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2875.5714	1.1300	3249.3957 (278)
Space and water heating			7443.5140 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.9332	1.5338	302.0628 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.9125	1.5002	-1501.5417
PV Unit electricity exported	-1974.6233	0.4634	-915.1360
Total			-2416.6777 (283)
Total Primary energy kWh/year			5458.9999 (286)
Target Primary Energy Rate (TPER)			62.9600 (287)

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Plot Reference	OHW		Issued on Date	08/07/2026	
Assessment Reference	OHW - Be Lean		Plot Type Ref		
Plot Address			SAP Version	10.2	
SAP Rating	83 B	DER	12.22	TER	11.98
Environmental	90 B	% DER < TER			
CO ₂ Emissions (t/year)	0.93	DFEE	34.30	TFEE	45.45
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER	-15.82	DPER	72.92	TPER	62.96
Assessor Details	Mr. Samuel Westover			Assessor ID	AX13-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.8100 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1278 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3028 (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) = 0.2573 (21)

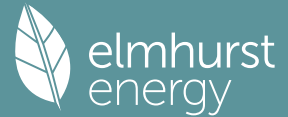
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3281	0.3217	0.3153	0.2831	0.2766	0.2445	0.2445	0.2380	0.2573	0.2766	0.2895	0.3024 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5538	0.5517	0.5497	0.5401	0.5383	0.5299	0.5299	0.5283	0.5331	0.5383	0.5419	0.5457 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Ws			25.4300	0.9615	24.4519		(27)
SD			2.1000	1.0000	2.1000		(26)
Heatloss Floor 1			59.7000	0.0900	5.3730		(28a)
EW	136.2000	27.5300	108.6700	0.1500	16.3005		(29a)
Insulation at Ceiling	41.4000		41.4000	0.0900	3.7260		(30)
Sloping Ceiling	19.8000		19.8000	0.0900	1.7820		(30)
Total net area of external elements Aum(A, m ²)			257.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.7334		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							185.0000 (35)
Thermal bridges (User defined value 0.025 * total exposed area)							6.4275 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	60.1609 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	42.9149	42.7529	42.5941	41.8484	41.7089	41.0594	41.0594	40.9391	41.3096	41.7089	41.9911	42.2862 (38)

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Heat transfer coeff	103.0758	102.9138	102.7551	102.0093	101.8698	101.2203	101.2203	101.1000	101.4705	101.8698	102.1521	102.4472 (39)
Average = Sum(39)m / 12 =												102.0087
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1889	1.1870	1.1852	1.1766	1.1750	1.1675	1.1675	1.1661	1.1704	1.1750	1.1782	1.1816 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (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												
29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses												
41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559 (44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906 (45)
Energy content (annual)										Total = Sum(45)m =		1067.9337
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 (or HIU 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	(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	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	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	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				907.7437 (64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				614.3496 (64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115 (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	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
117.4582	130.0430	117.4582	121.3734	117.4582	121.3734	117.4582	117.4582	121.3734	117.4582	121.3734	117.4582	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8541	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)												
49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	461.8816	475.6266	455.0129	442.3508	419.6879	405.7766	390.3854	389.4351	401.0884	412.8253	436.5979	451.2020 (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					3.6600	10.6334	0.6300	0.7000			0.7700	11.8939 (74)	
East					1.0300	19.6403	0.6300	0.7000			0.7700	6.1824 (76)	
South					15.4900	46.7521	0.6300	0.7000			0.7700	221.3217 (78)	
West					5.2500	19.6403	0.6300	0.7000			0.7700	31.5122 (80)	
Solar gains	270.9102	458.9364	621.7804	760.9916	844.4193	834.9868	806.3878	744.5412	669.9952	505.5097	324.0151	232.1559 (83)	
Total gains	732.7919	934.5630	1076.7933	1203.3424	1264.1072	1240.7634	1196.7733	1133.9762	1071.0836	918.3350	760.6130	683.3579 (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	43.2247	43.2927	43.3596	43.6766	43.7364	44.0170	44.0170	44.0694	43.9085	43.7364	43.6155	43.4899
alpha	3.8816	3.8862	3.8906	3.9118	3.9158	3.9345	3.9345	3.9380	3.9272	3.9158	3.9077	3.8993
util living area	0.9788	0.9498	0.9015	0.8064	0.6694	0.5019	0.3673	0.4028	0.6051	0.8492	0.9575	0.9834 (86)
MIT	19.4511	19.8129	20.1984	20.5917	20.8433	20.9612	20.9911	20.9871	20.9193	20.5674	19.9306	19.3790 (87)
Th 2	19.9289	19.9304	19.9319	19.9388	19.9401	19.9461	19.9461	19.9472	19.9438	19.9401	19.9375	19.9347 (88)
util rest of house	0.9738	0.9389	0.8810	0.7692	0.6122	0.4266	0.2816	0.3139	0.5280	0.8104	0.9463	0.9794 (89)

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MIT 2	18.5447	18.8975	19.2656	19.6286	19.8387	19.9277	19.9435	19.9431	19.9013	19.6194	19.0227	18.4782 (90)
Living area fraction									FLA = Living area / (4) =			0.3506 (91)
MIT	18.8625	19.2185	19.5927	19.9663	20.1910	20.2901	20.3108	20.3092	20.2582	19.9518	19.3410	18.7940 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8625	19.2185	19.5927	19.9663	20.1910	20.2901	20.3108	20.3092	20.2582	19.9518	19.3410	18.7940 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9674	0.9301	0.8735	0.7702	0.6264	0.4518	0.3116	0.3449	0.5519	0.8109	0.9385	0.9738	(94)
Useful gains	708.8802	869.2556	940.5535	926.8319	791.8294	560.5378	372.9013	391.1408	591.1443	744.6999	713.8303	665.4519	(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	1501.0436	1473.5688	1345.3375	1128.8696	864.9718	575.9545	375.6081	395.2189	624.8791	952.6670	1250.4451	1495.1186	(97)
Space heating kWh	589.3695	406.0984	301.1593	145.4671	54.4179	0.0000	0.0000	0.0000	0.0000	154.7275	386.3626	617.2720	(98a)
Space heating requirement - total per year (kWh/year)												2654.8744	
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	589.3695	406.0984	301.1593	145.4671	54.4179	0.0000	0.0000	0.0000	0.0000	154.7275	386.3626	617.2720	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2654.8744	
Space heating per m2										(98c) / (4) =		30.6214	(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	951.4710	749.0304	768.3603	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9183	0.9542	0.9423	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	873.7825	714.6916	724.0173	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1404.4419	1355.3054	1284.2062	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	382.0747	476.6167	416.7805	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	95.5187	119.1542	104.1951	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement													318.8680 (107)
Energy for space heating													30.6214 (99)
Energy for space cooling													3.6778 (108)
Total													34.2992 (109)
Fabric Energy Efficiency (DFEE)													34.3 (109)

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

1. Overall dwelling characteristics

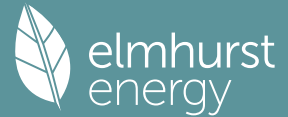
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b) =	168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c) =	66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	234.8100 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1278 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3778 (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) = 0.3211 (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)

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Adj infilt rate	0.4094	0.4014	0.3933	0.3532	0.3452	0.3050	0.3050	0.2970	0.3211	0.3452	0.3612	0.3773 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5838	0.5806	0.5774	0.5624	0.5596	0.5465	0.5465	0.5441	0.5516	0.5596	0.5652	0.5712 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			19.5600	1.1450	22.3969		(27)
Heatloss Floor 1			59.7000	0.1300	7.7610		(28a)
EW	136.2000	21.6600	114.5400	0.1800	20.6172		(29a)
Insulation at Ceiling	41.4000		41.4000	0.1100	4.5540		(30)
Sloping Ceiling	19.8000		19.8000	0.1100	2.1780		(30)
Total net area of external elements Aum(A, m2)			257.1000				(31)
Fabric heat loss, W/K = Sum (A x U)					59.6071		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 185.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	16.3900	0.0500	0.8195
E3 Sill	15.3900	0.0500	0.7695
E4 Jamb	29.9100	0.0500	1.4955
E5 Ground floor (normal)	36.5000	0.1600	5.8400
E6 Intermediate floor within a dwelling	13.6000	0.0000	0.0000
E16 Corner (normal)	21.2000	0.0900	1.9080
E10 Eaves (insulation at ceiling level)	18.4000	0.0600	1.1040
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000
E13 Gable (insulation at rafter level)	4.6000	0.0800	0.3680
E14 Flat roof	8.5000	0.0800	0.6800

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.5845 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 73.1916 (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	45.2374	44.9853	44.7381	43.5772	43.3599	42.3488	42.3488	42.1616	42.7383	43.3599	43.7994	44.2587 (38)
Heat transfer coeff	118.4291	118.1769	117.9297	116.7688	116.5516	115.5405	115.5405	115.3532	115.9299	116.5516	116.9910	117.4504 (39)
Average = Sum(39)m / 12 =												116.7678

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3660	1.3631	1.3602	1.3468	1.3443	1.3326	1.3326	1.3305	1.3371	1.3443	1.3494	1.3547 (40)
HLP (average)												1.3468
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

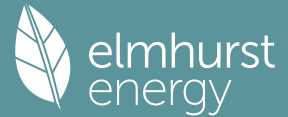
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (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												
29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses												
41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												64.3029 (43)
Daily hot water use												
70.1544	68.2298	66.1288	63.5137	61.1807	58.7563	58.2526	60.3494	62.5000	64.9897	67.6279	70.0559	(44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906 (45)
Energy content (annual)										Total = Sum(45)m =		1067.9337
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 (or HIU 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	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	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	(63d)
Output from w/h												
94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		907.7437 (64)
Electric shower(s)												
54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												614.3496 (64a)
Heat gains from water heating, kWh/month												
37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115	(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	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
117.4385	130.0212	117.4385	121.3531	117.4385	121.3531	117.4385	117.4385	121.3531	117.4385	121.3531	117.4385	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8541	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Full SAP Calculation Printout



Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778 (72)
Total internal gains	461.8620	475.6048	454.9932	442.3304	419.6682	405.7562	390.3657	389.4154	401.0681	412.8056	436.5776	451.1823 (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				2.8100	10.6334	0.6300	0.7000			0.7700		9.1317 (74)
East				0.7900	19.6403	0.6300	0.7000			0.7700		4.7418 (76)
South				11.9200	46.7521	0.6300	0.7000			0.7700		170.3134 (78)
West				4.0400	19.6403	0.6300	0.7000			0.7700		24.2494 (80)

Solar gains	208.4363	353.0935	478.3585	585.4207	649.5658	642.2946	620.3019	572.7522	515.4390	388.9196	249.2932	178.6200 (83)
Total gains	670.2983	828.6984	933.3517	1027.7511	1069.2340	1048.0509	1010.6676	962.1675	916.5071	801.7252	685.8708	629.8023 (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	37.6210	37.7012	37.7803	38.1559	38.2270	38.5615	38.5615	38.6241	38.4320	38.2270	38.0834	37.9345
alpha	3.5081	3.5134	3.5187	3.5437	3.5485	3.5708	3.5708	3.5749	3.5621	3.5485	3.5389	3.5290
util living area	0.9850	0.9688	0.9423	0.8846	0.7854	0.6305	0.4805	0.5200	0.7249	0.9078	0.9722	0.9878 (86)
MIT	19.0463	19.3681	19.7670	20.2498	20.6363	20.8825	20.9661	20.9547	20.7978	20.2784	19.5722	18.9916 (87)
Th 2	19.7895	19.7918	19.7940	19.8043	19.8063	19.8153	19.8153	19.8170	19.8119	19.8063	19.8024	19.7983 (88)
util rest of house	0.9812	0.9612	0.9278	0.8549	0.7296	0.5382	0.3610	0.3995	0.6410	0.8776	0.9640	0.9847 (89)
MIT 2	18.0446	18.3624	18.7520	19.2167	19.5609	19.7577	19.8054	19.8025	19.7004	19.2559	18.5747	17.9968 (90)
Living area fraction	18.3959	18.7150	19.1079	19.5790	19.9380	20.1521	20.2124	20.2065	20.0852	19.6144	18.9245	18.3456 (91)
MIT	18.3959	18.7150	19.1079	19.5790	19.9380	20.1521	20.2124	20.2065	20.0852	19.6144	18.9245	18.3456 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3959	18.7150	19.1079	19.5790	19.9380	20.1521	20.2124	20.2065	20.0852	19.6144	18.9245	18.3456 (93)

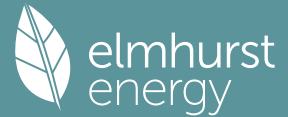
8. Space heating requirement

Utilisation	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 (96)
Heat loss rate W	1669.3600	1632.6153	1486.8462	1246.9686	960.1480	641.4956	417.3756	439.0880	693.8616	1050.6473	1383.3582	1661.4096 (97)
Space heating kWh	755.6574	566.7955	469.0007	269.9942	128.5319	0.0000	0.0000	0.0000	0.0000	261.6996	523.8813	777.1223 (98a)
Space heating requirement - total per year (kWh/year)												3752.6829
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	755.6574	566.7955	469.0007	269.9942	128.5319	0.0000	0.0000	0.0000	0.0000	261.6996	523.8813	777.1223 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3752.6829
Space heating per m ²												(98c) / (4) = 43.2835 (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	1086.0803	854.9994	876.6844	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8122	0.8771	0.8557	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	882.0733	749.9377	750.1923	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1179.2155	1137.8005	1083.4114	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	213.9424	288.5699	247.9151	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	53.4856	72.1425	61.9788	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												187.6068 (107)
Energy for space heating												43.2835 (99)
Energy for space cooling												2.1639 (108)
Total												45.4474 (109)
Fabric Energy Efficiency (TFEE)												45.4 (109)

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Plot Reference	OHW				Issued on Date	08/07/2026	
Assessment Reference	OHW - Be Lean			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	83 B	DER	12.22	TER	11.98		
Environmental	90 B	% DER < TER				-2.00	
CO ₂ Emissions (t/year)	0.93	DFEE	34.30	TFEE	45.45		
Compliance Check	See BREL	% DFEE < TFEE				24.53	
% DPER < TPER	-15.82	DPER	72.92	TPER	62.96		
Assessor Details	Mr. Samuel Westover				Assessor ID	AX13-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.8100 (5)

2. Ventilation rate

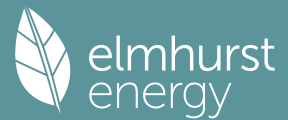
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1704 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3454 (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) = 0.2935 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3743	0.3669	0.3596	0.3229	0.3156	0.2789	0.2789	0.2715	0.2935	0.3156	0.3302	0.3449 (22b)
Effective ac	0.5700	0.5673	0.5647	0.5521	0.5498	0.5389	0.5389	0.5369	0.5431	0.5498	0.5545	0.5595 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Ws			25.4300	0.9615	24.4519		(27)
SD			2.1000	1.0000	2.1000		(26)
Heatloss Floor 1			59.7000	0.0900	5.3730		(28a)
EW	136.2000	27.5300	108.6700	0.1500	16.3005		(29a)
Insulation at Ceiling	41.4000		41.4000	0.0900	3.7260		(30)
Sloping Ceiling	19.8000		19.8000	0.0900	1.7820		(30)
Total net area of external elements Aum(A, m ²)			257.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.7334		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							185.0000 (35)
Thermal bridges (User defined value 0.025 * total exposed area)							6.4275 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	60.1609 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	44.1709	43.9601	43.7536	42.7833	42.6018	41.7567	41.7567
Heat transfer coeff	104.3318	104.1211	103.9145	102.9442	102.7627	101.9176	101.9176
						101.7611	102.2431
							102.7627
							103.1299
							103.5139 (39)

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Average = Sum(39)m / 12 =

102.9434

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2034	1.2009	1.1986	1.1874	1.1853	1.1755	1.1755	1.1737	1.1793	1.1853	1.1895	1.1939 (40)
HLP (average)												1.1874
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers												
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths												
29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses												
41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813 (43)
Daily hot water use												
137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												2100.8276
32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss (or HIU 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	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
268.8764	237.7777	252.4231	221.3080	214.1448	192.5289	189.6118	197.3243	199.7096	223.2306	238.0513	265.8413	(62)
WWHRS	-60.4992	-53.5060	-56.0284	-46.3938	-43.2373	-36.9985	-34.6802	-36.8789	-38.2801	-45.1280	-51.1245	-59.3789 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	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	(63d)
Output from w/h												
208.3772	184.2717	196.3946	174.9143	170.9074	155.5304	154.9317	160.4454	161.4295	178.1026	186.9268	206.4624	(64)
12Total per year (kWh/year)												2138.6939 (64)
Electric shower(s)												2139 (64)
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												
85.1973	75.2638	79.7266	69.5164	66.9990	59.9474	58.8418	61.4062	62.3349	70.0200	75.0836	84.1881	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
117.4582	130.0430	117.4582	121.3734	117.4582	121.3734	117.4582	117.4582	121.3734	117.4582	121.3734	117.4582	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8541	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)												
114.5125	111.9997	107.1594	96.5506	90.0524	83.2602	79.0885	82.5352	86.5763	94.1130	104.2827	113.1561	(72)
Total internal gains												
529.5116	542.0002	518.4855	498.8282	472.0502	450.7929	432.4309	433.4611	447.5070	467.0922	497.5418	517.8802	(73)

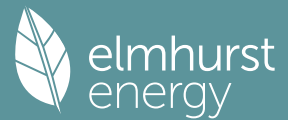
6. Solar gains

[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					3.6600	10.6334		0.6300	0.7000	0.7700	11.8939 (74)			
East					1.0300	19.6403		0.6300	0.7000	0.7700	6.1824 (76)			
South					15.4900	46.7521		0.6300	0.7000	0.7700	221.3217 (78)			
West					5.2500	19.6403		0.6300	0.7000	0.7700	31.5122 (80)			
Solar gains	270.9102	458.9364	621.7804	760.9916	844.4193	834.9868	806.3878	744.5412	669.9952	505.5097	324.0151	232.1559	(83)	
Total gains	800.4219	1000.9366	1140.2659	1259.8198	1316.4696	1285.7798	1238.8187	1178.0023	1117.5022	972.6019	821.5569	750.0361	(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	42.7043	42.7907	42.8758	43.2799	43.3564	43.7159	43.7159	43.7831	43.5767	43.3564	43.2020	43.0417
alpha	3.8470	3.8527	3.8584	3.8853	3.8904	3.9144	3.9144	3.9189	3.9051	3.8904	3.8801	3.8694
util living area	0.9722	0.9398	0.8881	0.7908	0.6536	0.4891	0.3576	0.3909	0.5882	0.8312	0.9473	0.9777 (86)
MIT	19.5176	19.8683	20.2396	20.6152	20.8530	20.9638	20.9917	20.9881	20.9255	20.5981	19.9894	19.4504 (87)
Th 2	19.9173	19.9193	19.9212	19.9301	19.9318	19.9396	19.9396	19.9411	19.9366	19.9318	19.9284	19.9249 (88)
util rest of house	0.9659	0.9271	0.8656	0.7521	0.5961	0.4147	0.2735	0.3038	0.5115	0.7899	0.9339	0.9725 (89)
MIT 2	18.2280	18.6642	19.1161	19.5579	19.8107	19.9178	19.9365	19.9363	19.8867	19.5540	18.8285	18.1487 (90)
Living area fraction												0.3506 (91)
									fLA = Living area / (4) =			

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MIT	18.6802	19.0864	19.5100	19.9286	20.1762	20.2846	20.3065	20.3051	20.2509	19.9201	19.2355	18.6051 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5302	18.9364	19.3600	19.7786	20.0262	20.1346	20.1565	20.1551	20.1009	19.7701	19.0855	18.4551 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9549	0.9128	0.8520	0.7461	0.6015	0.4287	0.2909	0.3217	0.5239	0.7828	0.9204	0.9628	(94)
Useful gains	764.3611	913.6556	971.4849	939.9077	791.8350	551.2616	360.3750	378.9790	585.4560	761.3137	756.1873	722.1100	(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	1484.6614	1461.4827	1336.3436	1119.8884	855.6185	564.0692	362.4678	382.1232	613.5544	942.3424	1236.0669	1475.6031	(97)
Space heating kWh	535.9034	368.1398	271.4549	129.5861	47.4550	0.0000	0.0000	0.0000	0.0000	134.6853	345.5133	560.5988	(98a)
Space heating requirement - total per year (kWh/year)												2393.3366	
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	535.9034	368.1398	271.4549	129.5861	47.4550	0.0000	0.0000	0.0000	0.0000	134.6853	345.5133	560.5988	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2393.3366	
Space heating per m2										(98c) / (4) =		27.6048	(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 %)													89.5000 (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	535.9034	368.1398	271.4549	129.5861	47.4550	0.0000	0.0000	0.0000	0.0000	134.6853	345.5133	560.5988	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	598.7748	411.3294	303.3015	144.7889	53.0223	0.0000	0.0000	0.0000	0.0000	150.4864	386.0484	626.3674	(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 requirement	208.3772	184.2717	196.3946	174.9143	170.9074	155.5304	154.9317	160.4454	161.4295	178.1026	186.9268	206.4624	(64)
Efficiency of water heater (217)m	86.9456	86.4730	85.7238	84.4117	82.7070	81.0000	81.0000	81.0000	81.0000	84.4537	86.3199	87.0415	(216)
Fuel for water heating, kWh/month	181.0538	159.8699	169.6563	148.7936	145.0282	131.1301	128.3614	135.1685	138.4129	150.5484	159.4207	178.6545	(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	54.4411	49.1726	54.4411	52.6849	54.4411	52.6849	54.4411	54.4411	52.6849	54.4411	52.6849	54.4411	(231)
Lighting	21.5787	17.3113	15.5869	11.4196	8.8208	7.2067	8.0467	10.4594	13.5857	17.8251	20.1335	22.1785	(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													2674.1191 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													81.0000
Water heating fuel used													1826.0981 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
maintaining electric keep-hot facility for gas combi boiler													600.0000 (230f)
Total electricity for the above, kWh/year													641.0000 (231)
Electricity for lighting (calculated in Appendix L)													174.1529 (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													5315.3700 (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	2674.1191	0.2100	561.5650	(261)
Total CO2 associated with community systems			0.0000	(373)

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Water heating (other fuel)	1826.0981	0.2100	383.4806 (264)
Space and water heating			945.0456 (265)
Pumps, fans and electric keep-hot	641.0000	0.1387	88.9146 (267)
Energy for lighting	174.1529	0.1443	25.1356 (268)
Total CO ₂ , kg/year			1059.0959 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.2200 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	2674.1191	1.1300	3021.7546 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1826.0981	1.1300	2063.4908 (278)
Space and water heating			5085.2454 (279)
Pumps, fans and electric keep-hot	641.0000	1.5128	969.7048 (281)
Energy for lighting	174.1529	1.5338	267.1215 (282)
Total Primary energy kWh/year			6322.0717 (286)
Dwelling Primary energy Rate (DPER)			72.9200 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.8100 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1278 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3778 (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) = 0.3211 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4094	0.4014	0.3933	0.3532	0.3452	0.3050	0.3050	0.2970	0.3211	0.3452	0.3612	0.3773 (22b)
Effective ac	0.5838	0.5806	0.5774	0.5624	0.5596	0.5465	0.5465	0.5441	0.5516	0.5596	0.5652	0.5712 (25)

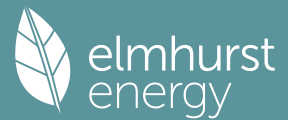
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			19.5600	1.1450	22.3969		(27)
Heatloss Floor 1			59.7000	0.1300	7.7610		(28a)
EW	136.2000	21.6600	114.5400	0.1800	20.6172		(29a)
Insulation at Ceiling	41.4000		41.4000	0.1100	4.5540		(30)
Sloping Ceiling	19.8000		19.8000	0.1100	2.1780		(31)
Total net area of external elements Aum(A, m ²)			257.1000				(32)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.6071		(33)

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

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	16.3900	0.0500	0.8195
E3 Sill	15.3900	0.0500	0.7695
E4 Jamb	29.9100	0.0500	1.4955
E5 Ground floor (normal)	36.5000	0.1600	5.8400
E6 Intermediate floor within a dwelling	13.6000	0.0000	0.0000
E16 Corner (normal)	21.2000	0.0900	1.9080
E10 Eaves (insulation at ceiling level)	18.4000	0.0600	1.1040
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

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E13 Gable (insulation at rafter level)	4.6000	0.0800	0.3680
E14 Flat roof	8.5000	0.0800	0.6800
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.5845 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	73.1916 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	45.2374	44.9853	44.7381	43.5772	43.3599	42.3488	42.3488	42.1616	42.7383	43.3599	43.7994	44.2587 (38)
Average = Sum(39)m / 12 =	118.4291	118.1769	117.9297	116.7688	116.5516	115.5405	115.5405	115.3532	115.9299	116.5516	116.9910	117.4504 (39)
												116.7678
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3660	1.3631	1.3602	1.3468	1.3443	1.3326	1.3326	1.3305	1.3371	1.3443	1.3494	1.3547 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers												
Hot water usage for baths												
Hot water usage for other uses												
Average daily hot water use (litres/day)												126.4813 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386 (44)
Energy content (annual)	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss (or HIU 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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
WWHRS	268.8764	237.7777	252.4231	221.3080	214.1448	192.5289	189.6118	197.3243	199.7096	223.2306	238.0513	265.8413 (62)
PV diverter	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603 (63a)
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 (63b)
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 (63c)
Output from w/h	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810 (64)
12Total per year (kWh/year)												2414.3567 (64)
Electric shower(s)												2414 (64)
	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)
												0.0000 (64a)
Heat gains from water heating, kWh/month												
	85.1973	75.2638	79.7266	69.5164	66.9990	59.9474	58.8418	61.4062	62.3349	70.0200	75.0836	84.1881 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	117.4385	130.0212	117.4385	121.3531	117.4385	121.3531	117.4385	117.4385	121.3531	117.4385	121.3531	117.4385 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8541	207.2186	222.5989 (68)
Pumps, fans	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)
Total internal gains	114.5125	111.9997	107.1594	96.5506	90.0524	83.2602	79.0885	82.5352	86.5763	94.1130	104.2827	113.1561 (72)
	529.4920	541.9784	518.4658	498.8078	472.0305	450.7726	432.4112	433.4415	447.4867	467.0726	497.5214	517.8605 (73)

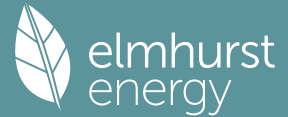
6. Solar gains

[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			2.8100		10.6334		0.6300		0.7000		0.7700		9.1317 (74)
East			0.7900		19.6403		0.6300		0.7000		0.7700		4.7418 (76)
South			11.9200		46.7521		0.6300		0.7000		0.7700		170.3134 (78)
West			4.0400		19.6403		0.6300		0.7000		0.7700		24.2494 (80)
Solar gains	208.4363	353.0935	478.3585	585.4207	649.5658	642.2946	620.3019	572.7522	515.4390	388.9196	249.2932	178.6200	(83)
Total gains	737.9283	895.0719	996.8243	1084.2285	1121.5964	1093.0672	1052.7131	1006.1936	962.9257	855.9921	746.8146	696.4806	(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

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tau	37.6210	37.7012	37.7803	38.1559	38.2270	38.5615	38.5615	38.6241	38.4320	38.2270	38.0834	37.9345
alpha	3.5081	3.5134	3.5187	3.5437	3.5485	3.5708	3.5708	3.5749	3.5621	3.5485	3.5389	3.5290
util living area	0.9800	0.9613	0.9316	0.8699	0.7666	0.6114	0.4637	0.5006	0.7035	0.8924	0.9645	0.9834 (86)
MIT	19.1396	19.4535	19.8399	20.3005	20.6661	20.8937	20.9697	20.9598	20.8172	20.3321	19.6519	19.0850 (87)
Th 2	19.7895	19.7918	19.7940	19.8043	19.8063	19.8153	19.8153	19.8170	19.8119	19.8063	19.8024	19.7983 (88)
util rest of house	0.9751	0.9520	0.9150	0.8379	0.7090	0.5197	0.3473	0.3833	0.6186	0.8587	0.9544	0.9793 (89)
MIT 2	17.6682	18.0635	18.5448	19.1073	19.5203	19.7492	19.8041	19.8007	19.6844	19.1602	18.3256	17.6047 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.1841	18.5509	18.9989	19.5257	19.9221	20.1505	20.2128	20.2071	20.0816	19.5711	18.7906	18.1238 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.1841	18.5509	18.9989	19.5257	19.9221	20.1505	20.2128	20.2071	20.0816	19.5711	18.7906	18.1238 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9659	0.9396	0.9014	0.8292	0.7152	0.5471	0.3876	0.4235	0.6395	0.8508	0.9430	0.9712 (94)
Useful gains	712.7776	840.9895	898.5656	899.0884	802.1229	598.0422	408.0239	426.0922	615.8247	728.2688	704.2459	676.3942 (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	1644.2821	1613.2170	1473.9930	1240.7480	958.2966	641.3056	417.4237	439.1619	693.4480	1045.5998	1367.6977	1635.3523 (97)
Space heating kWh	693.0393	518.9369	428.1180	245.9949	116.1932	0.0000	0.0000	0.0000	0.0000	236.0943	477.6853	713.4649 (98a)
Space heating requirement - total per year (kWh/year)	3429.5268											
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	693.0393	518.9369	428.1180	245.9949	116.1932	0.0000	0.0000	0.0000	0.0000	236.0943	477.6853	713.4649 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3429.5268											
Space heating per m2	(98c) / (4) = 39.5562 (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 %)	92.4000 (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	693.0393	518.9369	428.1180	245.9949	116.1932	0.0000	0.0000	0.0000	0.0000	236.0943	477.6853	713.4649 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	750.0425	561.6200	463.3311	266.2283	125.7502	0.0000	0.0000	0.0000	0.0000	255.5133	516.9755	772.1481 (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	238.0452	210.5103	223.8702	197.6651	192.1104	173.6740	171.9383	178.5303	180.2015	200.2327	211.9975	235.5810 (64)
Efficiency of water heater (217)m	86.5307	86.2347	85.7468	84.8513	83.3384	80.3000	80.3000	80.3000	80.3000	84.7354	86.0667	80.3000 (216)
Fuel for water heating, kWh/month	275.0992	244.1132	261.0830	232.9549	230.5185	216.2814	214.1200	222.3291	224.4104	236.3035	246.3179	272.0404 (219)

Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041 (231)
Lighting	24.4014	19.5757	17.6258	12.9134	9.9747	8.1494	9.0992	11.8275	15.3628	20.1568	22.7671	25.0796 (232)

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

(233a)m -51.2708 -69.8497 -97.0723 -105.4163 -110.6336 -102.1867 -100.8788 -96.6532 -88.8359 -78.0251 -55.4758 -44.6144 (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 -36.8739 -76.4992 -150.1324 -222.7959 -292.0649 -292.5647 -289.1503 -245.9920 -181.8585 -108.5153 -48.9324 -29.2438 (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 3711.6091 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 80.3000

Water heating fuel used 2875.5714 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year 86.0000 (231)

Electricity for lighting (calculated in Appendix L) 196.9332 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation -2975.5359 (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 3894.5779 (238)

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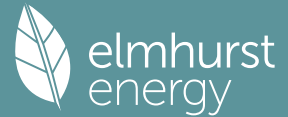
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3711.6091	0.2100	779.4379 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2875.5714	0.2100	603.8700 (264)
Space and water heating			1383.3079 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.9332	0.1443	28.4236 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.9125	0.1353	-135.4468
PV Unit electricity exported	-1974.6233	0.1263	-249.3005
Total			-384.7474 (269)
Total CO2, kg/year			1038.9134 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9800 (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	3711.6091	1.1300	4194.1182 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2875.5714	1.1300	3249.3957 (278)
Space and water heating			7443.5140 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.9332	1.5338	302.0628 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.9125	1.5002	-1501.5417
PV Unit electricity exported	-1974.6233	0.4634	-915.1360
Total			-2416.6777 (283)
Total Primary energy kWh/year			5458.9999 (286)
Target Primary Energy Rate (TPER)			62.9600 (287)

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Plot Reference	OHW				Issued on Date	08/07/2026	
Assessment Reference	OHW - Be Lean			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	83 B	DER	12.22	TER	11.98		
Environmental	90 B	% DER < TER				-2.00	
CO ₂ Emissions (t/year)	0.93	DFEE	34.30	TFEE	45.45		
Compliance Check	See BREL	% DFEE < TFEE				24.53	
% DPER < TPER	-15.82	DPER	72.92	TPER	62.96		
Assessor Details	Mr. Samuel Westover				Assessor ID	AX13-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.8100 (5)

2. Ventilation rate

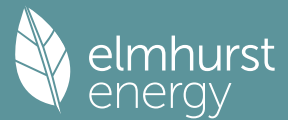
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1704 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3454 (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) = 0.2935 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3743	0.3669	0.3596	0.3229	0.3156	0.2789	0.2789	0.2715	0.2935	0.3156	0.3302	0.3449 (22b)
Effective ac	0.5700	0.5673	0.5647	0.5521	0.5498	0.5389	0.5389	0.5369	0.5431	0.5498	0.5545	0.5595 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Ws			25.4300	0.9615	24.4519		(27)
SD			2.1000	1.0000	2.1000		(26)
Heatloss Floor 1			59.7000	0.0900	5.3730		(28a)
EW	136.2000	27.5300	108.6700	0.1500	16.3005		(29a)
Insulation at Ceiling	41.4000		41.4000	0.0900	3.7260		(30)
Sloping Ceiling	19.8000		19.8000	0.0900	1.7820		(30)
Total net area of external elements Aum(A, m ²)			257.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.7334		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							185.0000 (35)
Thermal bridges (User defined value 0.025 * total exposed area)							6.4275 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	60.1609 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	44.1709	43.9601	43.7536	42.7833	42.6018	41.7567	41.7567
Heat transfer coeff	104.3318	104.1211	103.9145	102.9442	102.7627	101.9176	101.9176
						101.7611	102.2431
							102.7627
							103.1299
							103.5139 (39)

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Average = Sum(39)m / 12 =

102.9434

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2034	1.2009	1.1986	1.1874	1.1853	1.1755	1.1755	1.1737	1.1793	1.1853	1.1895	1.1939 (40)
HLP (average)												1.1874
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers												
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)	
Hot water usage for baths												
29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)	
Hot water usage for other uses												
41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)	
Average daily hot water use (litres/day)												126.4813 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386 (44)	
Energy content (annual)	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824 (45)
Distribution loss (46)m = 0.15 x (45)m												
32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324 (46)	
Water storage loss (or HIU 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 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
268.8764	237.7777	252.4231	221.3080	214.1448	192.5289	189.6118	197.3243	199.7096	223.2306	238.0513	265.8413 (62)	
WWHRS	-60.4992	-53.5060	-56.0284	-46.3938	-43.2373	-36.9985	-34.6802	-36.8789	-38.2801	-45.1280	-51.1245	-59.3789 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)	
Solar input	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 (63d)	
Output from w/h												
208.3772	184.2717	196.3946	174.9143	170.9074	155.5304	154.9317	160.4454	161.4295	178.1026	186.9268	206.4624 (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												
85.1973	75.2638	79.7266	69.5164	66.9990	59.9474	58.8418	61.4062	62.3349	70.0200	75.0836	84.1881 (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	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.6531	21.8967	17.8076	13.4815	10.0776	8.5079	9.1931	11.9495	16.0386	20.3647	23.7687	25.3383 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1798	342.0909	322.7419	298.3173	275.3615	260.0257	256.4190	265.5078	284.8568	309.2815	332.2372 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)
Water heating gains (Table 5)	114.5125	111.9997	107.1594	96.5506	90.0524	83.2602	79.0885	82.5352	86.5763	94.1130	104.2827	113.1561 (72)
Total internal gains	594.3394	592.6769	574.6586	540.3747	506.0480	471.7304	452.9080	455.5044	472.7234	506.9352	544.9335	578.3323 (73)

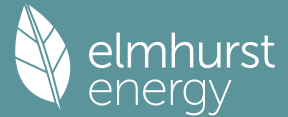
6. Solar gains

[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	3.6600				10.6334		0.6300		0.7000		0.7700		11.8939 (74)	
East	1.0300				19.6403		0.6300		0.7000		0.7700		6.1824 (76)	
South	15.4900				46.7521		0.6300		0.7000		0.7700		221.3217 (78)	
West	5.2500				19.6403		0.6300		0.7000		0.7700		31.5122 (80)	
Solar gains	270.9102	458.9364	621.7804	760.9916	844.4193	834.9868	806.3878	744.5412	669.9952	505.5097	324.0151	232.1559	(83)	
Total gains	865.2496	1051.6133	1196.4390	1301.3663	1350.4673	1306.7172	1259.2958	1200.0456	1142.7186	1012.4449	868.9486	810.4882	(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	42.7043	42.7907	42.8758	43.2799	43.3564	43.7159	43.7159	43.7831	43.5767	43.3564	43.2020	43.0417
alpha	3.8470	3.8527	3.8584	3.8853	3.8904	3.9144	3.9144	3.9189	3.9051	3.8904	3.8801	3.8694
util living area												
	0.9647	0.9310	0.8745	0.7775	0.6416	0.4821	0.3520	0.3841	0.5777	0.8165	0.9382	0.9715 (86)
MIT	19.6046	19.9273	20.2912	20.6393	20.8623	20.9656	20.9921	20.9888	20.9300	20.6262	20.0464	19.5337 (87)
Th 2	19.9173	19.9193	19.9212	19.9301	19.9318	19.9396	19.9396	19.9411	19.9366	19.9318	19.9284	19.9249 (88)
util rest of house												
	0.9569	0.9169	0.8502	0.7379	0.5842	0.4085	0.2691	0.2984	0.5016	0.7734	0.9229	0.9650 (89)
MIT 2	18.3362	18.7356	19.1757	19.5832	19.8189	19.9189	19.9367	19.9366	19.8899	19.5833	18.8973	18.2530 (90)
Living area fraction												
									fLA = Living area / (4) =			0.3506 (91)
MIT	18.7809	19.1535	19.5668	19.9535	20.1847	20.2859	20.3068	20.3055	20.2546	19.9490	19.3002	18.7021 (92)

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Temperature adjustment												-0.1500
adjusted MIT	18.6309	19.0035	19.4168	19.8035	20.0347	20.1359	20.1568	20.1555	20.1046	19.7990	19.1502	18.5521 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9447	0.9022	0.8372	0.7328	0.5900	0.4225	0.2863	0.3160	0.5142	0.7674	0.9091	0.9540	(94)
Useful gains	817.4223	948.8024	1001.6084	953.6086	796.7747	552.0366	360.5194	379.2182	587.5727	776.9198	789.9553	773.2271	(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	1495.1733	1468.4680	1342.2462	1122.4511	856.4992	564.2060	362.4956	382.1684	613.9305	945.3092	1242.7350	1485.6383	(97)
Space heating kWh	504.2468	349.2153	253.4345	121.5666	44.4350	0.0000	0.0000	0.0000	0.0000	125.2817	326.0014	530.0339	(98a)
Space heating requirement - total per year (kWh/year)												2254.2152	
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	504.2468	349.2153	253.4345	121.5666	44.4350	0.0000	0.0000	0.0000	0.0000	125.2817	326.0014	530.0339	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2254.2152	
Space heating per m2										(98c) / (4) =		26.0002	(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 %)													89.5000 (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	504.2468	349.2153	253.4345	121.5666	44.4350	0.0000	0.0000	0.0000	0.0000	125.2817	326.0014	530.0339	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	563.4042	390.1847	283.1670	135.8286	49.6481	0.0000	0.0000	0.0000	0.0000	139.9795	364.2473	592.2167	(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	208.3772	184.2717	196.3946	174.9143	170.9074	155.5304	154.9317	160.4454	161.4295	178.1026	186.9268	206.4624	(64)
Efficiency of water heater													81.0000 (216)
(217)m	86.8355	86.3694	85.5791	84.2821	82.6191	81.0000	81.0000	81.0000	81.0000	84.3064	86.2033	86.9424	(217)
Fuel for water heating, kWh/month	181.2833	160.0617	169.9430	149.0224	145.1826	131.1301	128.3614	135.1685	138.4129	150.8115	159.6361	178.8581	(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	54.4411	49.1726	54.4411	52.6849	54.4411	52.6849	54.4411	54.4411	52.6849	54.4411	52.6849	54.4411	(231)
Lighting	21.5787	17.3113	15.5869	11.4196	8.8208	7.2067	8.0467	10.4594	13.5857	17.8251	20.1335	22.1785	(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													2518.6762 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													81.0000
Water heating fuel used													1827.8716 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
maintaining electric keep-hot facility for gas combi boiler													600.0000 (230f)
Total electricity for the above, kWh/year													641.0000 (231)
Electricity for lighting (calculated in Appendix L)													174.1529 (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													5161.7007 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2518.6762	3.6400	91.6798 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1827.8716	3.6400	66.5345 (247)

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Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	641.0000	16.4900	105.7009 (249)
Energy for lighting	174.1529	16.4900	28.7178 (250)
Additional standing charges			92.0000 (251)
Total energy cost			384.6330 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0514 (257)
SAP value		82.9570
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	2518.6762	0.2100	528.9220 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1827.8716	0.2100	383.8530 (264)
Space and water heating			912.7750 (265)
Pumps, fans and electric keep-hot	641.0000	0.1387	88.9146 (267)
Energy for lighting	174.1529	0.1443	25.1356 (268)
Total CO2, kg/year			1026.8253 (272)
CO2 emissions per m2			11.8400 (273)
EI value			89.5524
EI rating			90 (274)
EI band			B

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	234.8100 (5)

2. Ventilation rate

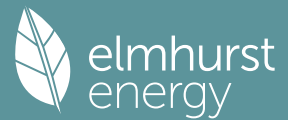
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1704 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3454 (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) = 0.2935 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.0000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.3082	0.2935	0.2935	0.2715	0.2715	0.2422	0.2495	0.2348	0.2422	0.2569	0.2569	0.2789 (22b)
Effective ac	0.5475	0.5431	0.5431	0.5369	0.5369	0.5293	0.5311	0.5276	0.5293	0.5330	0.5330	0.5389 (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							
Ws			25.4300	0.9615	24.4519		(27)
SD			2.1000	1.0000	2.1000		(26)
Heatloss Floor 1			59.7000	0.0900	5.3730		(28a)
EW	136.2000	27.5300	108.6700	0.1500	16.3005		(29a)
Insulation at Ceiling	41.4000		41.4000	0.0900	3.7260		(30)
Sloping Ceiling	19.8000		19.8000	0.0900	1.7820		(30)

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Total net area of external elements Aum(A, m2) 257.1000 (31)
Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 53.7334 (33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 185.0000 (35)
Thermal bridges (User defined value 0.025 * total exposed area) 6.4275 (36)
Point Thermal bridges 0.0000 (36a) =
Total fabric heat loss (33) + (36) + (36a) = 60.1609 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Heat transfer coeff 42.4244 42.0822 42.0822 41.6002 41.6002 41.0160 41.1558 40.8803 41.0160 41.2997 41.2997 41.7567 (38)
Average = Sum(39)m / 12 = 102.5853 102.2431 102.2431 101.7611 101.7611 101.1769 101.3167 101.0412 101.1769 101.4607 101.4607 101.9176 (39)
101.6787
HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
HLP (average) 1.1832 1.1793 1.1793 1.1737 1.1737 1.1670 1.1686 1.1654 1.1670 1.1702 1.1702 1.1755 (40)
Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5778 (42)
Hot water usage for mixer showers 67.4410 66.4275 64.9507 62.1249 60.0396 57.7140 56.3922 57.8579 59.4646 61.9615 64.8480 67.1826 (42a)
Hot water usage for baths 29.1251 28.6925 28.0834 26.9603 26.1193 25.1868 24.6831 25.2880 25.9466 26.9444 28.0906 29.0266 (42b)
Hot water usage for other uses 41.0293 39.5373 38.0453 36.5534 35.0614 33.5694 33.5694 35.0614 36.5534 38.0453 39.5373 41.0293 (42c)
Average daily hot water use (litres/day) 126.4813 (43)
Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Energy conte 137.5954 134.6574 131.0794 125.6386 121.2203 116.4703 114.6448 118.2073 121.9645 126.9513 132.4759 137.2386 (44)
Energy content (annual) 217.9175 191.7503 201.4642 171.9929 163.1858 143.2138 138.6529 146.3653 150.3945 172.2716 188.7362 214.8824 (45)
Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 2100.8276
Water storage loss (or HIU loss): 32.6876 28.7625 30.2196 25.7989 24.4779 21.4821 20.7979 21.9548 22.5592 25.8407 28.3104 32.2324 (46)
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 50.9589 46.0274 50.9589 49.3151 50.9589 49.3151 50.9589 50.9589 49.3151 50.9589 49.3151 50.9589 (61)
Total heat required for water heating calculated for each month
WWHRS 268.8764 237.7777 252.4231 221.3080 214.1448 192.5289 189.6118 197.3243 199.7096 223.2306 238.0513 265.8413 (62)
PV diverter -60.4992 -53.5060 -56.0284 -46.3938 -43.2373 -36.9985 -34.6802 -36.8789 -38.2801 -45.1280 -51.1245 -59.3789 (63a)
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 (63b)
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 (63c)
Output from w/h 208.3772 184.2717 196.3946 174.9143 170.9074 155.5304 154.9317 160.4454 161.4295 178.1026 186.9268 206.4624 (64)
Total per year (kWh/year) = Sum(64)m = 2138.6939 (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 85.1973 75.2638 79.7266 69.5164 66.9990 59.9474 58.8418 61.4062 62.3349 70.0200 75.0836 84.1881 (65)

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

Metabolic gains (Table 5), Watts
(66)m Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 24.6531 21.8967 17.8076 13.4815 10.0776 8.5079 9.1931 11.9495 16.0386 20.3647 23.7687 25.3383 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 347.5730 351.1798 342.0909 322.7419 298.3173 275.3615 260.0257 256.4190 265.5078 284.8568 309.2815 332.2372 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 53.0446 53.0446 53.0446 53.0446 53.0446 53.0446 53.0446 53.0446 53.0446 53.0446 53.0446 53.0446 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5) -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 -103.1122 (71)
Water heating gains (Table 5) 114.5125 111.9997 107.1594 96.5506 90.0524 83.2602 79.0885 82.5352 86.5763 94.1130 104.2827 113.1561 (72)
Total internal gains 594.3394 592.6769 574.6586 540.3747 506.0480 471.7304 452.9080 455.5044 472.7234 506.9352 544.9335 578.3323 (73)

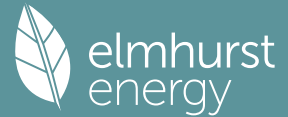
6. Solar gains

[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 3.6600 11.9814 0.6300 0.7000 0.7700 13.4018 (74)
East 1.0300 22.3313 0.6300 0.7000 0.7700 7.0295 (76)
South 15.4900 50.9848 0.6300 0.7000 0.7700 241.3594 (78)
West 5.2500 22.3313 0.6300 0.7000 0.7700 35.8299 (80)
Solar gains 297.6205 453.4123 607.5414 769.9533 837.0370 888.2534 847.5116 796.3225 710.6698 533.2971 364.5772 252.6638 (83)
Total gains 891.9599 1046.0892 1182.2000 1310.3280 1343.0850 1359.9837 1300.4196 1251.8269 1183.3933 1040.2324 909.5107 830.9961 (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)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	43.4313	43.5767	43.5767	43.7831	43.7831	44.0359	43.9752	44.0950	44.0359	43.9128	43.9128	43.7159
alpha	3.8954	3.9051	3.9051	3.9189	3.9189	3.9357	3.9317	3.9397	3.9357	3.9275	3.9275	3.9144
util living area	0.9545	0.9215	0.8552	0.7338	0.5694	0.3672	0.2408	0.2574	0.4796	0.7611	0.9141	0.9629 (86)
MIT	19.7956	20.0560	20.4133	20.7398	20.9237	20.9899	20.9986	20.9982	20.9701	20.7490	20.2447	19.7308 (87)
Th 2	19.9334	19.9366	19.9366	19.9411	19.9411	19.9465	19.9452	19.9478	19.9465	19.9439	19.9439	19.9396 (88)
util rest of house	0.9443	0.9052	0.8270	0.6880	0.5049	0.2919	0.1592	0.1732	0.3988	0.7080	0.8932	0.9544 (89)
MIT 2	18.5868	18.9072	19.3334	19.7022	19.8851	19.9420	19.9450	19.9474	19.9300	19.7251	19.1499	18.5115 (90)
Living area fraction									FLA = Living area / (4) =			0.3506 (91)
MIT	19.0107	19.3100	19.7120	20.0660	20.2493	20.3094	20.3144	20.3159	20.2947	20.0841	19.5338	18.9390 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.8607	19.1600	19.5620	19.9160	20.0993	20.1594	20.1644	20.1659	20.1447	19.9341	19.3838	18.7890 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9312	0.8909	0.8157	0.6868	0.5149	0.3073	0.1763	0.1907	0.4144	0.7075	0.8798	0.9423 (94)
Useful gains	830.5563	931.9338	964.3693	899.9842	691.5833	417.9543	229.2160	238.7646	490.3968	735.9563	800.2110	783.0233 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1411.6435	1386.4218	1243.4846	1019.2412	722.4315	420.8364	229.4221	239.0489	500.2873	845.5848	1155.0034	1395.1504 (97)
Space heating kWh	432.3289	305.4159	207.6618	85.8650	22.9510	0.0000	0.0000	0.0000	0.0000	81.5636	255.4506	455.4226 (98a)
Space heating requirement - total per year (kWh/year)												1846.6593
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	432.3289	305.4159	207.6618	85.8650	22.9510	0.0000	0.0000	0.0000	0.0000	81.5636	255.4506	455.4226 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1846.6593
Space heating per m2										(98c) / (4) =		21.2994 (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 %)												89.5000 (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	432.3289	305.4159	207.6618	85.8650	22.9510	0.0000	0.0000	0.0000	0.0000	81.5636	255.4506	455.4226 (98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)
Space heating fuel (main heating system)	483.0490	341.2468	232.0243	95.9386	25.6436	0.0000	0.0000	0.0000	0.0000	91.1325	285.4196	508.8520 (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	208.3772	184.2717	196.3946	174.9143	170.9074	155.5304	154.9317	160.4454	161.4295	178.1026	186.9268	206.4624 (64)
Efficiency of water heater (217)m	86.5463	86.1000	85.1565	83.6147	81.9211	81.0000	81.0000	81.0000	81.0000	83.4907	85.6999	86.6632 (217)
Fuel for water heating, kWh/month	181.8892	160.5624	170.7864	150.2119	146.4196	131.1301	128.3614	135.1685	138.4129	152.2849	160.5739	179.4343 (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	54.4411	49.1726	54.4411	52.6849	54.4411	52.6849	54.4411	54.4411	52.6849	54.4411	52.6849	54.4411 (231)
Lighting	21.5787	17.3113	15.5869	11.4196	8.8208	7.2067	8.0467	10.4594	13.5857	17.8251	20.1335	22.1785 (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												2063.3065 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												81.0000
Water heating fuel used												1835.2354 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
maintaining electric keep-hot facility for gas combi boiler												600.0000 (230f)
Total electricity for the above, kWh/year												641.0000 (231)
Electricity for lighting (calculated in Appendix L)												174.1529 (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)

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Energy used
Total delivered energy for all uses

0.0000 (237)
4713.6948 (238)

10a. Fuel costs - using BEDF prices (596)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2063.3065	7.3200	151.0340 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1835.2354	7.3200	134.3392 (247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000 (247a)
Pumps, fans and electric keep-hot	641.0000	27.6700	177.3647 (249)
Energy for lighting	174.1529	27.6700	48.1881 (250)
Additional standing charges			108.0000 (251)
Total energy cost			618.9261 (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	2063.3065	0.2100	433.2944 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1835.2354	0.2100	385.3994 (264)
Space and water heating			818.6938 (265)
Pumps, fans and electric keep-hot	641.0000	0.1387	88.9146 (267)
Energy for lighting	174.1529	0.1443	25.1356 (268)
Total CO2, kg/year			932.7440 (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	2063.3065	1.1300	2331.5364 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1835.2354	1.1300	2073.8160 (278)
Space and water heating			4405.3523 (279)
Pumps, fans and electric keep-hot	641.0000	1.5128	969.7048 (281)
Energy for lighting	174.1529	1.5338	267.1215 (282)
Total Primary energy kWh/year			5642.1786 (286)

SAP 10 EPC IMPROVEMENTS

OHW - Be Lean

Current energy efficiency rating: B 83
Current environmental impact rating: B 90

N Solar water heating SAP increase too small
U Solar photovoltaic panels Recommended
V2 Wind turbine Not applicable

Recommended measures:
U Solar photovoltaic panels SAP change + 5.9 Cost change -£ 230 CO2 change -111 kg (11.9%)

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.6 -£ 36 -156 kg (16.7%)

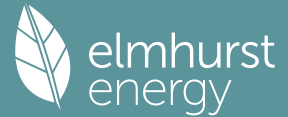
Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£230 1.28 kg/m²	B 89	B 91
Total Savings	£230 1.28 kg/m²		
Potential energy efficiency rating:		B 89	
Potential environmental impact rating:			B 91

Fuel prices for cost data on this page from database revision number 596 TEST (30 Jun 2026)
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	£226	£226	£0
Mains gas	£393	£393	£0
Space heating	£436	£436	£0
Water heating	£134	£134	£0
Lighting	£48	£48	£0
Generated (PV)	-£0	-£230	£230
Total cost of fuels	£619	£389	£230
Total cost of uses	£618	£388	£230
Delivered energy	54 kWh/m²	45 kWh/m²	10 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.8 tonnes	0.1 tonnes
CO2 emissions per m²	11 kg/m²	9 kg/m²	1 kg/m²
Primary energy	65 kWh/m²	51 kWh/m²	14 kWh/m²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.8100 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1704 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3454 (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) = 0.2935 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3743	0.3669	0.3596	0.3229	0.3156	0.2789	0.2789	0.2715	0.2935	0.3156	0.3302	0.3449 (22b)
Effective ac	0.5700	0.5673	0.5647	0.5521	0.5498	0.5389	0.5389	0.5369	0.5431	0.5498	0.5545	0.5595 (25)

3. Heat losses and heat loss parameter

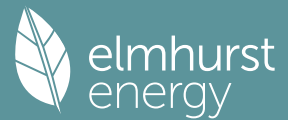
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Ws			25.4300	0.9615	24.4519		(27)
SD			2.1000	1.0000	2.1000		(26)
Heatloss Floor 1			59.7000	0.0900	5.3730		(28a)
EW	136.2000	27.5300	108.6700	0.1500	16.3005		(29a)
Insulation at Ceiling	41.4000		41.4000	0.0900	3.7260		(30)
Sloping Ceiling	19.8000		19.8000	0.0900	1.7820		(30)
Total net area of external elements Aum(A, m ²)			257.1000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.7334		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							185.0000 (35)
Thermal bridges (User defined value 0.025 * total exposed area)							6.4275 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	60.1609 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	44.1709	43.9601	43.7536	42.7833	42.6018	41.7567	41.7567	41.6002	42.0822	42.6018	42.9690	43.3529 (38)
Heat transfer coeff	104.3318	104.1211	103.9145	102.9442	102.7627	101.9176	101.9176	101.7611	102.2431	102.7627	103.1299	103.5139 (39)
Average = Sum(39)m / 12 =												102.9434
HLP	1.2034	1.2009	1.1986	1.1874	1.1853	1.1755	1.1755	1.1737	1.1793	1.1853	1.1895	1.1939 (40)
HLP (average)												1.1874
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers												67.1826 (42a)
Hot water usage for baths												29.0266 (42b)
Hot water usage for other uses												41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386 (44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824 (45)
Energy content (annual)												Total = Sum(45)m = 2100.8276
Distribution loss (46)m = 0.15 x (45)m												32.2324 (46)
Water storage loss (or HIU loss):												
Total storage loss												

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
WWHRS	268.8764	237.7777	252.4231	221.3080	214.1448	192.5289	189.6118	197.3243	199.7096	223.2306	238.0513	265.8413 (62)
PV diverter	-60.4992	-53.5060	-56.0284	-46.3938	-43.2373	-36.9985	-34.6802	-36.8789	-38.2801	-45.1280	-51.1245	-59.3789 (63a)
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 (63b)
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 (63c)
Output from w/h	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)
	208.3772	184.2717	196.3946	174.9143	170.9074	155.5304	154.9317	160.4454	161.4295	178.1026	186.9268	206.4624 (64)
Total per year (kWh/year) = Sum(64)m =											2138.6939	(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												
	85.1973	75.2638	79.7266	69.5164	66.9990	59.9474	58.8418	61.4062	62.3349	70.0200	75.0836	84.1881 (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	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.6531	21.8967	17.8076	13.4815	10.0776	8.5079	9.1931	11.9495	16.0386	20.3647	23.7687	25.3383 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1798	342.0909	322.7419	298.3173	275.3615	260.0257	256.4190	265.5078	284.8568	309.2815	332.2372 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)
Water heating gains (Table 5)	114.5125	111.9997	107.1594	96.5506	90.0524	83.2602	79.0885	82.5352	86.5763	94.1130	104.2827	113.1561 (72)
Total internal gains	594.3394	592.6769	574.6586	540.3747	506.0480	471.7304	452.9080	455.5044	472.7234	506.9352	544.9335	578.3323 (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						3.6600	10.6334	0.6300	0.7000			0.7700	11.8939 (74)	
East						1.0300	19.6403	0.6300	0.7000			0.7700	6.1824 (76)	
South						15.4900	46.7521	0.6300	0.7000			0.7700	221.3217 (78)	
West						5.2500	19.6403	0.6300	0.7000			0.7700	31.5122 (80)	

Solar gains	270.9102	458.9364	621.7804	760.9916	844.4193	834.9868	806.3878	744.5412	669.9952	505.5097	324.0151	232.1559	(83)	
Total gains	865.2496	1051.6133	1196.4390	1301.3663	1350.4673	1306.7172	1259.2958	1200.0456	1142.7186	1012.4449	868.9486	810.4882	(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	42.7043	42.7907	42.8758	43.2799	43.3564	43.7159	43.7159	43.7831	43.5767	43.3564	43.2020	43.0417
alpha	3.8470	3.8527	3.8584	3.8853	3.8904	3.9144	3.9144	3.9189	3.9051	3.8904	3.8801	3.8694
util living area	0.9647	0.9310	0.8745	0.7775	0.6416	0.4821	0.3520	0.3841	0.5777	0.8165	0.9382	0.9715 (86)
MIT	19.6046	19.9273	20.2912	20.6393	20.8623	20.9656	20.9921	20.9888	20.9300	20.6262	20.0464	19.5337 (87)
Th 2	19.9173	19.9193	19.9212	19.9301	19.9318	19.9396	19.9396	19.9411	19.9366	19.9318	19.9284	19.9249 (88)
util rest of house	0.9569	0.9169	0.8502	0.7379	0.5842	0.4085	0.2691	0.2984	0.5016	0.7734	0.9229	0.9650 (89)
MIT 2	18.3362	18.7356	19.1757	19.5832	19.8189	19.9189	19.9367	19.9366	19.8899	19.5833	18.8973	18.2530 (90)
Living area fraction	18.7809	19.1535	19.5668	19.9535	20.1847	20.2859	20.3068	20.3055	20.2546	19.9490	19.3002	18.7021 (92)
MIT	18.6309	19.0035	19.4168	19.8035	20.0347	20.1359	20.1568	20.1555	20.1046	19.7990	19.1502	-0.1500
Temperature adjustment												
adjusted MIT												18.5521 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9447	0.9022	0.8372	0.7328	0.5900	0.4225	0.2863	0.3160	0.5142	0.7674	0.9091	0.9540 (94)
Useful gains	817.4223	948.8024	1001.6084	953.6086	796.7747	552.0366	360.5194	379.2182	587.5727	776.9198	789.9553	773.2271 (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	1495.1733	1468.4680	1342.2462	1122.4511	856.4992	564.2060	362.4956	382.1684	613.9305	945.3092	1242.7350	1485.6383 (97)
Space heating kWh	504.2468	349.2153	253.4345	121.5666	44.4350	0.0000	0.0000	0.0000	0.0000	125.2817	326.0014	530.0339 (98a)
Space heating requirement - total per year (kWh/year)												2254.2152
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	504.2468	349.2153	253.4345	121.5666	44.4350	0.0000	0.0000	0.0000	0.0000	125.2817	326.0014	530.0339 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2254.2152
Space heating per m2												26.0002 (99)

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

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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 %)	89.5000	(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	504.2468	349.2153	253.4345	121.5666	44.4350	0.0000	0.0000	0.0000	0.0000	125.2817	326.0014	530.0339	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	563.4042	390.1847	283.1670	135.8286	49.6481	0.0000	0.0000	0.0000	0.0000	139.9795	364.2473	592.2167	(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	208.3772	184.2717	196.3946	174.9143	170.9074	155.5304	154.9317	160.4454	161.4295	178.1026	186.9268	206.4624	(64)
Efficiency of water heater	86.8355	86.3694	85.5791	84.2821	82.6191	81.0000	81.0000	81.0000	81.0000	84.3064	86.2033	86.9424	(216)
Fuel for water heating, kWh/month	181.2833	160.0617	169.9430	149.0224	145.1826	131.1301	128.3614	135.1685	138.4129	150.8115	159.6361	178.8581	(217)
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	54.4411	49.1726	54.4411	52.6849	54.4411	52.6849	54.4411	54.4411	52.6849	54.4411	52.6849	54.4411	(231)
Lighting	21.5787	17.3113	15.5869	11.4196	8.8208	7.2067	8.0467	10.4594	13.5857	17.8251	20.1335	22.1785	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-34.2868	-49.7684	-73.8710	-86.0122	-95.5029	-90.4810	-89.6014	-83.2935	-72.4141	-58.4053	-38.2786	-29.4899	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2518.6762	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												81.0000	
Water heating fuel used												1827.8716	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler												600.0000	(230f)
Total electricity for the above, kWh/year												641.0000	(231)
Electricity for lighting (calculated in Appendix L)												174.1529	(232)

Energy saving/generation technologies (Appendices M ,N and Q)			
PV generation			-801.4053 (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			4360.2954 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2518.6762	3.6400	91.6798	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1827.8716	3.6400	66.5345	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	641.0000	16.4900	105.7009	(249)
Energy for lighting	174.1529	16.4900	28.7178	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-801.4053	16.4900	-132.1517	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-132.1517	(252)
Total energy cost			252.4813	(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] =	0.6902	(257)
SAP value		88.8126	
SAP rating (Section 12)		89	(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	2518.6762	0.2100	528.9220	(261)

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Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1827.8716	0.2100	383.8530 (264)
Space and water heating			912.7750 (265)
Pumps, fans and electric keep-hot	641.0000	0.1387	88.9146 (267)
Energy for lighting	174.1529	0.1443	25.1356 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.4053	0.1338	-107.2570
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-107.2570 (269)
Total CO2, kg/year			919.5683 (272)
CO2 emissions per m2			10.6100 (273)
EI value			90.6437
EI rating			91 (274)
EI band			B

SAP 10 WORKSHEET FOR New Build (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	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	234.8100 (5)

2. Ventilation rate

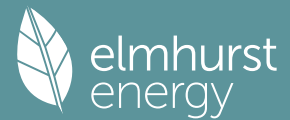
		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1704 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.5000	(17)
Infiltration rate	0.3454	(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) =	0.2935 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.3082	0.2935	0.2935	0.2715	0.2715	0.2422	0.2495	0.2348	0.2422	0.2569	0.2569	0.2789 (22b)
Effective ac	0.5475	0.5431	0.5431	0.5369	0.5369	0.5293	0.5311	0.5276	0.5293	0.5330	0.5330	0.5389 (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												
Ws			25.4300	0.9615	24.4519		(27)					
SD			2.1000	1.0000	2.1000		(26)					
Heatloss Floor 1			59.7000	0.0900	5.3730		(28a)					
EW	136.2000	27.5300	108.6700	0.1500	16.3005		(29a)					
Insulation at Ceiling	41.4000		41.4000	0.0900	3.7260		(30)					
Sloping Ceiling	19.8000		19.8000	0.0900	1.7820		(30)					
Total net area of external elements Aum(A, m2)			257.1000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.7334		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							185.0000 (35)					
Thermal bridges (User defined value 0.025 * total exposed area)							6.4275 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	60.1609 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.4244	Feb 42.0822	Mar 42.0822	Apr 41.6002	May 41.6002	Jun 41.0160	Jul 41.1558	Aug 40.8803	Sep 41.0160	Oct 41.2997	Nov 41.2997	Dec 41.7567 (38)
Heat transfer coeff	102.5853	102.2431	102.2431	101.7611	101.7611	101.1769	101.3167	101.0412	101.1769	101.4607	101.4607	101.9176 (39)
Average = Sum(39)m / 12 =												101.6787
HLP	Jan 1.1832	Feb 1.1793	Mar 1.1793	Apr 1.1737	May 1.1737	Jun 1.1670	Jul 1.1686	Aug 1.1654	Sep 1.1670	Oct 1.1702	Nov 1.1702	Dec 1.1755 (40)
HLP (average)												1.1728
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386 (44)
Energy content (annual)	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824 (45)
Distribution loss (46)m = 0.15 x (45)m	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324 (46)
Water storage loss (or HIU 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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	268.8764	237.7777	252.4231	221.3080	214.1448	192.5289	189.6118	197.3243	199.7096	223.2306	238.0513	265.8413 (62)
WWHRS	-60.4992	-53.5060	-56.0284	-46.3938	-43.2373	-36.9985	-34.6802	-36.8789	-38.2801	-45.1280	-51.1245	-59.3789 (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	208.3772	184.2717	196.3946	174.9143	170.9074	155.5304	154.9317	160.4454	161.4295	178.1026	186.9268	206.4624 (64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m =											2138.6939 (64)
	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	85.1973	75.2638	79.7266	69.5164	66.9990	59.9474	58.8418	61.4062	62.3349	70.0200	75.0836	84.1881 (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	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.6531	21.8967	17.8076	13.4815	10.0776	8.5079	9.1931	11.9495	16.0386	20.3647	23.7687	25.3383 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1798	342.0909	322.7419	298.3173	275.3615	260.0257	256.4190	265.5078	284.8568	309.2815	332.2372 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)
Water heating gains (Table 5)	114.5125	111.9997	107.1594	96.5506	90.0524	83.2602	79.0885	82.5352	86.5763	94.1130	104.2827	113.1561 (72)
Total internal gains	594.3394	592.6769	574.6586	540.3747	506.0480	471.7304	452.9080	455.5044	472.7234	506.9352	544.9335	578.3323 (73)

6. Solar gains

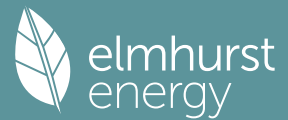
[Jan]														
	Area				Solar flux		g		FF		Access		Gains	
	m2				Table 6a		Specific data		Specific data		factor		W	
					W/m2		or Table 6b		or Table 6c		Table 6d			
North	3.6600				11.9814		0.6300		0.7000		0.7700		13.4018 (74)	
East	1.0300				22.3313		0.6300		0.7000		0.7700		7.0295 (76)	
South	15.4900				50.9848		0.6300		0.7000		0.7700		241.3594 (78)	
West	5.2500				22.3313		0.6300		0.7000		0.7700		35.8299 (80)	
Solar gains	297.6205	453.4123	607.5414	769.9533	837.0370	888.2534	847.5116	796.3225	710.6698	533.2971	364.5772	252.6638 (83)		
Total gains	891.9599	1046.0892	1182.2000	1310.3280	1343.0850	1359.9837	1300.4196	1251.8269	1183.3933	1040.2324	909.5107	830.9961 (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	43.4313	43.5767	43.5767	43.7831	43.7831	44.0359	43.9752	44.0950	44.0359	43.9128	43.9128	43.7159
alpha	3.8954	3.9051	3.9051	3.9189	3.9189	3.9357	3.9317	3.9397	3.9357	3.9275	3.9275	3.9144
util living area	0.9545	0.9215	0.8552	0.7338	0.5694	0.3672	0.2408	0.2574	0.4796	0.7611	0.9141	0.9629 (86)
MIT	19.7956	20.0560	20.4133	20.7398	20.9237	20.9899	20.9986	20.9982	20.9701	20.7490	20.2447	19.7308 (87)
Th 2	19.9334	19.9366	19.9366	19.9411	19.9411	19.9465	19.9452	19.9478	19.9465	19.9439	19.9439	19.9396 (88)
util rest of house	0.9443	0.9052	0.8270	0.6880	0.5049	0.2919	0.1592	0.1732	0.3988	0.7080	0.8932	0.9544 (89)
MIT 2	18.5868	18.9072	19.3334	19.7022	19.8851	19.9420	19.9450	19.9474	19.9300	19.7251	19.1499	18.5115 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.0107	19.3100	19.7120	20.0660	20.2493	20.3094	20.3144	20.3159	20.2947	20.0841	19.5338	18.9390 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.8607	19.1600	19.5620	19.9160	20.0993	20.1594	20.1644	20.1659	20.1447	19.9341	19.3838	18.7890 (93)

8. Space heating requirement

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9312	0.8909	0.8157	0.6868	0.5149	0.3073	0.1763	0.1907	0.4144	0.7075	0.8798	0.9423	(94)
Useful gains	830.5563	931.9338	964.3693	899.9842	691.5833	417.9543	229.2160	238.7646	490.3968	735.9563	800.2110	783.0233	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1411.6435	1386.4218	1243.4846	1019.2412	722.4315	420.8364	229.4221	239.0489	500.2873	845.5848	1155.0034	1395.1504	(97)
Space heating kWh	432.3289	305.4159	207.6618	85.8650	22.9510	0.0000	0.0000	0.0000	0.0000	81.5636	255.4506	455.4226	(98a)
Space heating requirement - total per year (kWh/year)												1846.6593	
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	432.3289	305.4159	207.6618	85.8650	22.9510	0.0000	0.0000	0.0000	0.0000	81.5636	255.4506	455.4226	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1846.6593	
Space heating per m2										(98c) / (4) =		21.2994	(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 %)													89.5000	(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	432.3289	305.4159	207.6618	85.8650	22.9510	0.0000	0.0000	0.0000	0.0000	81.5636	255.4506	455.4226	(98)	
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)	
Space heating fuel (main heating system)	483.0490	341.2468	232.0243	95.9386	25.6436	0.0000	0.0000	0.0000	0.0000	91.1325	285.4196	508.8520	(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	208.3772	184.2717	196.3946	174.9143	170.9074	155.5304	154.9317	160.4454	161.4295	178.1026	186.9268	206.4624	(64)	
Efficiency of water heater (217)m	86.5463	86.1000	85.1565	83.6147	81.9211	81.0000	81.0000	81.0000	81.0000	83.4907	85.6999	86.6632	(216)	
Fuel for water heating, kWh/month	181.8892	160.5624	170.7864	150.2119	146.4196	131.1301	128.3614	135.1685	138.4129	152.2849	160.5739	179.4343	(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	54.4411	49.1726	54.4411	52.6849	54.4411	52.6849	54.4411	54.4411	52.6849	54.4411	52.6849	54.4411	(231)	
Lighting	21.5787	17.3113	15.5869	11.4196	8.8208	7.2067	8.0467	10.4594	13.5857	17.8251	20.1335	22.1785	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-37.5697	-50.1215	-73.7932	-87.5144	-95.7021	-93.8680	-92.4530	-87.1281	-75.9359	-61.5097	-42.5762	-32.1058	(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													2063.3065	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													81.0000	
Water heating fuel used													1835.2354	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
central heating pump													41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler													600.0000	(230f)
Total electricity for the above, kWh/year													641.0000	(231)
Electricity for lighting (calculated in Appendix L)													174.1529	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-830.2777	(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													3883.4171	(238)

10a. Fuel costs - using BEDF prices (596)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2063.3065	7.3200	151.0340	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1835.2354	7.3200	134.3392	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(247a)
Pumps, fans and electric keep-hot	641.0000	27.6700	177.3647	(249)
Energy for lighting	174.1529	27.6700	48.1881	(250)
Additional standing charges			108.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-830.2777	27.6700	-229.7378	
PV Unit electricity exported	0.0000	5.8100	0.0000	

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Total	-229.7378 (252)
Total energy cost	389.1882 (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	2063.3065	0.2100	433.2944 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1835.2354	0.2100	385.3994 (264)
Space and water heating			818.6938 (265)
Pumps, fans and electric keep-hot	641.0000	0.1387	88.9146 (267)
Energy for lighting	174.1529	0.1443	25.1356 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-830.2777	0.1339	-111.1575
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-111.1575 (269)
Total CO2, kg/year			821.5866 (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	2063.3065	1.1300	2331.5364 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1835.2354	1.1300	2073.8160 (278)
Space and water heating			4405.3523 (279)
Pumps, fans and electric keep-hot	641.0000	1.5128	969.7048 (281)
Energy for lighting	174.1529	1.5338	267.1215 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-830.2777	1.4947	-1241.0518
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1241.0518 (283)
Total Primary energy kWh/year			4401.1269 (286)

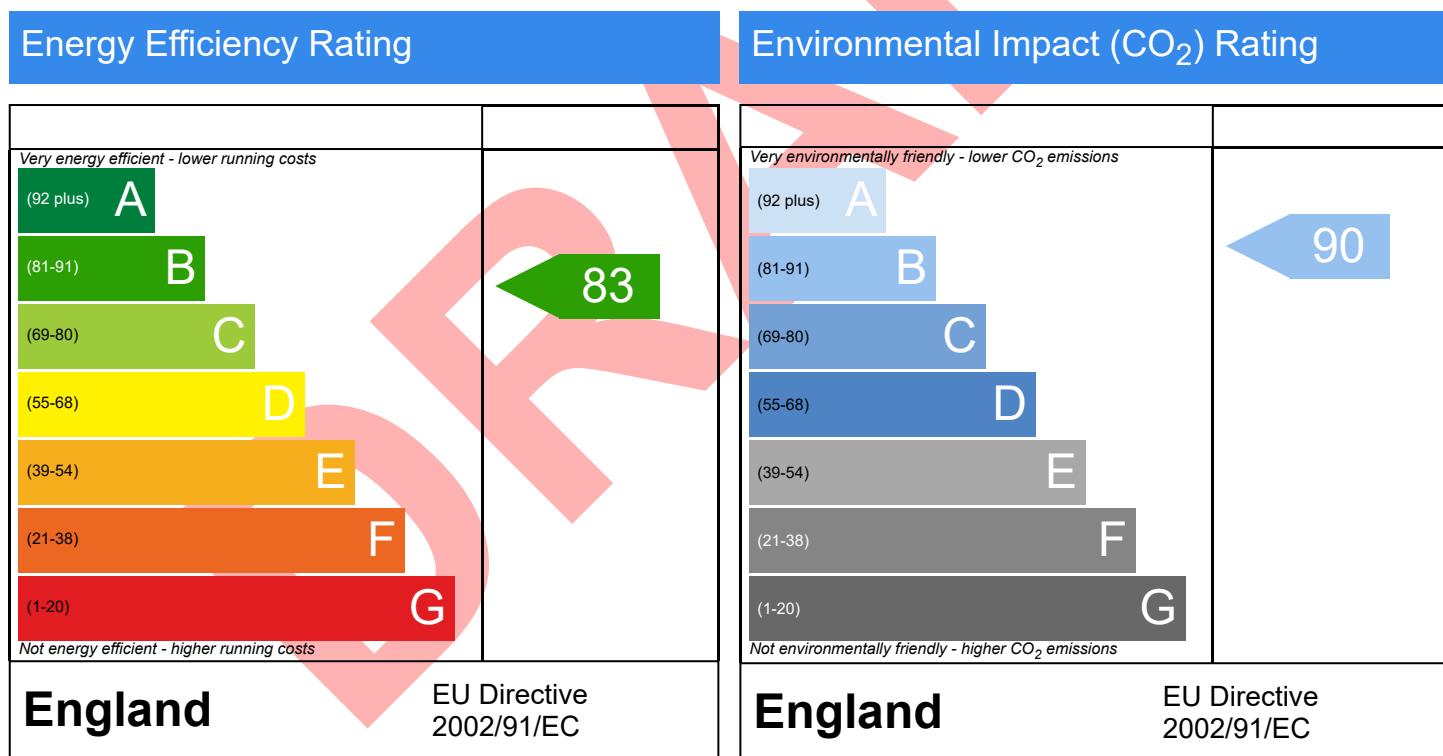
Predicted Energy Assessment



Dwelling type: House, Detached
 Date of assessment: 08/07/2026
 SAP Version: 10.2
 Produced by: Samuel Westover
 Total floor area: 86.7 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.



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

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

Energy Report



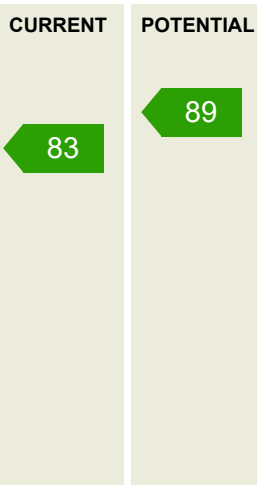
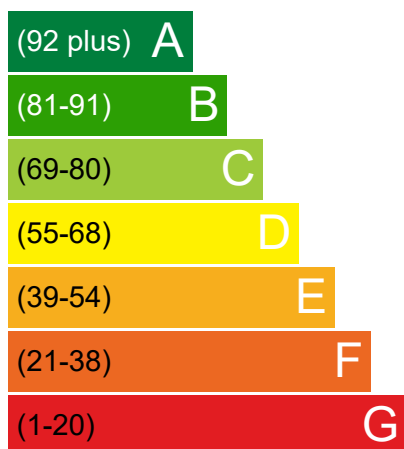
Dwelling Address	
Reference	OHW-OHW - Be Lean
SAP Version	10.2
Assessment Date	08/07/2026
Submission Date	
Property Type	House, Detached
Total Floor Area	87

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

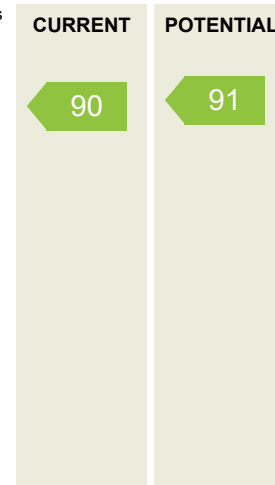
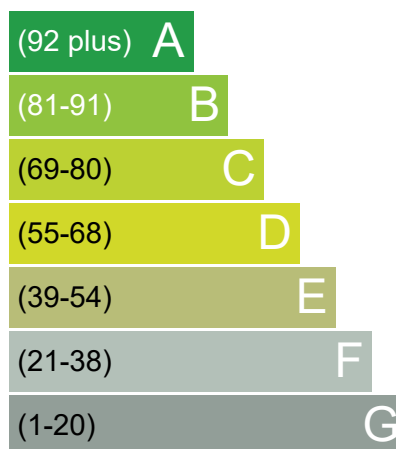
Energy Efficiency Rating

Most energy efficient - lower running costs



Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home

Energy Report

	Primary Energy	Energy	Carbon	Cost	HTC
CURRENT	65.08 kWh	4714 kWh	933 kg	618.93 £	103 W/K
POTENTIAL	50.76 kWh	3883 kWh	822 kg	389.19 £	103 W/K

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 0.15 W/m ² K	Very Good
Roof	Average thermal transmittance 0.09 W/m ² K	Very Good
Floor	Average thermal transmittance 0.09 W/m ² K	Very Good
Windows	High performance glazing	Very Good
Main heating	Boiler and underfloor heating, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system, waste water heat recovery	Very Good
Lighting	Excellent lighting efficiency	Very Good
Air tightness	Air permeability [AP50] = 3.5 m ³ /h.m ² (assumed)	Good

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
Solar water heating	£36	B 84			B 91
Photovoltaic	£266	B 89	£8,000 - £10,000	£230	B 91

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 	£48	£48	
Heating 	£436	£436	
Hot Water 	£134	£134	
New Technologies e.g. Impact of PV	£0	-(£230)	
TOTAL	£619	£389	

Estimated energy use and potential savings



Space Heating

2063

kWh per year



Water Heating

1835

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 (CO ₂)	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.

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Plot Reference	OHW			Issued on Date	14/07/2026
Assessment Reference	OHW - Be Green	Plot Type Ref			
Plot Address				SAP Version	10.2
SAP Rating	96 A	DER	-0.20	TER	11.61
Environmental	100 A	% DER < TER			101.72
CO ₂ Emissions (t/year)	-0.07	DFEE	34.30	TFEE	45.45
Compliance Check	See BREL	% DFEE < TFEE			24.53
% DPER < TPER	81.37	DPER	11.35	TPER	60.93
Assessor Details	Mr. Samuel Westover			Assessor ID	AX13-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	234.8100 (5)

2. Ventilation rate

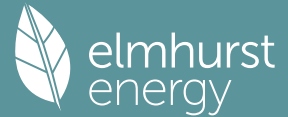
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1704 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3454 (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) = 0.2935 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3743	0.3669	0.3596	0.3229	0.3156	0.2789	0.2789	0.2715	0.2935	0.3156	0.3302	0.3449 (22b)
Effective ac	0.5700	0.5673	0.5647	0.5521	0.5498	0.5389	0.5389	0.5369	0.5431	0.5498	0.5545	0.5595 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Ws			25.4300	0.9615	24.4519		(27)
SD			2.1000	1.0000	2.1000		(26)
Heatloss Floor 1			59.7000	0.0900	5.3730		(28a)
EW	136.2000	27.5300	108.6700	0.1500	16.3005		(29a)
Insulation at Ceiling	41.4000		41.4000	0.0900	3.7260		(30)
Sloping Ceiling	19.8000		19.8000	0.0900	1.7820		(30)
Total net area of external elements Aum(A, m ²)			257.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.7334		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							185.0000 (35)
Thermal bridges (User defined value 0.025 * total exposed area)							6.4275 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	60.1609 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	44.1709	43.9601	43.7536	42.7833	42.6018	41.7567	41.7567
Heat transfer coeff	104.3318	104.1211	103.9145	102.9442	102.7627	101.9176	101.9176
						101.7611	102.2431
							102.7627
							103.1299
							103.5139 (39)

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Average = Sum(39)m / 12 =

102.9434

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2034	1.2009	1.1986	1.1874	1.1853	1.1755	1.1755	1.1737	1.1793	1.1853	1.1895	1.1939 (40)
HLP (average)												1.1874
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers												
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths												
29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses												
41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386 (44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												2100.8276
32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7900 (48)
Temperature factor from Table 2b												0.7209 (49)
Enter (49) or (54) in (55)												0.5695 (55)
Total storage loss												
17.6548	15.9463	17.6548	17.0853	17.6548	17.0853	17.6548	17.6548	17.0853	17.6548	17.0853	17.6548	(56)
If cylinder contains dedicated solar storage												
17.6548	15.9463	17.6548	17.0853	17.6548	17.0853	17.6548	17.6548	17.0853	17.6548	17.0853	17.6548	(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												
235.5723	207.6966	219.1190	189.0783	180.8407	160.2992	156.3078	164.0202	167.4798	189.9265	205.8215	232.5373	(62)
WWHRS	-60.4992	-53.5060	-56.0284	-46.3938	-43.2373	-36.9985	-34.6802	-36.8789	-38.2801	-45.1280	-51.1245	-59.3789 (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	175.0731	154.1906	163.0906	142.6845	137.6034	123.3007	121.6276	127.1413	129.1998	144.7985	154.6970	173.1584 (64)
12Total per year (kWh/year)												1746.5654 (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	86.5814	76.5140	81.1107	70.8559	68.3832	61.2869	60.2260	62.7904	63.6744	71.4042	76.4231	85.5723 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
117.4582	130.0430	117.4582	121.3734	117.4582	121.3734	117.4582	117.4582	121.3734	117.4582	121.3734	117.4582	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8541	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)												
116.3729	113.8602	109.0198	98.4110	91.9129	85.1206	80.9489	84.3956	88.4367	95.9734	106.1431	115.0165	(72)
Total internal gains	531.3721	543.8606	520.3459	500.6886	473.9106	452.6534	434.2913	435.3216	449.3674	468.9527	499.4022	519.7406 (73)

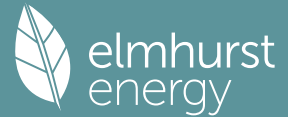
6. Solar gains

[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					3.6600	10.6334		0.6300	0.7000	0.7700	11.8939 (74)	
East					1.0300	19.6403		0.6300	0.7000	0.7700	6.1824 (76)	
South					15.4900	46.7521		0.6300	0.7000	0.7700	221.3217 (78)	
West					5.2500	19.6403		0.6300	0.7000	0.7700	31.5122 (80)	
Solar gains	270.9102	458.9364	621.7804	760.9916	844.4193	834.9868	806.3878	744.5412	669.9952	505.5097	324.0151	232.1559 (83)
Total gains	802.2823	1002.7970	1142.1263	1261.6802	1318.3300	1287.6402	1240.6791	1179.8627	1119.3626	974.4623	823.4173	751.8965 (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 from living area, nil,m (see Table 9a)												
tau	42.7043	42.7907	42.8758	43.2799	43.3564	43.7159	43.7159	43.7831	43.5767	43.3564	43.2020	43.0417
alpha	3.8470	3.8527	3.8584	3.8853	3.8904	3.9144	3.9144	3.9189	3.9051	3.8904	3.8801	3.8694
util living area	0.9720	0.9395	0.8877	0.7902	0.6530	0.4885	0.3571	0.3903	0.5874	0.8305	0.9469	0.9775 (86)
MIT	19.5202	19.8705	20.2413	20.6163	20.8535	20.9640	20.9917	20.9882	20.9258	20.5995	19.9917	19.4530 (87)
Th 2	19.9173	19.9193	19.9212	19.9301	19.9318	19.9396	19.9396	19.9411	19.9366	19.9318	19.9284	19.9249 (88)

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util rest of house	0.9656	0.9268	0.8651	0.7514	0.5955	0.4141	0.2731	0.3034	0.5108	0.7891	0.9334	0.9723 (89)
MIT 2	18.2312	18.6668	19.1182	19.5590	19.8112	19.9179	19.9365	19.9363	19.8870	19.5554	18.8312	18.1520 (90)
Living area fraction									FLA = Living area / (4) =			0.3506 (91)
MIT	18.6831	19.0889	19.5120	19.9297	20.1766	20.2847	20.3065	20.3051	20.2512	19.9215	19.2381	18.6082 (92)
Temperature adjustment												-0.1000
adjusted MIT	18.5831	18.9889	19.4120	19.8297	20.0766	20.1847	20.2065	20.2051	20.1512	19.8215	19.1381	18.5082 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9551	0.9132	0.8528	0.7475	0.6037	0.4317	0.2945	0.3254	0.5269	0.7843	0.9209	0.9629	(94)
Useful gains	766.2850	915.7797	973.9715	943.0655	795.8265	555.9355	365.3492	383.8981	589.7962	764.2354	758.2688	724.0056	(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	1490.1849	1466.9504	1341.7412	1125.1543	860.8067	569.1775	367.5663	387.2152	618.6953	947.6243	1241.4908	1481.0921	(97)
Space heating kWh	538.5816	370.3868	273.6207	131.1040	48.3453	0.0000	0.0000	0.0000	0.0000	136.4413	347.9199	563.2724	(98a)
Space heating requirement - total per year (kWh/year)												2409.6718	
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	538.5816	370.3868	273.6207	131.1040	48.3453	0.0000	0.0000	0.0000	0.0000	136.4413	347.9199	563.2724	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2409.6718	
Space heating per m2										(98c) / (4) =			27.7932 (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 %)												249.9000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement	538.5816	370.3868	273.6207	131.1040	48.3453	0.0000	0.0000	0.0000	0.0000	136.4413	347.9199	563.2724	(98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)	215.5188	148.2140	109.4921	52.4626	19.3459	0.0000	0.0000	0.0000	0.0000	54.5984	139.2236	225.3991	(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	175.0731	154.1906	163.0906	142.6845	137.6034	123.3007	121.6276	127.1413	129.1998	144.7985	154.6970	173.1584	(64)
Efficiency of water heater												175.1000	(216)
(217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(217)
Fuel for water heating, kWh/month	99.9846	88.0586	93.1414	81.4874	78.5856	70.4173	69.4618	72.6107	73.7863	82.6948	88.3478	98.8911	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	21.5787	17.3113	15.5869	11.4196	8.8208	7.2067	8.0467	10.4594	13.5857	17.8251	20.1335	22.1785	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-52.8774	-75.7630	-109.0978	-119.7463	-125.2432	-113.3428	-111.7416	-105.7661	-94.2239	-83.1284	-57.9139	-45.5978	(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	-22.2524	-49.6069	-104.4216	-166.4118	-228.2810	-234.2277	-231.2357	-193.8949	-140.4708	-77.1404	-31.2008	-17.2730	(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												964.2544	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												997.4674	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												174.1529	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2590.8591	(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												-454.9844	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Space heating - main system 1	964.2544	0.1564	150.8401 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	997.4674	0.1410	140.6644 (264)
Space and water heating			291.5045 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	174.1529	0.1443	25.1356 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1094.4421	0.1352	-147.9174
PV Unit electricity exported	-1496.4170	0.1242	-185.8767
Total			-333.7941 (269)
Total CO2, kg/year			-17.1539 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-0.2000 (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	964.2544	1.5791	1522.6512 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	997.4674	1.5215	1517.5988 (278)
Space and water heating			3040.2500 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	174.1529	1.5338	267.1215 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1094.4421	1.4995	-1641.1682
PV Unit electricity exported	-1496.4170	0.4559	-682.1870
Total			-2323.3552 (283)
Total Primary energy kWh/year			984.0162 (286)
Dwelling Primary energy Rate (DPER)			11.3500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	234.8100 (5)

2. Ventilation rate

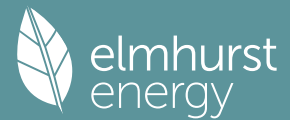
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1278 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3778 (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) = 0.3211 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4094	0.4014	0.3933	0.3532	0.3452	0.3050	0.3050	0.2970	0.3211	0.3452	0.3612	0.3773 (22b)
Effective ac	0.5838	0.5806	0.5774	0.5624	0.5596	0.5465	0.5465	0.5441	0.5516	0.5596	0.5652	0.5712 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			19.5600	1.1450	22.3969		(27)
Heatloss Floor 1			59.7000	0.1300	7.7610		(28a)
EW	136.2000	21.6600	114.5400	0.1800	20.6172		(29a)
Insulation at Ceiling	41.4000		41.4000	0.1100	4.5540		(30)
Sloping Ceiling	19.8000		19.8000	0.1100	2.1780		(30)
Total net area of external elements Aum(A, m2)			257.1000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		59.6071		(33)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				185.0000 (35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	16.3900	0.0500	0.8195	
E3 Sill	15.3900	0.0500	0.7695	
E4 Jamb	29.9100	0.0500	1.4955	
E5 Ground floor (normal)	36.5000	0.1600	5.8400	
E6 Intermediate floor within a dwelling	13.6000	0.0000	0.0000	
E16 Corner (normal)	21.2000	0.0900	1.9080	
E10 Eaves (insulation at ceiling level)	18.4000	0.0600	1.1040	
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000	
E13 Gable (insulation at rafter level)	4.6000	0.0800	0.3680	
E14 Flat roof	8.5000	0.0800	0.6800	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				13.5845 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 73.1916 (37)

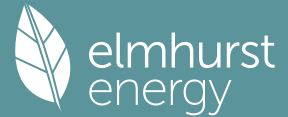
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	45.2374	44.9853	44.7381	43.5772	43.3599	42.3488	42.3488	42.1616	42.7383	43.3599	43.7994	44.2587 (38)
Heat transfer coeff	118.4291	118.1769	117.9297	116.7688	116.5516	115.5405	115.5405	115.3532	115.9299	116.5516	116.9910	117.4504 (39)
Average = Sum(39)m / 12 =												116.7678
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.3660	1.3631	1.3602	1.3468	1.3443	1.3326	1.3326	1.3305	1.3371	1.3443	1.3494	1.3547 (40)
HLP (average)												1.3468
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers												
	67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826 (42a)
Hot water usage for baths												
	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses												
	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386 (44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824 (45)
Energy content (annual)												Total = Sum(45)m = 2100.8276
Distribution loss (46)m = 0.15 x (45)m												
	32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	264.5124	233.8360	248.0591	217.0848	209.7807	188.3057	185.2478	192.9602	195.4863	218.8666	233.8280	261.4773 (62)
WWHRS	-30.8312	-27.2674	-28.5528	-23.6429	-22.0343	-18.8549	-17.6735	-18.7940	-19.5080	-22.9978	-26.0537	-30.2603 (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												
	233.6812	206.5686	219.5062	193.4419	187.7464	169.4508	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170 (64)
Total per year (kWh/year)												2362.9741 (64)
Electric shower(s)												2363 (64)
	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												
	109.7335	97.4256	104.2628	93.2611	91.5352	83.6921	83.3780	85.9424	86.0796	94.5562	98.8283	108.7243 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	117.4385	130.0212	117.4385	121.3531	117.4385	121.3531	117.4385	117.4385	121.3531	117.4385	121.3531	117.4385 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8541	207.2186	222.5989 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (69)
Pumps, fans												
	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)
Water heating gains (Table 5)												
	147.4912	144.9785	140.1381	129.5293	123.0312	116.2390	112.0672	115.5140	119.5551	127.0917	137.2615	146.1348 (72)
Total internal gains												
	562.4707	574.9572	551.4446	531.7866	505.0093	483.7514	465.3900	466.4202	480.4654	500.0513	530.5002	550.8393 (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	2.8100	10.6334	0.6300	0.7000	0.7700	9.1317 (74)

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East	0.7900	19.6403	0.6300	0.7000	0.7700	4.7418 (76)
South	11.9200	46.7521	0.6300	0.7000	0.7700	170.3134 (78)
West	4.0400	19.6403	0.6300	0.7000	0.7700	24.2494 (80)

Solar gains	208.4363	353.0935	478.3585	585.4207	649.5658	642.2946	620.3019	572.7522	515.4390	388.9196	249.2932	178.6200 (83)
Total gains	770.9070	928.0507	1029.8031	1117.2073	1154.5751	1126.0460	1085.6919	1039.1724	995.9044	888.9709	779.7934	729.4593 (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	37.6210	37.7012	37.7803	38.1559	38.2270	38.5615	38.5615	38.6241	38.4320	38.2270	38.0834	37.9345
alpha	3.5081	3.5134	3.5187	3.5437	3.5485	3.5708	3.5708	3.5749	3.5621	3.5485	3.5389	3.5290
util living area	0.9773	0.9572	0.9257	0.8612	0.7549	0.5979	0.4511	0.4869	0.6886	0.8826	0.9600	0.9810 (86)
MIT	19.1844	19.4949	19.8765	20.3287	20.6836	20.9011	20.9722	20.9632	20.8297	20.3631	19.6939	19.1306 (87)
Th 2	19.7895	19.7918	19.7940	19.8043	19.8063	19.8153	19.8153	19.8170	19.8119	19.8063	19.8024	19.7983 (88)
util rest of house	0.9717	0.9472	0.9080	0.8279	0.6963	0.5068	0.3373	0.3719	0.6033	0.8470	0.9487	0.9763 (89)
MIT 2	17.7244	18.1146	18.5886	19.1386	19.5370	19.7543	19.8051	19.8022	19.6943	19.1944	18.3773	17.6621 (90)
Living area fraction	18.2363	18.5986	19.0402	19.5559	19.9390	20.1564	20.2143	20.2093	20.0924	19.6042	18.8389	18.1770 (92)
MIT	18.2363	18.5986	19.0402	19.5559	19.9390	20.1564	20.2143	20.2093	20.0924	19.6042	18.8389	18.1770 (93)
Temperature adjustment												0.0000
adjusted MIT	18.2363	18.5986	19.0402	19.5559	19.9390	20.1564	20.2143	20.2093	20.0924	19.6042	18.8389	18.1770 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9619	0.9342	0.8944	0.8199	0.7035	0.5344	0.3767	0.4114	0.6251	0.8399	0.9368	0.9674 (94)
Useful gains	741.5204	867.0250	921.1033	915.9687	812.1860	601.7938	409.0170	427.4906	622.4938	746.6140	730.5423	705.7005 (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	1650.4685	1618.8584	1478.8626	1244.2774	960.2738	641.9848	417.6025	439.4124	694.7006	1049.4542	1373.3466	1641.6045 (97)
Space heating kWh	676.2574	505.2320	414.9730	236.3822	110.1774	0.0000	0.0000	0.0000	0.0000	225.3131	462.8191	696.3126 (98a)
Space heating requirement - total per year (kWh/year)												3327.4667
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	676.2574	505.2320	414.9730	236.3822	110.1774	0.0000	0.0000	0.0000	0.0000	225.3131	462.8191	696.3126 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3327.4667
Space heating per m2										(98c) / (4) =		38.3791 (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 %)												92.3000 (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	676.2574	505.2320	414.9730	236.3822	110.1774	0.0000	0.0000	0.0000	0.0000	225.3131	462.8191	696.3126 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	732.6732	547.3803	449.5915	256.1021	119.3688	0.0000	0.0000	0.0000	0.0000	244.1095	501.4291	754.4015 (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	233.6812	206.5686	219.5062	193.4419	187.7464	169.4508	167.5743	174.1663	175.9783	195.8687	207.7743	231.2170 (64)
Efficiency of water heater (217)m	86.3004	85.9857	85.4653	84.5105	82.9075	79.8000	79.8000	79.8000	79.8000	84.3747	85.8017	79.8000 (216)
Fuel for water heating, kWh/month	270.7764	240.2361	256.8367	228.8970	226.4529	212.3443	209.9929	218.2535	220.5242	232.1417	242.1563	267.7000 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.4014	19.5757	17.6258	12.9134	9.9747	8.1494	9.0992	11.8275	15.3628	20.1568	22.7671	25.0796 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-51.2708	-69.8497	-97.0723	-105.4163	-110.6336	-102.1867	-100.8788	-96.6532	-88.8359	-78.0251	-55.4758	-44.6144 (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	-36.8739	-76.4992	-150.1324	-222.7959	-292.0649	-292.5647	-289.1503	-245.9920	-181.8585	-108.5153	-48.9324	-29.2438 (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												3605.0561 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2826.3119 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	196.9332 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2975.5359 (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	3738.7653 (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	3605.0561	0.2100	757.0618 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2826.3119	0.2100	593.5255 (264)
Space and water heating			1350.5873 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.9332	0.1443	28.4236 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.9125	0.1353	-135.4468
PV Unit electricity exported	-1974.6233	0.1263	-249.3005
Total			-384.7474 (269)
Total CO2, kg/year			1006.1927 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6100 (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	3605.0561	1.1300	4073.7134 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2826.3119	1.1300	3193.7324 (278)
Space and water heating			7267.4457 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.9332	1.5338	302.0628 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1000.9125	1.5002	-1501.5417
PV Unit electricity exported	-1974.6233	0.4634	-915.1360
Total			-2416.6777 (283)
Total Primary energy kWh/year			5282.9316 (286)
Target Primary Energy Rate (TPER)			60.9300 (287)

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

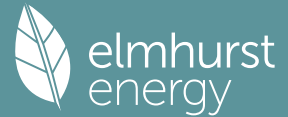
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	234.8100 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1278 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3028 (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) = 0.2573 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3281	0.3217	0.3153	0.2831	0.2766	0.2445	0.2445	0.2380	0.2573	0.2766	0.2895	0.3024 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.5538	0.5517	0.5497	0.5401	0.5383	0.5299	0.5299	0.5283	0.5331	0.5383	0.5419	0.5457 (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							
Ws			25.4300	0.9615	24.4519		(27)
SD			2.1000	1.0000	2.1000		(26)
Heatloss Floor 1			59.7000	0.0900	5.3730		(28a)
EW	136.2000	27.5300	108.6700	0.1500	16.3005		(29a)
Insulation at Ceiling	41.4000		41.4000	0.0900	3.7260		(30)
Sloping Ceiling	19.8000		19.8000	0.0900	1.7820		(30)
Total net area of external elements Aum(A, m2)			257.1000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	53.7334	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							
Thermal bridges (User defined value 0.025 * total exposed area)							
Point Thermal bridges						(36a) =	185.0000 (35)
Total fabric heat loss						(33) + (36) + (36a) =	6.4275 (36)
							0.0000 (37)
							60.1609 (37)

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

(38)m	Jan 42.9149	Feb 42.7529	Mar 42.5941	Apr 41.8484	May 41.7089	Jun 41.0594	Jul 41.0594	Aug 40.9391	Sep 41.3096	Oct 41.7089	Nov 41.9911	Dec 42.2862 (38)
Heat transfer coeff	103.0758	102.9138	102.7551	102.0093	101.8698	101.2203	101.2203	101.1000	101.4705	101.8698	102.1521	102.4472 (39)
Average = Sum(39)m / 12 =												102.0087
HLP	Jan 1.1889	Feb 1.1870	Mar 1.1852	Apr 1.1766	May 1.1750	Jun 1.1675	Jul 1.1675	Aug 1.1661	Sep 1.1704	Oct 1.1750	Nov 1.1782	Dec 1.1816 (40)
HLP (average)												1.1766
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

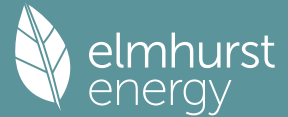
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (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	29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266 (42b)
Hot water usage for other uses	41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293 (42c)
Average daily hot water use (litres/day)												64.3029 (43)
Daily hot water use	Jan 70.1544	Feb 68.2298	Mar 66.1288	Apr 63.5137	May 61.1807	Jun 58.7563	Jul 58.2526	Aug 60.3494	Sep 62.5000	Oct 64.9897	Nov 67.6279	Dec 70.0559 (44)
Energy conte	111.1074	97.1584	101.6374	86.9470	82.3610	72.2477	70.4514	74.7252	77.0687	88.1905	96.3484	109.6906 (45)
Energy content (annual)										Total = Sum(45)m =		1067.9337
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 (or HIU 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	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370 (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	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				907.7437 (64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												614.3496 (64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115 (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	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.4582	130.0430	117.4582	121.3734	117.4582	121.3734	117.4582	117.4582	121.3734	117.4582	121.3734	117.4582 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8541	207.2186	222.5989 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890 (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)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778 (72)
Total internal gains	461.8816	475.6266	455.0129	442.3508	419.6879	405.7766	390.3854	389.4351	401.0884	412.8253	436.5979	451.2020 (73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
North				3.6600	10.6334		0.6300		0.7000	0.7700	11.8939 (74)	
East				1.0300	19.6403		0.6300		0.7000	0.7700	6.1824 (76)	
South				15.4900	46.7521		0.6300		0.7000	0.7700	221.3217 (78)	
West				5.2500	19.6403		0.6300		0.7000	0.7700	31.5122 (80)	
Solar gains	270.9102	458.9364	621.7804	760.9916	844.4193	834.9868	806.3878	744.5412	669.9952	505.5097	324.0151	232.1559 (83)
Total gains	732.7919	934.5630	1076.7933	1203.3424	1264.1072	1240.7634	1196.7733	1133.9762	1071.0836	918.3350	760.6130	683.3579 (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	43.2247	43.2927	43.3596	43.6766	43.7364	44.0170	44.0170	44.0694	43.9085	43.7364	43.6155	43.4899
alpha	3.8816	3.8862	3.8906	3.9118	3.9158	3.9345	3.9345	3.9380	3.9272	3.9158	3.9077	3.8993
util living area	0.9788	0.9498	0.9015	0.8064	0.6694	0.5019	0.3673	0.4028	0.6051	0.8492	0.9575	0.9834 (86)
MIT	19.4511	19.8129	20.1984	20.5917	20.8433	20.9612	20.9911	20.9871	20.9193	20.5674	19.9306	19.3790 (87)
Th 2	19.9289	19.9304	19.9319	19.9388	19.9401	19.9461	19.9461	19.9472	19.9438	19.9401	19.9375	19.9347 (88)
util rest of house	0.9738	0.9389	0.8810	0.7692	0.6122	0.4266	0.2816	0.3139	0.5280	0.8104	0.9463	0.9794 (89)
MIT 2	18.5447	18.8975	19.2656	19.6286	19.8387	19.9277	19.9435	19.9431	19.9013	19.6194	19.0227	18.4782 (90)
Living area fraction										FLA = Living area / (4) =		0.3506 (91)
MIT	18.8625	19.2185	19.5927	19.9663	20.1910	20.2901	20.3108	20.3092	20.2582	19.9518	19.3410	18.7940 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8625	19.2185	19.5927	19.9663	20.1910	20.2901	20.3108	20.3092	20.2582	19.9518	19.3410	18.7940 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9674	0.9301	0.8735	0.7702	0.6264	0.4518	0.3116	0.3449	0.5519	0.8109	0.9385	0.9738 (94)
Useful gains	708.8802	869.2556	940.5535	926.8319	791.8294	560.5378	372.9013	391.1408	591.1443	744.6999	713.8303	665.4519 (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	1501.0436	1473.5688	1345.3375	1128.8696	864.9718	575.9545	375.6081	395.2189	624.8791	952.6670	1250.4451	1495.1186 (97)
Space heating kWh	589.3695	406.0984	301.1593	145.4671	54.4179	0.0000	0.0000	0.0000	0.0000	154.7275	386.3626	617.2720 (98a)
Space heating requirement - total per year (kWh/year)												2654.8744
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	589.3695	406.0984	301.1593	145.4671	54.4179	0.0000	0.0000	0.0000	0.0000	154.7275	386.3626	617.2720 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2654.8744
Space heating per m ²										(98c) / (4) =		30.6214 (99)

8c. Space cooling requirement

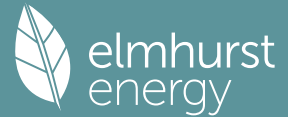
Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	951.4710	749.0304	768.3603	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9183	0.9542	0.9423	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	873.7825	714.6916	724.0173	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1404.4419	1355.3054	1284.2062	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	382.0747	476.6167	416.7805	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000 (105)
	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	95.5187	119.1542	104.1951	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												318.8680 (107)
Energy for space heating												30.6214 (99)
Energy for space cooling												3.6778 (108)
Total												34.2992 (109)
Fabric Energy Efficiency (DFEE)												34.3 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	234.8100 (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													3 * 10 =	30.0000 (7a)	
Number of passive vents													0 * 10 =	0.0000 (7b)	
Number of flueless gas fires													0 * 40 =	0.0000 (7c)	
													Air changes per hour		
Infiltration due to chimneys, flues and fans											= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1278 (8)	
Pressure test													Yes		
Pressure Test Method													Blower Door		
Measured/design AP50													5.0000 (17)		
Infiltration rate													0.3778 (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) =		0.3211 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)		
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)		
Adj infilt rate	0.4094	0.4014	0.3933	0.3532	0.3452	0.3050	0.3050	0.2970	0.3211	0.3452	0.3612	0.3773	(22b)		
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)		
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)		
Effective ac	0.5838	0.5806	0.5774	0.5624	0.5596	0.5465	0.5465	0.5441	0.5516	0.5596	0.5652	0.5712	(25)		

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	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)
94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	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	(63d)
Output from w/h	94.4413	82.5846	86.3918	73.9050	70.0069	61.4105	59.8837	63.5164	65.5084	74.9619	81.8961	93.2370 (64)
12Total per year (kWh/year)												907.7437 (64)
Electric shower(s)	54.0090	48.1225	52.5479	50.1458	51.0868	48.7319	50.3562	51.0868	50.1458	52.5479	51.5598	54.0090 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												614.3496 (64a)
Heat gains from water heating, kWh/month	37.1126	32.6768	34.7349	31.0127	30.2734	27.5356	27.5600	28.6508	28.9136	31.8775	33.3640	36.8115 (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	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	128.8902	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.4385	130.0212	117.4385	121.3531	117.4385	121.3531	117.4385	117.4385	121.3531	117.4385	121.3531	117.4385	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.8739	235.2904	229.2009	216.2371	199.8726	184.4922	174.2172	171.8007	177.8902	190.8541	207.2186	222.5989	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	35.8890	(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)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)	49.8825	48.6262	46.6867	43.0732	40.6901	38.2439	37.0430	38.5091	40.1577	42.8460	46.3389	49.4778	(72)
Total internal gains	461.8620	475.6048	454.9932	442.3304	419.6682	405.7562	390.3657	389.4154	401.0681	412.8056	436.5776	451.1823	(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				2.8100	10.6334		0.6300		0.7000		0.7700		9.1317 (74)
East				0.7900	19.6403		0.6300		0.7000		0.7700		4.7418 (76)
South				11.9200	46.7521		0.6300		0.7000		0.7700		170.3134 (78)
West				4.0400	19.6403		0.6300		0.7000		0.7700		24.2494 (80)
Solar gains	208.4363	353.0935	478.3585	585.4207	649.5658	642.2946	620.3019	572.7522	515.4390	388.9196	249.2932	178.6200	(83)
Total gains	670.2983	828.6984	933.3517	1027.7511	1069.2340	1048.0509	1010.6676	962.1675	916.5071	801.7252	685.8708	629.8023	(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	37.6210	37.7012	37.7803	38.1559	38.2270	38.5615	38.5615	38.6241	38.4320	38.2270	38.0834	37.9345	
alpha	3.5081	3.5134	3.5187	3.5437	3.5485	3.5708	3.5708	3.5749	3.5621	3.5485	3.5389	3.5290	
util living area	0.9850	0.9688	0.9423	0.8846	0.7854	0.6305	0.4805	0.5200	0.7249	0.9078	0.9722	0.9878	(86)
MIT	19.0463	19.3681	19.7670	20.2498	20.6363	20.8825	20.9661	20.9547	20.7978	20.2784	19.5722	18.9916	(87)
Th 2	19.7895	19.7918	19.7940	19.8043	19.8063	19.8153	19.8153	19.8170	19.8119	19.8063	19.8024	19.7983	(88)
util rest of house	0.9812	0.9612	0.9278	0.8549	0.7296	0.5382	0.3610	0.3995	0.6410	0.8776	0.9640	0.9847	(89)
MIT 2	18.0446	18.3624	18.7520	19.2167	19.5609	19.7577	19.8054	19.8025	19.7004	19.2559	18.5747	17.9968	(90)
Living area fraction	18.3959	18.7150	19.1079	19.5790	19.9380	20.1521	20.2124	20.2065	20.0852	19.6144	18.9245	18.3456	(91)
MIT	18.3959	18.7150	19.1079	19.5790	19.9380	20.1521	20.2124	20.2065	20.0852	19.6144	18.9245	18.3456	(92)
Temperature adjustment	18.3959	18.7150	19.1079	19.5790	19.9380	20.1521	20.2124	20.2065	20.0852	19.6144	18.9245	18.3456	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9752	0.9523	0.9176	0.8484	0.7364	0.5661	0.4025	0.4409	0.6622	0.8717	0.9561	0.9795	(94)
Useful gains	653.6914	789.1696	856.4689	871.9766	787.3900	593.2590	406.7729	424.2267	606.8748	698.9005	655.7453	616.8905	(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	1669.3600	1632.6153	1486.8462	1246.9686	960.1480	641.4956	417.3756	439.0880	693.8616	1050.6473	1383.3582	1661.4096	(97)
Space heating kWh	755.6574	566.7955	469.0007	269.9942	128.5319	0.0000	0.0000	0.0000	0.0000	261.6996	523.8813	777.1223	(98a)
Space heating requirement - total per year (kWh/year)												3752.6829	
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	755.6574	566.7955	469.0007	269.9942	128.5319	0.0000	0.0000	0.0000	0.0000	261.6996	523.8813	777.1223	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3752.6829	
Space heating per m2												(98c) / (4) =	43.2835 (99)

8c. Space cooling requirement

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

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Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1086.0803	854.9994	876.6844	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8122	0.8771	0.8557	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	882.0733	749.9377	750.1923	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1179.2155	1137.8005	1083.4114	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	213.9424	288.5699	247.9151	0.0000	0.0000	0.0000	0.0000 (104)
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 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	53.4856	72.1425	61.9788	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												187.6068 (107)
Energy for space heating												43.2835 (99)
Energy for space cooling												2.1639 (108)
Total												45.4474 (109)
Fabric Energy Efficiency (TFEE)												45.4 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.8100 (5)

2. Ventilation rate

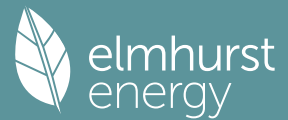
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1704 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.5000	(17)
Infiltration rate	0.3454	(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) =	0.2935 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.3743	0.3669	0.3596	0.3229	0.3156	0.2789	0.2789	0.2715	0.2935	0.3156	0.3302	0.3449 (22b)
	0.5700	0.5673	0.5647	0.5521	0.5498	0.5389	0.5389	0.5369	0.5431	0.5498	0.5545	0.5595 (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				
Ws				25.4300	0.9615	24.4519		(27)				
SD				2.1000	1.0000	2.1000		(26)				
Heatloss Floor 1				59.7000	0.0900	5.3730		(28a)				
EW	136.2000		27.5300	108.6700	0.1500	16.3005		(29a)				
Insulation at Ceiling	41.4000			41.4000	0.0900	3.7260		(30)				
Sloping Ceiling	19.8000			19.8000	0.0900	1.7820		(30)				
Total net area of external elements Aum(A, m2)				257.1000				(31)				
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	53.7334		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								185.0000 (35)				
Thermal bridges (User defined value 0.025 * total exposed area)								6.4275 (36)				
Point Thermal bridges							(36a) =	0.0000				
Total fabric heat loss							(33) + (36) + (36a) =	60.1609 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	44.1709	43.9601	43.7536	42.7833	42.6018	41.7567	41.7567	41.6002	42.0822	42.6018	42.9690	43.3529 (38)
Average = Sum(39)m / 12 =	104.3318	104.1211	103.9145	102.9442	102.7627	101.9176	101.9176	101.7611	102.2431	102.7627	103.1299	103.5139 (39)
												102.9434
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.2034	1.2009	1.1986	1.1874	1.1853	1.1755	1.1755	1.1737	1.1793	1.1853	1.1895	1.1939 (40)

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HLP (average)	31	28	31	30	31	30	31	31	30	31	30	1.1874
Days in mont												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers												
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths												
29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses												
41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386 (44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824 (45)
Energy content (annual)												Total = Sum(45)m = 2100.8276
Distribution loss	(46)m = 0.15 x (45)m											
32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7900 (48)
Temperature factor from Table 2b												0.7209 (49)
Enter (49) or (54) in (55)												0.5695 (55)
Total storage loss												
17.6548	15.9463	17.6548	17.0853	17.6548	17.0853	17.6548	17.6548	17.0853	17.6548	17.0853	17.6548	(56)
If cylinder contains dedicated solar storage												
17.6548	15.9463	17.6548	17.0853	17.6548	17.0853	17.6548	17.6548	17.0853	17.6548	17.0853	17.6548	(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												
235.5723	207.6966	219.1190	189.0783	180.8407	160.2992	156.3078	164.0202	167.4798	189.9265	205.8215	232.5373	(62)
WWHRS	-60.4992	-53.5060	-56.0284	-46.3938	-43.2373	-36.9985	-34.6802	-36.8789	-38.2801	-45.1280	-51.1245	-59.3789 (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	175.0731	154.1906	163.0906	142.6845	137.6034	123.3007	121.6276	127.1413	129.1998	144.7985	154.6970	173.1584 (64)
												Total per year (kWh/year) = Sum(64)m = 1746.5654 (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	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												
86.5814	76.5140	81.1107	70.8559	68.3832	61.2869	60.2260	62.7904	63.6744	71.4042	76.4231	85.5723	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
24.6531	21.8967	17.8076	13.4815	10.0776	8.5079	9.1931	11.9495	16.0386	20.3647	23.7687	25.3383	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
347.5730	351.1798	342.0909	322.7419	298.3173	275.3615	260.0257	256.4190	265.5078	284.8568	309.2815	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)												
116.3729	113.8602	109.0198	98.4110	91.9129	85.1206	80.9489	84.3956	88.4367	95.9734	106.1431	115.0165	(72)
Total internal gains	596.1998	594.5373	576.5190	542.2351	507.9084	473.5908	454.7684	457.3648	474.5838	508.7956	546.7940	580.1927 (73)

6. Solar gains												

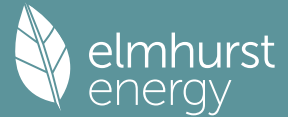
[Jan]												
			Area	Solar flux	g	FF		Access		Gains		
			m2	Table 6a	Specific data	Specific data		factor		W		
				W/m2	or Table 6b	or Table 6c		Table 6d				
North			3.6600	10.6334	0.6300	0.7000		0.7700		11.8939	(74)	
East			1.0300	19.6403	0.6300	0.7000		0.7700		6.1824	(76)	
South			15.4900	46.7521	0.6300	0.7000		0.7700		221.3217	(78)	
West			5.2500	19.6403	0.6300	0.7000		0.7700		31.5122	(80)	

Solar gains	270.9102	458.9364	621.7804	760.9916	844.4193	834.9868	806.3878	744.5412	669.9952	505.5097	324.0151	232.1559 (83)
Total gains	867.1100	1053.4737	1198.2994	1303.2268	1352.3277	1308.5776	1261.1562	1201.9060	1144.5790	1014.3053	870.8090	812.3486 (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	42.7043	42.7907	42.8758	43.2799	43.3564	43.7159	43.7159	43.7831	43.5767	43.3564	43.2020	43.0417
alpha	3.8470	3.8527	3.8584	3.8853	3.8904	3.9144	3.9144	3.9189	3.9051	3.8904	3.8801	3.8694
util living area	0.9645	0.9307	0.8740	0.7770	0.6410	0.4815	0.3515	0.3835	0.5770	0.8158	0.9378	0.9713 (86)
MIT	19.6070	19.9295	20.2928	20.6403	20.8627	20.9657	20.9921	20.9889	20.9303	20.6275	20.0486	19.5362 (87)
Th 2	19.9173	19.9193	19.9212	19.9301	19.9318	19.9396	19.9396	19.9411	19.9366	19.9318	19.9284	19.9249 (88)
util rest of house	0.9566	0.9165	0.8497	0.7373	0.5835	0.4079	0.2687	0.2979	0.5009	0.7726	0.9225	0.9648 (89)
MIT 2	18.3393	18.7382	19.1776	19.5843	19.8193	19.9190	19.9367	19.9366	19.8902	19.5846	18.8999	18.2562 (90)
Living area fraction												FLA = Living area / (4) = 0.3506 (91)
MIT	18.7838	19.1559	19.5686	19.9546	20.1852	20.2860	20.3068	20.3056	20.2549	19.9502	19.3027	18.7050 (92)

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Temperature adjustment												-0.1000
adjusted MIT	18.6838	19.0559	19.4686	19.8546	20.0852	20.1860	20.2068	20.2056	20.1549	19.8502	19.2027	18.6050 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9450	0.9027	0.8380	0.7342	0.5922	0.4254	0.2898	0.3196	0.5172	0.7689	0.9096	0.9542	(94)
Useful gains	819.3882	950.9853	1004.1895	956.8497	800.8245	556.7292	365.4999	384.1470	591.9533	779.9398	792.0975	775.1541	(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	1500.6859	1473.9249	1347.6306	1127.7088	861.6835	569.3136	367.5939	387.2601	619.0693	950.5803	1248.1471	1491.1180	(97)
Space heating kWh	506.8855	351.4154	255.5202	123.0185	45.2791	0.0000	0.0000	0.0000	0.0000	126.9565	328.3557	532.6771	(98a)
Space heating requirement - total per year (kWh/year)												2270.1080	
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	506.8855	351.4154	255.5202	123.0185	45.2791	0.0000	0.0000	0.0000	0.0000	126.9565	328.3557	532.6771	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2270.1080	
Space heating per m2										(98c) / (4) =		26.1835	(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 %)													249.9000 (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	506.8855	351.4154	255.5202	123.0185	45.2791	0.0000	0.0000	0.0000	0.0000	126.9565	328.3557	532.6771	(98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)	202.8353	140.6224	102.2490	49.2271	18.1189	0.0000	0.0000	0.0000	0.0000	50.8029	131.3948	213.1561	(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	175.0731	154.1906	163.0906	142.6845	137.6034	123.3007	121.6276	127.1413	129.1998	144.7985	154.6970	173.1584	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
(217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(217)
Fuel for water heating, kWh/month	99.9846	88.0586	93.1414	81.4874	78.5856	70.4173	69.4618	72.6107	73.7863	82.6948	88.3478	98.8911	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	21.5787	17.3113	15.5869	11.4196	8.8208	7.2067	8.0467	10.4594	13.5857	17.8251	20.1335	22.1785	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-52.6784	-75.4675	-108.5403	-119.3078	-125.0076	-113.3428	-111.7416	-105.7661	-94.2239	-82.8518	-57.7070	-45.4459	(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	-22.4513	-49.9024	-104.9791	-166.8503	-228.5165	-234.2277	-231.2357	-193.8949	-140.4708	-77.4170	-31.4077	-17.4249	(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												908.4066	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												997.4674	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												174.1529	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2590.8591	(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												-510.8323	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	908.4066	16.4900	149.7962	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)			164.4824	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)

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Energy for lighting	174.1529	16.4900	28.7178 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1092.0807	16.4900	-180.0841
PV Unit electricity exported	-1498.7784	5.5900	-83.7817
Total			-263.8658 (252)
Total energy cost			79.1306 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.2163 (257)
SAP value		96.4937
SAP rating (Section 12)		96 (258)
SAP band		A

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	908.4066	0.1565	142.1313 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	997.4674	0.1410	140.6644 (264)
Space and water heating			282.7957 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	174.1529	0.1443	25.1356 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1092.0807	0.1351	-147.5649
PV Unit electricity exported	-1498.7784	0.1243	-186.2700
Total			-333.8349 (269)
Total CO2, kg/year			-25.9036 (272)
CO2 emissions per m2			-0.3000 (273)
EI value			100.2636
EI rating			100 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	234.8100 (5)

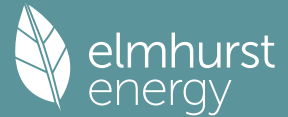
2. Ventilation rate

	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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1704 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3454 (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) = 0.2935 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.3082	0.2935	0.2935	0.2715	0.2715	0.2422	0.2495	0.2348	0.2422	0.2569	0.2569	0.2789 (22b)
Effective ac	0.5475	0.5431	0.5431	0.5369	0.5369	0.5293	0.5311	0.5276	0.5293	0.5330	0.5330	0.5389 (25)

3. Heat losses and heat loss parameter

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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							
Ws			25.4300	0.9615	24.4519		(27)
SD			2.1000	1.0000	2.1000		(26)
Heatloss Floor 1			59.7000	0.0900	5.3730		(28a)
EW	136.2000	27.5300	108.6700	0.1500	16.3005		(29a)
Insulation at Ceiling	41.4000		41.4000	0.0900	3.7260		(30)
Sloping Ceiling	19.8000		19.8000	0.0900	1.7820		(30)
Total net area of external elements Aum(A, m2)			257.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.7334		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 185.0000 (35)
Thermal bridges (User defined value 0.025 * total exposed area) 6.4275 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 60.1609 (37)

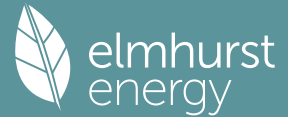
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.4244	Feb 42.0822	Mar 42.0822	Apr 41.6002	May 41.6002	Jun 41.0160	Jul 41.1558	Aug 40.8803	Sep 41.0160	Oct 41.2997	Nov 41.2997	Dec 41.7567
Heat transfer coeff	102.5853	102.2431	102.2431	101.7611	101.7611	101.1769	101.3167	101.0412	101.1769	101.4607	101.4607	101.9176
Average = Sum(39)m / 12 =												101.6787
HLP	Jan 1.1832	Feb 1.1793	Mar 1.1793	Apr 1.1737	May 1.1737	Jun 1.1670	Jul 1.1686	Aug 1.1654	Sep 1.1670	Oct 1.1702	Nov 1.1702	Dec 1.1755
HLP (average)												1.1728
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.5778
Hot water usage for mixer showers												
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths												
29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses												
41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813
Daily hot water use	Jan 137.5954	Feb 134.6574	Mar 131.0794	Apr 125.6386	May 121.2203	Jun 116.4703	Jul 114.6448	Aug 118.2073	Sep 121.9645	Oct 126.9513	Nov 132.4759	Dec 137.2386
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824
Energy content (annual)										Total = Sum(45)m =		2100.8276
Distribution loss (46)m = 0.15 x (45)m												
32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss (or HIU loss):												
Store volume												110.0000
a) If manufacturer declared loss factor is known (kWh/day):												0.7900
Temperature factor from Table 2b												0.7209
Enter (49) or (54) in (55)												0.5695
Total storage loss												
17.6548	15.9463	17.6548	17.0853	17.6548	17.0853	17.6548	17.6548	17.0853	17.6548	17.0853	17.6548	(56)
If cylinder contains dedicated solar storage												
17.6548	15.9463	17.6548	17.0853	17.6548	17.0853	17.6548	17.6548	17.0853	17.6548	17.0853	17.6548	(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	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
235.5723	207.6966	219.1190	189.0783	180.8407	160.2992	156.3078	164.4202	167.4798	189.9265	205.8215	232.5373	(62)
WWHRS	-60.4992	-53.5060	-56.0284	-46.3938	-43.2373	-36.9985	-34.6802	-36.8789	-38.2801	-45.1280	-51.1245	-59.3789
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
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
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
Output from w/h	175.0731	154.1906	163.0906	142.6845	137.6034	123.3007	121.6276	127.1413	129.1998	144.7985	154.6970	173.1584
Total per year (kWh/year) = Sum(64)m =												1746.5654
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
Heat gains from water heating, kWh/month												
86.5814	76.5140	81.1107	70.8559	68.3832	61.2869	60.2260	62.7904	63.6744	71.4042	76.4231	85.5723	(65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan 154.6682	Feb 154.6682	Mar 154.6682	Apr 154.6682	May 154.6682	Jun 154.6682	Jul 154.6682	Aug 154.6682	Sep 154.6682	Oct 154.6682	Nov 154.6682	Dec 154.6682
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
24.6531	21.8967	17.8076	13.4815	10.0776	8.5079	9.1931	11.9495	16.0386	20.3647	23.7687	25.3383	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
347.5730	351.1798	342.0909	322.7419	298.3173	275.3615	260.0257	256.4190	265.5078	284.8568	309.2815	332.2372	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	(71)
Water heating gains (Table 5)												
116.3729	113.8602	109.0198	98.4110	91.9129	85.1206	80.9489	84.3956	88.4367	95.9734	106.1431	115.0165	(72)
Total internal gains	596.1998	594.5373	576.5190	542.2351	507.9084	473.5908	454.7684	457.3648	474.5838	508.7956	546.7940	580.1927

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	3.6600	11.9814	0.6300	0.7000	0.7700	13.4018	(74)
East	1.0300	22.3313	0.6300	0.7000	0.7700	7.0295	(76)
South	15.4900	50.9848	0.6300	0.7000	0.7700	241.3594	(78)
West	5.2500	22.3313	0.6300	0.7000	0.7700	35.8299	(80)

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Solar gains	297.6205	453.4123	607.5414	769.9533	837.0370	888.2534	847.5116	796.3225	710.6698	533.2971	364.5772	252.6638 (83)
Total gains	893.8203	1047.9496	1184.0605	1312.1884	1344.9454	1361.8442	1302.2800	1253.6873	1185.2537	1042.0928	911.3711	832.8566 (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	43.4313	43.5767	43.5767	43.7831	43.7831	44.0359	43.9752	44.0950	44.0359	43.9128	43.9128	43.7159	
alpha	3.8954	3.9051	3.9051	3.9189	3.9189	3.9357	3.9317	3.9397	3.9357	3.9275	3.9275	3.9144	
util living area	0.9542	0.9211	0.8547	0.7331	0.5688	0.3667	0.2405	0.2570	0.4789	0.7603	0.9137	0.9627 (86)	
MIT	19.7980	20.0581	20.4148	20.7407	20.9240	20.9899	20.9986	20.9982	20.9702	20.7500	20.2467	19.7333 (87)	
Th 2	19.9334	19.9366	19.9366	19.9411	19.9411	19.9465	19.9452	19.9478	19.9465	19.9439	19.9439	19.9396 (88)	
util rest of house	0.9439	0.9048	0.8264	0.6873	0.5043	0.2915	0.1590	0.1730	0.3982	0.7072	0.8927	0.9541 (89)	
MIT 2	18.5897	18.9097	19.3351	19.7030	19.8853	19.9420	19.9450	19.9474	19.9301	19.7260	19.1522	18.5145 (90)	
Living area fraction									fLA = Living area / (4) =				0.3506 (91)
MIT	19.0134	19.3123	19.7137	20.0668	20.2495	20.3094	20.3144	20.3159	20.2948	20.0850	19.5360	18.9418 (92)	
Temperature adjustment												-0.1000	
adjusted MIT	18.9134	19.2123	19.6137	19.9668	20.1495	20.2094	20.2144	20.2159	20.1948	19.9850	19.4360	18.8418 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9315	0.8914	0.8167	0.6885	0.5175	0.3105	0.1799	0.1945	0.4177	0.7095	0.8806	0.9425 (94)
Useful gains	832.5832	934.1771	967.0766	903.4856	695.9470	422.8715	234.2610	243.7895	495.0842	739.3300	802.5163	784.9979 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1417.0500	1391.7690	1248.7643	1024.4131	727.5457	425.8983	234.4883	244.1014	505.3569	850.7524	1160.2992	1400.5337 (97)
Space heating kWh	434.8434	307.5017	209.5756	87.0678	23.5095	0.0000	0.0000	0.0000	0.0000	82.8982	257.6036	457.9586 (98a)
Space heating requirement - total per year (kWh/year)												1860.9586
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	434.8434	307.5017	209.5756	87.0678	23.5095	0.0000	0.0000	0.0000	0.0000	82.8982	257.6036	457.9586 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1860.9586
Space heating per m2										(98c) / (4) =		21.4643 (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 %)												249.9000 (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	434.8434	307.5017	209.5756	87.0678	23.5095	0.0000	0.0000	0.0000	0.0000	82.8982	257.6036	457.9586 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	174.0069	123.0499	83.8638	34.8411	9.4076	0.0000	0.0000	0.0000	0.0000	33.1726	103.0827	183.2568 (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	175.0731	154.1906	163.0906	142.6845	137.6034	123.3007	121.6276	127.1413	129.1998	144.7985	154.6970	173.1584 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	99.9846	88.0586	93.1414	81.4874	78.5856	70.4173	69.4618	72.6107	73.7863	82.6948	88.3478	98.8911 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	21.5787	17.3113	15.5869	11.4196	8.8208	7.2067	8.0467	10.4594	13.5857	17.8251	20.1335	22.1785 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-57.2547	-75.2923	-106.9705	-119.1874	-123.5319	-116.7944	-114.6258	-109.8412	-98.2264	-85.6136	-63.2711	-49.1029 (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	-26.9653	-51.2903	-106.2107	-175.4942	-231.3639	-256.7180	-249.9178	-215.6984	-155.8584	-87.2356	-39.1007	-20.6739 (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												744.6813 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.1000
Water heating fuel used												997.4674 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

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Total electricity for the above, kWh/year 0.0000 (231)
Electricity for lighting (calculated in Appendix L) 174.1529 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -2736.2395 (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 -819.9379 (238)

10a. Fuel costs - using BEDF prices (596)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	744.6813	27.6700	206.0533 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	997.4674	27.6700	275.9992 (247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	174.1529	27.6700	48.1881 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1119.7124	27.6700	-309.8244
PV Unit electricity exported	-1616.5271	5.8100	-93.9202
Total			-403.7446 (252)
Total energy cost			126.4960 (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	744.6813	0.1572	117.0542 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	997.4674	0.1410	140.6644 (264)
Space and water heating			257.7186 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	174.1529	0.1443	25.1356 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1119.7124	0.1351	-151.3216
PV Unit electricity exported	-1616.5271	0.1240	-200.4420
Total			-351.7636 (269)
Total CO2, kg/year			-68.9094 (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	744.6813	1.5819	1178.0102 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	997.4674	1.5215	1517.5988 (278)
Space and water heating			2695.6090 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	174.1529	1.5338	267.1215 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1119.7124	1.4995	-1679.0004
PV Unit electricity exported	-1616.5271	0.4550	-735.5215
Total			-2414.5219 (283)
Total Primary energy kWh/year			548.2086 (286)

SAP 10 EPC IMPROVEMENTS

OHW - Be Green

Current energy efficiency rating: A 96
Current environmental impact rating: A 100

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

Recommended measures: SAP change Cost change CO2 change
N Solar water heating + 1.5 -£ 61 -33 kg (47.2%)

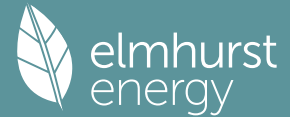
Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£61 0.38 kg/m²	A 98	A 101
Total Savings	£61 0.38 kg/m²		

Potential energy efficiency rating: A 98
Potential environmental impact rating: A 101

Fuel prices for cost data on this page from database revision number 596 TEST (30 Jun 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):
Electricity Current £530 Potential £457 Saving £73

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Space heating	£206	£228	-£22
Water heating	£276	£180	£96
Lighting	£48	£48	£0
Generated (PV)	-£404	-£392	-£12
Total cost of fuels	£126	£65	£61
Total cost of uses	£126	£64	£62
Delivered energy	-9 kWh/m²	-13 kWh/m²	3 kWh/m²
Carbon dioxide emissions	-0.1 tonnes	-0.1 tonnes	0.0 tonnes
CO2 emissions per m²	-1 kg/m²	-1 kg/m²	0 kg/m²
Primary energy	6 kWh/m²	3 kWh/m²	4 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	234.8100 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 40.0000 / (5) = 0.1704 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3454 (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) = 0.2935 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3743	0.3669	0.3596	0.3229	0.3156	0.2789	0.2789	0.2715	0.2935	0.3156	0.3302	0.3449 (22b)
Effective ac	0.5700	0.5673	0.5647	0.5521	0.5498	0.5389	0.5389	0.5369	0.5431	0.5498	0.5545	0.5595 (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					
Ws			25.4300	0.9615	24.4519		(27)					
SD			2.1000	1.0000	2.1000		(26)					
Heatloss Floor 1			59.7000	0.0900	5.3730		(28a)					
EW	136.2000	27.5300	108.6700	0.1500	16.3005		(29a)					
Insulation at Ceiling	41.4000		41.4000	0.0900	3.7260		(30)					
Sloping Ceiling	19.8000		19.8000	0.0900	1.7820		(30)					
Total net area of external elements Aum(A, m2)			257.1000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.7334		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							185.0000 (35)					
Thermal bridges (User defined value 0.025 * total exposed area)							6.4275 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	60.1609 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 44.1709	Feb 43.9601	Mar 43.7536	Apr 42.7833	May 42.6018	Jun 41.7567	Jul 41.7567	Aug 41.6002	Sep 42.0822	Oct 42.6018	Nov 42.9690	Dec 43.3529 (38)
Heat transfer coeff	104.3318	104.1211	103.9145	102.9442	102.7627	101.9176	101.9176	101.7611	102.2431	102.7627	103.1299	103.5139 (39)
Average = Sum(39)m / 12 =												102.9434
HLP	Jan 1.2034	Feb 1.2009	Mar 1.1986	Apr 1.1874	May 1.1853	Jun 1.1755	Jul 1.1755	Aug 1.1737	Sep 1.1793	Oct 1.1853	Nov 1.1895	Dec 1.1939 (40)
HLP (average)												1.1874
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers												67.1826 (42a)
Hot water usage for baths												29.0266 (42b)
Hot water usage for other uses												41.0293 (42c)
Average daily hot water use (litres/day)												126.4813 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386 (44)
Energy content (annual)	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	214.8824 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2100.8276
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7900 (48)
Temperature factor from Table 2b												0.7209 (49)
Enter (49) or (54) in (55)												0.5695 (55)
Total storage loss	17.6548	15.9463	17.6548	17.0853	17.6548	17.0853	17.6548	17.6548	17.0853	17.6548	17.0853	17.6548 (56)
If cylinder contains dedicated solar storage	17.6548	15.9463	17.6548	17.0853	17.6548	17.0853	17.6548	17.6548	17.0853	17.6548	17.0853	17.6548 (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	235.5723	207.6966	219.1190	189.0783	180.8407	160.2992	156.3078	164.0202	167.4798	189.9265	205.8215	232.5373 (62)
WWHRS	-60.4992	-53.5060	-56.0284	-46.3938	-43.2373	-36.9985	-34.6802	-36.8789	-38.2801	-45.1280	-51.1245	-59.3789 (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)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												557.1263 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												557.1263
Solar input	-0.0000	-16.3589	-54.5482	-72.3414	-91.5252	-83.7244	-82.8850	-74.3814	-53.1759	-28.1860	-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	175.0731	137.8317	108.5424	70.3432	46.0782	39.5763	38.7426	52.7599	76.0239	116.6125	154.6970	173.1584 (64)
												Total per year (kWh/year) = Sum(64)m = 1189.4391 (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	86.5814	76.5140	81.1107	70.8559	68.3832	61.2869	60.2260	62.7904	63.6744	71.4042	76.4231	85.5723 (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	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.6531	21.8967	17.8076	13.4815	10.0776	8.5079	9.1931	11.9495	16.0386	20.3647	23.7687	25.3383 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1798	342.0909	322.7419	298.3173	275.3615	260.0257	256.4190	265.5078	284.8568	309.2815	332.2372 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)
Water heating gains (Table 5)	116.3729	113.8602	109.0198	98.4110	91.9129	85.1206	80.9489	84.3956	88.4367	95.9734	106.1431	115.0165 (72)
Total internal gains	596.1998	594.5373	576.5190	542.2351	507.9084	473.5908	454.7684	457.3648	474.5838	508.7956	546.7940	580.1927 (73)

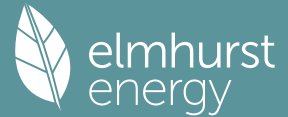
6. Solar gains

[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				3.6600	10.6334		0.6300		0.7000		0.7700		11.8939 (74)
East				1.0300	19.6403		0.6300		0.7000		0.7700		6.1824 (76)
South				15.4900	46.7521		0.6300		0.7000		0.7700		221.3217 (78)
West				5.2500	19.6403		0.6300		0.7000		0.7700		31.5122 (80)
Solar gains	270.9102	458.9364	621.7804	760.9916	844.4193	834.9868	806.3878	744.5412	669.9952	505.5097	324.0151	232.1559	(83)
Total gains	867.1100	1053.4737	1198.2994	1303.2268	1352.3277	1308.5776	1261.1562	1201.9060	1144.5790	1014.3053	870.8090	812.3486	(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	42.7043	42.7907	42.8758	43.2799	43.3564	43.7159	43.7159	43.7831	43.5767	43.3564	43.2020	43.0417
alpha	3.8470	3.8527	3.8584	3.8853	3.8904	3.9144	3.9144	3.9189	3.9051	3.8904	3.8801	3.8694

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util living area	0.9645	0.9307	0.8740	0.7770	0.6410	0.4815	0.3515	0.3835	0.5770	0.8158	0.9378	0.9713 (86)
MIT	19.6070	19.9295	20.2928	20.6403	20.8627	20.9657	20.9921	20.9889	20.9303	20.6275	20.0486	19.5362 (87)
Th 2	19.9173	19.9193	19.9212	19.9301	19.9318	19.9396	19.9396	19.9411	19.9366	19.9318	19.9284	19.9249 (88)
util rest of house												
	0.9566	0.9165	0.8497	0.7373	0.5835	0.4079	0.2687	0.2979	0.5009	0.7726	0.9225	0.9648 (89)
MIT 2	18.3393	18.7382	19.1776	19.5843	19.8193	19.9190	19.9367	19.9366	19.8902	19.5846	18.8999	18.2562 (90)
Living area fraction									FLA = Living area / (4) =			0.3506 (91)
MIT	18.7838	19.1559	19.5686	19.9546	20.1852	20.2860	20.3068	20.3056	20.2549	19.9502	19.3027	18.7050 (92)
Temperature adjustment												-0.1000
adjusted MIT	18.6838	19.0559	19.4686	19.8546	20.0852	20.1860	20.2068	20.2056	20.1549	19.8502	19.2027	18.6050 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9450	0.9027	0.8380	0.7342	0.5922	0.4254	0.2898	0.3196	0.5172	0.7689	0.9096	0.9542 (94)
Useful gains	819.3882	950.9853	1004.1895	956.8497	800.8245	556.7292	365.4999	384.1470	591.9533	779.9398	792.0975	775.1541 (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	1500.6859	1473.9249	1347.6306	1127.7088	861.6835	569.3136	367.5939	387.2601	619.0693	950.5803	1248.1471	1491.1180 (97)
Space heating kWh	506.8855	351.4154	255.5202	123.0185	45.2791	0.0000	0.0000	0.0000	0.0000	126.9565	328.3557	532.6771 (98a)
Space heating requirement - total per year (kWh/year)												2270.1080
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	506.8855	351.4154	255.5202	123.0185	45.2791	0.0000	0.0000	0.0000	0.0000	126.9565	328.3557	532.6771 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2270.1080
Space heating per m2										(98c) / (4) =		26.1835 (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 %)												249.9000 (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	506.8855	351.4154	255.5202	123.0185	45.2791	0.0000	0.0000	0.0000	0.0000	126.9565	328.3557	532.6771 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	202.8353	140.6224	102.2490	49.2271	18.1189	0.0000	0.0000	0.0000	0.0000	50.8029	131.3948	213.1561 (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	175.0731	137.8317	108.5424	70.3432	46.0782	39.5763	38.7426	52.7599	76.0239	116.6125	154.6970	173.1584 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	99.9846	78.7160	61.9888	40.1731	26.3154	22.6021	22.1260	30.1313	43.4174	66.5977	88.3478	98.8911 (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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945 (231)
Lighting	21.5787	17.3113	15.5869	11.4196	8.8208	7.2067	8.0467	10.4594	13.5857	17.8251	20.1335	22.1785 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-52.7857	-75.3411	-106.5916	-114.3425	-115.6525	-103.5605	-102.1122	-98.4373	-90.5334	-82.1601	-57.8811	-45.5307 (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	-22.3441	-50.0289	-106.9278	-171.8155	-237.8717	-244.0101	-240.8651	-201.2237	-144.1613	-78.1088	-31.2336	-17.3401 (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												908.4066 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.1000
Water heating fuel used												679.2913 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
pump for solar water heating												80.0000 (230g)
Total electricity for the above, kWh/year												80.0000 (231)
Electricity for lighting (calculated in Appendix L)												174.1529 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2590.8591 (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												-749.0083 (238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	908.4066	16.4900	149.7962 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	679.2913	16.4900	112.0151 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	174.1529	16.4900	28.7178 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1044.9285	16.4900	-172.3087
PV Unit electricity exported	-1545.9306	5.5900	-86.4175
Total			-258.7262 (252)
Total energy cost			44.9950 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.1230 (257)
SAP value		98.0063
SAP rating (Section 12)		98 (258)
SAP band		A

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	908.4066	0.1565	142.1313 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	679.2913	0.1471	99.9516 (264)
Space and water heating			242.0829 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	174.1529	0.1443	25.1356 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1044.9285	0.1357	-141.7513
PV Unit electricity exported	-1545.9306	0.1240	-191.6402
Total			-333.3915 (269)
Total CO2, kg/year			-55.0760 (272)
CO2 emissions per m2			-0.6400 (273)
EI value			100.5604
EI rating			101 (274)
EI band			A

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

1. Overall dwelling characteristics

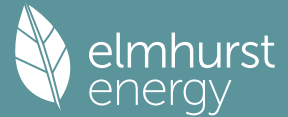
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	60.2000 (1b)	x 2.8000 (2b)	= 168.5600 (1b) - (3b)
First floor	26.5000 (1c)	x 2.5000 (2c)	= 66.2500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	234.8100 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1704 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.3454 (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) = 0.2935 (21)

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

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Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
Effective ac	0.3082	0.2935	0.2935	0.2715	0.2715	0.2422	0.2495	0.2348	0.2422	0.2569	0.2569	0.2789 (22b)
	0.5475	0.5431	0.5431	0.5369	0.5369	0.5293	0.5311	0.5276	0.5293	0.5330	0.5330	0.5389 (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							
Ws			25.4300	0.9615	24.4519		(27)
SD			2.1000	1.0000	2.1000		(26)
Heatloss Floor 1			59.7000	0.0900	5.3730		(28a)
EW	136.2000	27.5300	108.6700	0.1500	16.3005		(29a)
Insulation at Ceiling	41.4000		41.4000	0.0900	3.7260		(30)
Sloping Ceiling	19.8000		19.8000	0.0900	1.7820		(30)
Total net area of external elements Aum(A, m2)			257.1000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.7334		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							185.0000 (35)
Thermal bridges (User defined value 0.025 * total exposed area)							6.4275 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	60.1609 (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	42.4244	42.0822	42.0822	41.6002	41.6002	41.0160	41.1558	40.8803	41.0160	41.2997	41.2997	41.7567 (38)
Heat transfer coeff	102.5853	102.2431	102.2431	101.7611	101.7611	101.1769	101.3167	101.0412	101.1769	101.4607	101.4607	101.9176 (39)
Average = Sum(39)m / 12 =												101.6787
HLP	1.1832	1.1793	1.1793	1.1737	1.1737	1.1670	1.1686	1.1654	1.1670	1.1702	1.1702	1.1755 (40)
HLP (average)												1.1728
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

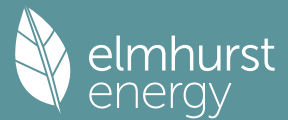
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5778 (42)
Hot water usage for mixer showers												
67.4410	66.4275	64.9507	62.1249	60.0396	57.7140	56.3922	57.8579	59.4646	61.9615	64.8480	67.1826	(42a)
Hot water usage for baths												
29.1251	28.6925	28.0834	26.9603	26.1193	25.1868	24.6831	25.2880	25.9466	26.9444	28.0906	29.0266	(42b)
Hot water usage for other uses												
41.0293	39.5373	38.0453	36.5534	35.0614	33.5694	33.5694	35.0614	36.5534	38.0453	39.5373	41.0293	(42c)
Average daily hot water use (litres/day)												126.4813 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
137.5954	134.6574	131.0794	125.6386	121.2203	116.4703	114.6448	118.2073	121.9645	126.9513	132.4759	137.2386	(44)
Energy conte	217.9175	191.7503	201.4642	171.9929	163.1858	143.2138	138.6529	146.3653	150.3945	172.2716	188.7362	(45)
Energy content (annual)										Total = Sum(45)m =	2100.8276	
Distribution loss (46)m = 0.15 x (45)m												
32.6876	28.7625	30.2196	25.7989	24.4779	21.4821	20.7979	21.9548	22.5592	25.8407	28.3104	32.2324	(46)
Water storage loss (or HIU loss):												
Store volume												110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.7900 (48)
Temperature factor from Table 2b												0.7209 (49)
Enter (49) or (54) in (55)												0.5695 (55)
Total storage loss												
17.6548	15.9463	17.6548	17.0853	17.6548	17.0853	17.6548	17.6548	17.0853	17.6548	17.0853	17.6548	(56)
If cylinder contains dedicated solar storage												
17.6548	15.9463	17.6548	17.0853	17.6548	17.0853	17.6548	17.6548	17.0853	17.6548	17.0853	17.6548	(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	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
235.5723	207.6966	219.1190	189.0783	180.8407	160.2992	156.3078	164.0202	167.4798	189.9265	205.8215	232.5373	(62)
WWHRS	-60.4992	-53.5060	-56.0284	-46.3938	-43.2373	-36.9985	-34.6802	-36.8789	-38.2801	-45.1280	-51.1245	-59.3789 (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)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												604.9047 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												604.9047
Solar input	-0.0000	-17.6014	-55.4625	-75.9557	-93.2131	-90.8902	-88.9738	-82.6234	-60.3735	-34.2967	-5.5145	-0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
175.0731	136.5892	107.6281	66.7288	44.3903	32.4105	32.6538	44.5179	68.8263	110.5019	149.1826	173.1584	(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)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
86.5814	76.5140	81.1107	70.8559	68.3832	61.2869	60.2260	62.7904	63.6744	71.4042	76.4231	85.5723	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682	154.6682 (66)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.6531	21.8967	17.8076	13.4815	10.0776	8.5079	9.1931	11.9495	16.0386	20.3647	23.7687	25.3383 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.5730	351.1798	342.0909	322.7419	298.3173	275.3615	260.0257	256.4190	265.5078	284.8568	309.2815	332.2372 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446	53.0446 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122	-103.1122 (71)
Water heating gains (Table 5)	116.3729	113.8602	109.0198	98.4110	91.9129	85.1206	80.9489	84.3956	88.4367	95.9734	106.1431	115.0165 (72)
Total internal gains	596.1998	594.5373	576.5190	542.2351	507.9084	473.5908	454.7684	457.3648	474.5838	508.7956	546.7940	580.1927 (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					3.6600	11.9814	0.6300	0.7000			0.7700	13.4018 (74)
East					1.0300	22.3313	0.6300	0.7000			0.7700	7.0295 (76)
South					15.4900	50.9848	0.6300	0.7000			0.7700	241.3594 (78)
West					5.2500	22.3313	0.6300	0.7000			0.7700	35.8299 (80)
Solar gains	297.6205	453.4123	607.5414	769.9533	837.0370	888.2534	847.5116	796.3225	710.6698	533.2971	364.5772	252.6638 (83)
Total gains	893.8203	1047.9496	1184.0605	1312.1884	1344.9454	1361.8442	1302.2800	1253.6873	1185.2537	1042.0928	911.3711	832.8566 (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	43.4313	43.5767	43.5767	43.7831	43.7831	44.0359	43.9752	44.0950	44.0359	43.9128	43.9128	43.7159
alpha	3.8954	3.9051	3.9051	3.9189	3.9189	3.9357	3.9317	3.9397	3.9357	3.9275	3.9275	3.9144
util living area	0.9542	0.9211	0.8547	0.7331	0.5688	0.3667	0.2405	0.2570	0.4789	0.7603	0.9137	0.9627 (86)
MIT	19.7980	20.0581	20.4148	20.7407	20.9240	20.9899	20.9986	20.9982	20.9702	20.7500	20.2467	19.7333 (87)
Th 2	19.9334	19.9366	19.9366	19.9411	19.9411	19.9465	19.9452	19.9478	19.9465	19.9439	19.9439	19.9396 (88)
util rest of house	0.9439	0.9048	0.8264	0.6873	0.5043	0.2915	0.1590	0.1730	0.3982	0.7072	0.8927	0.9541 (89)
MIT 2	18.5897	18.9097	19.3351	19.7030	19.8853	19.9420	19.9450	19.9474	19.9301	19.7260	19.1522	18.5145 (90)
Living area fraction									fLA = Living area / (4) =			0.3506 (91)
MIT	19.0134	19.3123	19.7137	20.0668	20.2495	20.3094	20.3144	20.3159	20.2948	20.0850	19.5360	18.9418 (92)
Temperature adjustment												-0.1000
adjusted MIT	18.9134	19.2123	19.6137	19.9668	20.1495	20.2094	20.2144	20.2159	20.1948	19.9850	19.4360	18.8418 (93)

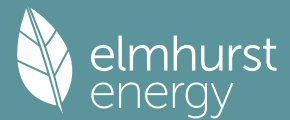
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9315	0.8914	0.8167	0.6885	0.5175	0.3105	0.1799	0.1945	0.4177	0.7095	0.8806	0.9425 (94)
Useful gains	832.5832	934.1771	967.0766	903.4856	695.9470	422.8715	234.2610	243.7895	495.0842	739.3300	802.5163	784.9979 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1417.0500	1391.7690	1248.7643	1024.4131	727.5457	425.8983	234.4883	244.1014	505.3569	850.7524	1160.2992	1400.5337 (97)
Space heating kWh	434.8434	307.5017	209.5756	87.0678	23.5095	0.0000	0.0000	0.0000	0.0000	82.8982	257.6036	457.9586 (98a)
Space heating requirement - total per year (kWh/year)												1860.9586
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	434.8434	307.5017	209.5756	87.0678	23.5095	0.0000	0.0000	0.0000	0.0000	82.8982	257.6036	457.9586 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1860.9586
Space heating per m2										(98c) / (4) =		21.4643 (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 %)												249.9000 (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	434.8434	307.5017	209.5756	87.0678	23.5095	0.0000	0.0000	0.0000	0.0000	82.8982	257.6036	457.9586 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	174.0069	123.0499	83.8638	34.8411	9.4076	0.0000	0.0000	0.0000	0.0000	33.1726	103.0827	183.2568 (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	175.0731	136.5892	107.6281	66.7288	44.3903	32.4105	32.6538	44.5179	68.8263	110.5019	149.1826	173.1584 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	99.9846	78.0064	61.4666	38.1090	25.3514	18.5097	18.6487	25.4243	39.3069	63.1079	85.1985	98.8911 (219)
Space cooling fuel requirement												

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(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	(231)
Lighting	21.5787	17.3113	15.5869	11.4196	8.8208	7.2067	8.0467	10.4594	13.5857	17.8251	20.1335	22.1785	22.1785	(232)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-57.3878	-75.1286	-104.8886	-113.5189	-113.6731	-105.2369	-103.5094	-100.7916	-93.4959	-84.5094	-63.3885	-49.2073	-49.2073	(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	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	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-26.8323	-51.4540	-108.2926	-181.1627	-241.2227	-268.2754	-261.0342	-224.7480	-160.5889	-88.3398	-38.9832	-20.5695	-20.5695	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													744.6813	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													175.1000	
Water heating fuel used													652.0050	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
pump for solar water heating													80.0000	(230g)
Total electricity for the above, kWh/year													80.0000	(231)
Electricity for lighting (calculated in Appendix L)													174.1529	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2736.2395	(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													-1085.4003	(238)

10a. Fuel costs - using BEDF prices (596)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	744.6813	27.6700	206.0533	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	652.0050	27.6700	180.4098	(247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000	(249a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	27.6700	22.1360	(249)
Energy for lighting	174.1529	27.6700	48.1881	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1064.7362	27.6700	-294.6125	
PV Unit electricity exported	-1671.5032	5.8100	-97.1143	
Total			-391.7268	(252)
Total energy cost			65.0603	(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	744.6813	0.1572	117.0542	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	652.0050	0.1480	96.4799	(264)
Space and water heating			213.5341	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	174.1529	0.1443	25.1356	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1064.7362	0.1358	-144.5597	
PV Unit electricity exported	-1671.5032	0.1236	-206.6721	
Total			-351.2318	(269)
Total CO2, kg/year			-101.4651	(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	744.6813	1.5819	1178.0102	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	652.0050	1.5475	1008.9456	(278)
Space and water heating			2186.9557	(279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240	(281)
Energy for lighting	174.1529	1.5338	267.1215	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1064.7362	1.5019	-1599.0752	
PV Unit electricity exported	-1671.5032	0.4537	-758.3489	
Total			-2357.4241	(283)
Total Primary energy kWh/year			217.6770	(286)

Predicted Energy Assessment

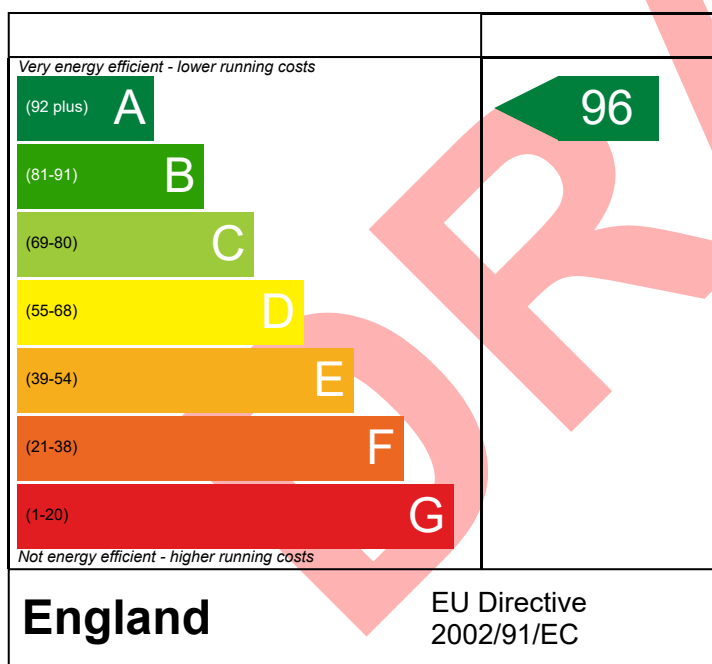


Dwelling type: House, Detached
Date of assessment: 14/07/2026
SAP Version: 10.2
Produced by: Samuel Westover
Total floor area: 86.7 m²
DRRN:

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.

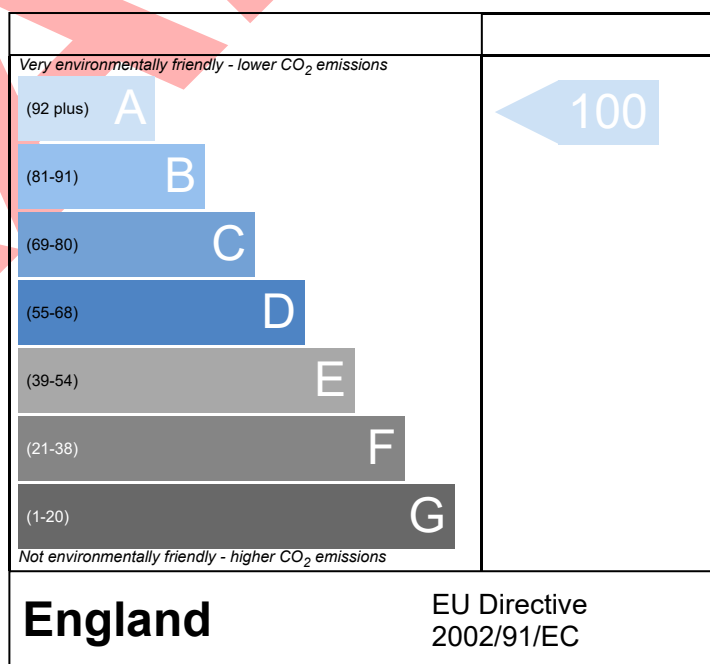
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

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 (CO₂) Rating



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

Summary for Input Data



Plot Reference	OHW		Issued on Date	14/07/2026
Assessment Reference	OHW - Be Green	Plot Type Ref		
Plot Address			SAP Version	10.2

SAP Rating	96 A	DER	-0.20	TER	11.61
Environmental	100 A	% DER < TER			101.72
CO ₂ Emissions (t/year)	-0.07	DFEE	34.30	TFEE	45.45
Compliance Check	See BREL	% DFEE < TFEE			24.53
% DPER < TPER	81.37	DPER	11.35	TPER	60.93

Assessor Details	Mr. Samuel Westover	Assessor ID	AX13-0001
Client			

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

Orientation	North	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
2.0 Number of Storeys	2	
3.0 Date Built	2026	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Enter TMP value	
Thermal Mass	185.00	kJ/m²

7.0 Electricity Tariff	Standard
Smart electricity meter fitted	Yes
Smart gas meter fitted	Yes

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	36.50 m	60.20 m ²	2.80 m
		13.60 m	26.50 m ²	2.50 m

8.0 Living Area	30.40	m ²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	EW	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.15		136.20	108.67	0.00	None	27.53	Calculate Wall Area

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	Insulation at Ceiling	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	41.40	41.40	None	0.00	Enter Gross Area	0.00
	Sloping Ceiling	External Slope Roof	Plasterboard, insulated slope	0.09	9.00	19.80	19.80	None	0.00	Enter Gross Area	0.00

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
	Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.09	None	0.00	75.00	59.70

12.0 Opening Types	Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
	Ws	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.00
	SD	Manufacturer	Solid Door				0.00			1.00

13.0 Openings	Name	Opening Type	Location	Orientation	Area (m ²)	Pitch
	S	Ws	EW	South	15.49	
	N	Ws	EW	North	3.66	
	FD	SD	EW	North	2.10	

Summary for Input Data

W E	Ws Ws	EW EW	West East	5.25 1.03
--------	----------	----------	--------------	--------------

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

17.0 Thermal Bridging	User Input
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17.1 List of Bridges						
Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported	
E1 Steel lintel with perforated steel base plate		16.39			Yes	
E3 Sill		15.39			Yes	
E4 Jamb		29.91			Yes	
E5 Ground floor (normal)		36.50			Yes	
E6 Intermediate floor within a dwelling		13.60			Yes	
E16 Corner (normal)		21.20			Yes	
E10 Eaves (insulation at ceiling level)		18.40			No	
E12 Gable (insulation at ceiling level)		10.00			No	
E13 Gable (insulation at rafter level)		4.60			No	
E14 Flat roof		8.50			No	

Y-value	0.03	W/m²K
Description	RCDs	

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	4
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System	No
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22.0 Pressure Testing	
Designed AP ₅₀	3.50 m³/(h.m²) @ 50 Pa
Test Method	Blower Door

22.0 Lighting											
No Fixed Lighting	No										
	<table border="1"> <tr> <td>Name</td> <td>Efficacy</td> <td>Power</td> <td>Capacity</td> <td>Count</td> </tr> <tr> <td>Lighting 1</td> <td>120.00</td> <td>5.00</td> <td>600.00</td> <td>35</td> </tr> </table>	Name	Efficacy	Power	Capacity	Count	Lighting 1	120.00	5.00	600.00	35
Name	Efficacy	Power	Capacity	Count							
Lighting 1	120.00	5.00	600.00	35							

24.0 Main Heating 1	
Percentage of Heat	100.00 %
Fuel Type	Electricity
SAP Code	214
In Winter	249.90
In Summer	175.10
Controls SAP Code	2207
Controls description	Time and temperature zone control by arrangement
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in Wood

Summary for Input Data

Flow Temperature

Flow Temperature Value

25.0 Main Heating 2

26.0 Heat Networks

27.0 Secondary Heating

28.0 Water Heating

Water Heating

SAP Code

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

Cold Water Source

Bath Count

Supplementary Immersion

Immersion Only Heating Hot Water

28.1 Showers						
Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To	
s1	Vented hot water system	8.00		Yes	Instantaneous System 1	
s2	Vented hot water system	8.00		Yes	Instantaneous System 1	

28.3 Waste Water Heat Recovery System Instantaneous System 1

Database ID

Brand Model

Details

29.0 Hot Water Cylinder

Cylinder Stat

Cylinder In Heated Space

Independent Time Control

Insulation Type

Cylinder Volume L

Loss kWh/day

Pipes insulation

31.0 Thermal Store

Thermal Store Pipework

In Airing Cupboard

32.0 Photovoltaic Unit

Export Capable Meter?

Connected To Dwelling

Diverter

Battery Capacity [kWh]

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

34.0 Small-scale Hydro

Summary for Input Data



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
Solar water heating	£4,000 - £7,000	£61	A 98	A 101
Photovoltaic			0	0
Wind turbine			0	0

Energy Report



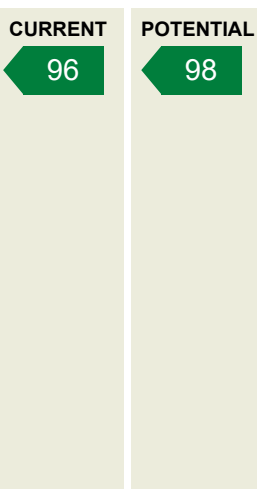
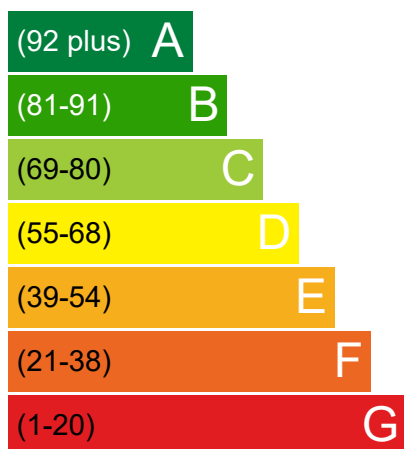
Dwelling Address	
Reference	OHW-OHW - Be Green
SAP Version	10.2
Assessment Date	06/07/2026
Submission Date	
Property Type	House, Detached
Total Floor Area	87

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

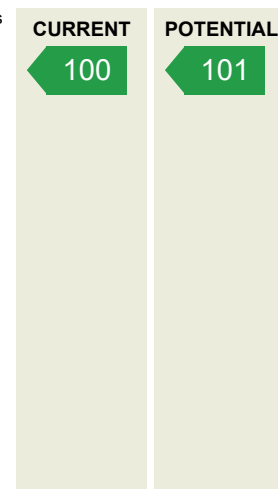
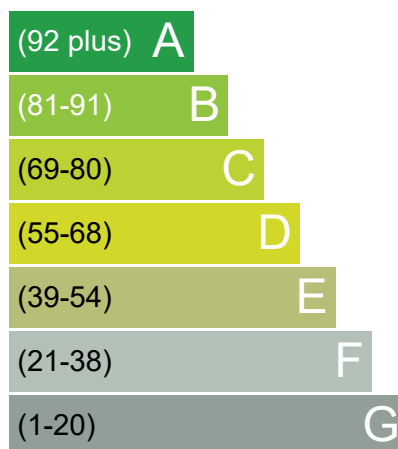
Energy Efficiency Rating

Most energy efficient - lower running costs



Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home

	Primary Energy	Energy	Carbon	Cost	HTC
CURRENT	6.32 kWh	-820 kWh	-69 kg	126.50 £	103 W/K
POTENTIAL	2.51 kWh	-1085 kWh	-101 kg	65.06 £	103 W/K

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.15 W/m ² K	Very Good
Roof	Average thermal transmittance 0.09 W/m ² K	Very Good
Floor	Average thermal transmittance 0.09 W/m ² K	Very Good
Windows	High performance glazing	Very Good
Main heating	Air source heat pump, underfloor, electric	Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system, waste water heat recovery	Good
Lighting	Excellent lighting efficiency	Very Good
Air tightness	Air permeability [AP50] = 3.5 m ³ /h.m ² (assumed)	Good

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
Solar water heating	£61	A 98	£4,000 - £7,000	£61	A 101

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		£48	£48	
Heating		£206	£228	
Hot Water		£276	£180	
New Technologies e.g. Impact of PV		-(£404)	-(£392)	
TOTAL		£126	£65	

Estimated energy use and potential savings



Space Heating

745
kWh per year



Water Heating

997
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 (CO ₂)	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.