

Summary for Input Data



Plot Reference	SAP 1033 Plot 2		Issued on Date	07/12/2025
Assessment Reference	Rev A	Plot Type Ref		
Plot Address	L/A Appletree Cottage, Winchester Road, Botley, Hampshire, SO32 2DH		SAP Version	10.2

SAP Rating	92 A	DER	9.73	TER	10.45
Environmental	92 A	% DER < TER			6.89
CO ₂ Emissions (t/year)	0.67	DFEE	25.10	TFEE	31.88
Compliance Check	See BREL	% DFEE < TFEE			21.27
% DPER < TPER	5.46	DPER	51.41	TPER	54.38

Assessor Details	Mr. Tobias Whiting	Assessor ID	E477-0001
Client			

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

Orientation	East	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Mid-Terrace	
2.0 Number of Storeys	2	
3.0 Date Built	2025	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	205.38	kJ/m²

7.0 Electricity Tariff	Standard
Smart electricity meter fitted	No
Smart gas meter fitted	No

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	9.80 m	41.94 m²	2.40 m
		9.80 m	41.94 m²	2.70 m

8.0 Living Area	18.41	m²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
	External Wall 1	Cavity Wall	Other	0.18	43.49	49.98	33.50	0.00	None	16.48	Calculate Wall Area

9.1 Party Walls	Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
	Party Wall 1	Solid Wall	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	45.00	0.00	None
	Party Wall 2	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	45.00	0.00	None

9.2 Internal Walls	Description	Construction	Kappa (kJ/m²K)	Area (m²)
	Internal Wall 1	Plasterboard on timber frame	9.00	54.19
	Internal Wall 2	Plasterboard on timber frame	9.00	74.40

10.0 External Roofs	Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	External Roof 1	External Plane Roof	Other	0.09	10.37	41.94	41.94	None	0.00	Calculate Wall Area	0.00

10.2 Internal Ceilings	Description	Storey	Construction	Kappa	Area (m²)
	Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	9.00	41.94

11.0 Heat Loss Floors

Summary for Input Data



Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.12	None	0.00	75.00	41.94

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	41.94

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.1			0.63		0.70	1.10
Fully Glazed Door/Win	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Elevation	Front Door	External Wall 1	East	2.12	
Front Elevation	Fully Glazed Door/Win	External Wall 1	East	4.11	
Rear Elevation	Fully Glazed Door/Win	External Wall 1	West	10.25	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	10.57	0.00	0.00	No
E3 Sill	Independently assessed	6.05	0.00	0.00	No
E4 Jamb	Independently assessed	21.64	0.00	0.00	No
E5 Ground floor (normal)	Independently assessed	9.80	0.00	0.00	No
E6 Intermediate floor within a dwelling	Independently assessed	9.80	0.00	0.00	No
E10 Eaves (insulation at ceiling level)	Independently assessed	9.80	0.00	0.00	No
E18 Party wall between dwellings	Independently assessed	20.40	0.00	0.00	No
P1 Party wall - Ground floor	Independently assessed	17.08	0.00	0.00	No
P2 Party wall - Intermediate floor within a dwelling	Independently assessed	17.08	0.00	0.00	No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	17.08	0.00	0.00	No

Y-value W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys

Number of open flues

Number of chimneys/flues attached to closed fire

Number of flues attached to solid fuel boiler

Number of flues attached to other heater

Number of blocked chimneys

Number of intermittent extract fans

Number of passive vents

Number of flueless gas fires

21.0 Fixed Cooling System

22.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Test Method

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Low energy Lighting	100.00	10.00	1000.00	12

24.0 Main Heating 1

Description

Percentage of Heat %

Summary for Input Data

Database Ref. No.	17960
Fuel Type	Mains gas
In Winter	88.70
In Summer	76.40
Model Name	ecoFIT sustain 835
Manufacturer	Vaillant
System Type	Combi boiler
Controls SAP Code	2106
Controls description	Programmer, room thermostat and TRVs
PCDF Controls	0
Delayed Start Stat	No
Boiler Compensator	0
Flue Type	Balanced
Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	Yes
Combi boiler type	Standard Combi
Combi keep hot type	None

25.0 Main Heating 2	None
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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
Over Bath	Combi boiler or unvented hot water system	8.00		No	
En-Suite	Combi boiler or unvented hot water system	8.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System Instantaneous System 1	
Database ID	80195
Brand Model	Zypho, PiPe 75
Details	Year: 2022 + current Efficiency: 74.05 Utilisation factor: 0.975

29.0 Hot Water Cylinder	None
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32.0 Photovoltaic Unit	One Dwelling
Export Capable Meter?	Yes

Summary for Input Data



Connected To Dwelling

Diverter

Battery Capacity [kWh]

PV Cells kWp		Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer		
1.32		East	45°	None Or Little		No	1.00				
34.0 Small-scale Hydro				None							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

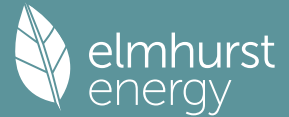
Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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Environmental	92 A	% DER < TER				6.89	
CO ₂ Emissions (t/year)	0.67	DFEE	25.10	TFEE	31.88		
Compliance Check	See BREL	% DFEE < TFEE				21.27	
% DPER < TPER	5.46	DPER	51.41	TPER	54.38		
Assessor Details	Mr. Tobias Whiting				Assessor ID	E477-0001	
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	41.9400 (1b)	x 2.4000 (2b)	= 100.6560 (1b) - (3b)
First floor	41.9400 (1c)	x 2.7000 (2c)	= 113.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.8940 (5)

2. Ventilation rate

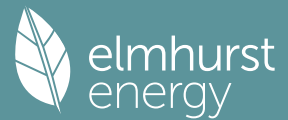
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1870 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3870 (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) = 0.3290 (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	0.4194	0.4112	0.4030	0.3619	0.3536	0.3125	0.3125	0.3043	0.3290	0.3536	0.3701	0.3865 (22b)
Effective ac	0.5880	0.5845	0.5812	0.5655	0.5625	0.5488	0.5488	0.5463	0.5541	0.5625	0.5685	0.5747 (25)

3. Heat losses and heat loss parameter

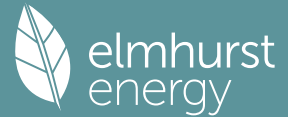
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1200	1.1000	2.3320		(26a)
Fully Glazed Door/Win			14.3600	1.1450	16.4427		(27)
Heat Loss Floor 1			41.9400	0.1200	5.0328	75.0000	3145.5000 (28a)
External Wall 1	49.9800	16.4800	33.5000	0.1800	6.0300	43.4900	1456.9150 (29a)
External Roof 1	41.9400		41.9400	0.0900	3.7746	10.3700	434.9178 (30)
Total net area of external elements Aum(A, m ²)			133.8600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.6121		(33)
Main dwelling							
Party Wall 1			45.0000	0.0000	0.0000	110.0000	4950.0000 (32)
Party Wall 2			45.0000	0.0000	0.0000	110.0000	4950.0000 (32)
Internal Wall 1			54.1900		9.0000		487.7100 (32c)
Internal Wall 2			74.4000		9.0000		669.6000 (32c)
Internal Floor 1			41.9400		18.0000		754.9200 (32d)
Internal Ceiling 1			41.9400		9.0000		377.4600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17227.0228 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							205.3770 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)						10.5700	0.0000	0.0000				
E3 Sill						6.0500	0.0000	0.0000				
E4 Jamb						21.6400	0.0000	0.0000				
E5 Ground floor (normal)						9.8000	0.0000	0.0000				
E6 Intermediate floor within a dwelling						9.8000	0.0000	0.0000				
E10 Baves (insulation at ceiling level)						9.8000	0.0000	0.0000				
E18 Party wall between dwellings						20.4000	0.0000	0.0000				
P1 Party wall - Ground floor						17.0800	0.0000	0.0000				
P2 Party wall - Intermediate floor within a dwelling						17.0800	0.0000	0.0000				
P4 Party wall - Roof (insulation at ceiling level)						17.0800	0.0000	0.0000				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											0.0000	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss									(33) + (36) + (36a) =		33.6121	(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	41.5009	41.2599	41.0236	39.9136	39.7060	38.7393	38.7393	38.5602	39.1116	39.7060	40.1261	40.5653
Average = Sum(39)m / 12 =	75.1131	74.8720	74.6357	73.5258	73.3181	72.3514	72.3514	72.1724	72.7238	73.3181	73.7382	74.1774
												73.5248
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8955	0.8926	0.8898	0.8766	0.8741	0.8626	0.8626	0.8604	0.8670	0.8741	0.8791	0.8843
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												0.8765
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.5324
Hot water usage for mixer showers												
Hot water usage for baths	66.6793	65.6772	64.2170	61.4232	59.3614	57.0621	55.7552	57.2044	58.7929	61.2616	64.1155	66.4238
Hot water usage for other uses	28.7975	28.3698	27.7675	26.6571	25.8256	24.9035	24.4055	25.0036	25.6547	26.6413	27.7747	28.7001
Average daily hot water use (litres/day)	40.5640	39.0890	37.6139	36.1388	34.6638	33.1887	33.1887	34.6638	36.1388	37.6139	39.0890	40.5640
												125.0522
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	136.0408	133.1360	129.5984	124.2191	119.8508	115.1544	113.3495	116.8717	120.5865	125.5169	130.9791	135.6879
Energy content (annual)	215.4553	189.5838	199.1880	170.0497	161.3422	141.5958	137.0864	144.7116	148.6952	170.3252	186.6037	212.4545
Distribution loss (46)m = 0.15 x (45)m	32.3183	28.4376	29.8782	25.5075	24.2013	21.2394	20.5630	21.7067	22.3043	25.5488	27.9906	31.8682
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
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
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
Combi loss	0.6607	0.6034	0.6621	0.6018	0.5992	0.5525	0.5448	0.5547	0.5479	0.5940	0.6100	0.6545
Total heat required for water heating calculated for each month	216.1160	190.1872	199.8501	170.6516	161.9414	142.1483	137.6312	145.2663	149.2431	170.9192	187.2137	213.1090
WWHRS	-31.1909	-27.5855	-28.8860	-23.9187	-22.2914	-19.0749	-17.8797	-19.0132	-19.7356	-23.2661	-26.3577	-30.6133
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	184.9250	162.6017	170.9641	146.7328	139.6500	123.0734	119.7515	126.2531	129.5075	147.6530	160.8560	182.4956
12Total per year (kWh/year)												1794.4638
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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												1794
Heat gains from water heating, kWh/month	71.8041	63.1875	66.3955	56.6920	53.7961	47.2187	45.7174	48.2553	49.5781	56.7816	62.1982	70.8047
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	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.1242	130.7804	118.1242	122.0617	118.1242	122.0617	118.1242	118.1242	122.0617	118.1242	122.0617	118.1242
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.3583	229.7176	223.7723	211.1155	195.1386	180.1225	170.0909	167.7316	173.6769	186.3337	202.3106	217.3267
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619
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
Losses e.g. evaporation (negative values) (Table 5)	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948
Water heating gains (Table 5)	96.5108	94.0290	89.2413	78.7389	72.3065	65.5816	61.4481	64.8593	68.8585	76.3194	86.3864	95.1677
Total internal gains	505.9789	518.5125	495.1234	475.9017	449.5549	428.7513	410.6488	411.7007	425.5827	444.7628	474.7443	494.6041
6. Solar gains												
[Jan]												
				Area		Solar flux		g		FF		Gains
				m2		Table 6a		W/m2		Specific data		W
						or Table 6b				or Table 6c		
East				4.1100		19.6403		0.6300		0.7000		24.6695
West				10.2500		19.6403		0.6300		0.7000		61.5238
Solar gains	86.1933	168.6124	277.6806	404.9806	496.3190	508.0708	483.7041	415.4947	322.9540	200.0728	107.4729	70.8812
Total gains	592.1722	687.1249	772.8040	880.8823	945.8739	936.8221	894.3529	827.1953	748.5367	644.8357	582.2172	565.4853

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7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
tau	63.7077	63.9129	64.1152	65.0831	65.2674	66.1395	66.1395	66.3035	65.8008	65.2674	64.8956	64.5113	
alpha	5.2472	5.2609	5.2743	5.3389	5.3512	5.4093	5.4093	5.4202	5.3867	5.3512	5.3264	5.3008	
util living area	0.9896	0.9770	0.9449	0.8464	0.6810	0.4887	0.3551	0.3996	0.6426	0.9039	0.9781	0.9917	(86)
MIT	19.9488	20.1594	20.4457	20.7724	20.9403	20.9917	20.9988	20.9978	20.9671	20.7161	20.2810	19.9193	(87)
Th 2	20.1713	20.1738	20.1762	20.1875	20.1896	20.1994	20.1994	20.2013	20.1956	20.1896	20.1853	20.1808	(88)
util rest of house													
	0.9870	0.9715	0.9322	0.8161	0.6323	0.4298	0.2909	0.3311	0.5773	0.8766	0.9719	0.9896	(89)
MIT 2	19.2156	19.4245	19.7032	20.0121	20.1510	20.1955	20.1991	20.2005	20.1780	19.9718	19.5554	19.1940	(90)
Living area fraction													
MIT	19.3765	19.5858	19.8662	20.1790	20.3243	20.3703	20.3746	20.3755	20.3512	20.1351	19.7147	19.3532	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3765	19.5858	19.8662	20.1790	20.3243	20.3703	20.3746	20.3755	20.3512	20.1351	19.7147	19.3532	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9666	0.9266	0.8158	0.6407	0.4425	0.3050	0.3461	0.5904	0.8745	0.9675	0.9868	(94)
Useful gains	582.5952	664.1897	716.0790	718.5932	605.9812	414.5480	272.7870	286.3184	441.9217	563.9118	563.2836	558.0215	(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	1132.4445	1099.5560	997.5936	829.2953	632.3160	417.4866	273.0971	286.9220	454.6097	699.0978	930.1838	1124.0261	(97)
Space heating kWh	409.0879	292.5661	209.4468	79.7055	19.5931	0.0000	0.0000	0.0000	0.0000	100.5783	264.1682	421.1074	(98a)
Space heating requirement - total per year (kWh/year)												1796.2534	
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	409.0879	292.5661	209.4468	79.7055	19.5931	0.0000	0.0000	0.0000	0.0000	100.5783	264.1682	421.1074	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1796.2534	
Space heating per m2										(98c) / (4) =		21.4146	(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 %)													88.7000 (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	409.0879	292.5661	209.4468	79.7055	19.5931	0.0000	0.0000	0.0000	0.0000	100.5783	264.1682	421.1074	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	461.2040	329.8378	236.1294	89.8597	22.0891	0.0000	0.0000	0.0000	0.0000	113.3916	297.8221	474.7547	(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	184.9250	162.6017	170.9641	146.7328	139.6500	123.0734	119.7515	126.2531	129.5075	147.6530	160.8560	182.4956	(64)
Efficiency of water heater (217)m	84.4665	83.8760	82.7152	80.3205	77.7261	76.4000	76.4000	76.4000	76.4000	80.9482	83.6058	84.5829	(216)
Fuel for water heating, kWh/month	218.9329	193.8595	206.6901	182.6841	179.6693	161.0908	156.7428	165.2527	169.5124	182.4044	192.3980	215.7596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.8382	18.3217	16.4966	12.0861	9.3357	7.6273	8.5163	11.0698	14.3786	18.8655	21.3086	23.4730	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.7119	-25.4250	-42.3376	-54.0338	-63.0282	-60.5071	-59.4252	-53.3966	-43.4201	-31.3544	-18.1986	-13.1161	(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	-4.6594	-11.3881	-27.1007	-47.5840	-69.0405	-71.7913	-70.1041	-55.5917	-35.9015	-17.6111	-6.5387	-3.5340	(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												2025.0884	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.4000	
Water heating fuel used												2224.9966	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												184.3175	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-900.7996	(233)

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Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3619.6029 (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	2025.0884	0.2100	425.2686 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2224.9966	0.2100	467.2493 (264)
Space and water heating			892.5178 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	184.3175	0.1443	26.6027 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.9547	0.1322	-63.4381
PV Unit electricity exported	-420.8449	0.1222	-51.4164
Total			-114.8545 (269)
Total CO2, kg/year			816.1954 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.7300 (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	2025.0884	1.1300	2288.3499 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2224.9966	1.1300	2514.2461 (278)
Space and water heating			4802.5960 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	184.3175	1.5338	282.7124 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.9547	1.4884	-714.3467
PV Unit electricity exported	-420.8449	0.4483	-188.6559
Total			-903.0026 (283)
Total Primary energy kWh/year			4312.4067 (286)
Dwelling Primary energy Rate (DPER)			51.4100 (287)

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

1. Overall dwelling characteristics

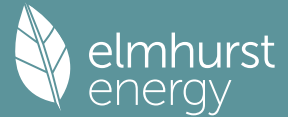
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.9400 (1b)	x 2.4000 (2b)	= 100.6560 (1b) - (3b)
First floor	41.9400 (1c)	x 2.7000 (2c)	= 113.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	213.8940 (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)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1403 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3903 (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) = 0.3317 (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	0.4229	0.4146	0.4064	0.3649	0.3566	0.3151	0.3151	0.3068	0.3317	0.3566	0.3732	0.3898 (22b)
Effective ac	0.5894	0.5860	0.5826	0.5666	0.5636	0.5497	0.5497	0.5471	0.5550	0.5636	0.5696	0.5760 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			2.1200	1.0000	2.1200			(26a)
TER Opening Type			14.3600	1.1450	16.4427			(27)
Heat Loss Floor 1			41.9400	0.1300	5.4522			(28a)
External Wall 1	49.9800	16.4800	33.5000	0.1800	6.0300			(29a)
External Roof 1	41.9400		41.9400	0.1100	4.6134			(30)
Total net area of external elements Aum(A, m2)			133.8600					(31)
Fabric heat loss, W/K = Sum (A x U)								(32)
Main dwelling								
Party Wall 1			45.0000	0.0000	0.0000			(32)
Party Wall 2			45.0000	0.0000	0.0000			(32)

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

205.3770 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	10.5700	0.0500	0.5285	
E3 Sill	6.0500	0.0500	0.3025	
E4 Jamb	21.6400	0.0500	1.0820	
E5 Ground floor (normal)	9.8000	0.1600	1.5680	
E6 Intermediate floor within a dwelling	9.8000	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	9.8000	0.0600	0.5880	
E18 Party wall between dwellings	20.4000	0.0600	1.2240	
P1 Party wall - Ground floor	17.0800	0.0800	1.3664	
P2 Party wall - Intermediate floor within a dwelling	17.0800	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	17.0800	0.1200	2.0496	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.7090 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 43.3673 (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	41.6056	41.3604	41.1201	39.9915	39.7804	38.7973	38.7973	38.6153	39.1760	39.7804	40.2075	40.6541	(38)
Average = Sum(39)m / 12 =	84.9729	84.7278	84.4875	83.3589	83.1477	82.1647	82.1647	81.9827	82.5433	83.1477	83.5749	84.0215	(39)
												83.3579	
HLP	1.0130	1.0101	1.0072	0.9938	0.9913	0.9796	0.9796	0.9774	0.9841	0.9913	0.9964	1.0017	(40)
HLP (average)												0.9938	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

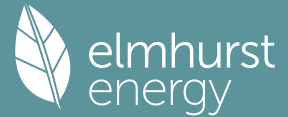
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5324 (42)
Hot water usage for mixer showers													
66.6793	65.6772	64.2170	61.4232	59.3614	57.0621	55.7552	57.2044	58.7929	61.2616	64.1155	66.4238	66.4238	(42a)
Hot water usage for baths													
28.7975	28.3698	27.7675	26.6571	25.8256	24.9035	24.4055	25.0036	25.6547	26.6413	27.7747	28.7001	28.7001	(42b)
Hot water usage for other uses													
40.5640	39.0890	37.6139	36.1388	34.6638	33.1887	33.1887	34.6638	36.1388	37.6139	39.0890	40.5640	40.5640	(42c)
Average daily hot water use (litres/day)													125.0522 (43)
Daily hot water use													
136.0408	133.1360	129.5984	124.2191	119.8508	115.1544	113.3495	116.8717	120.5865	125.5169	130.9791	135.6879	135.6879	(44)
Energy conte	215.4553	189.5838	199.1880	170.0497	161.3422	141.5958	137.0864	144.7116	148.6952	170.3252	186.6037	212.4545	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													2077.0915
32.3183	28.4376	29.8782	25.5075	24.2013	21.2394	20.5630	21.7067	22.3043	25.5488	27.9906	31.8682	31.8682	(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	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
266.4142	235.6112	250.1469	219.3648	212.3011	190.9109	188.0453	195.6705	198.0103	221.2841	235.9188	263.4134	263.4134	(62)
WWHRS	-30.4830	-26.9594	-28.2303	-23.3758	-21.7854	-18.6419	-18.5817	-19.2877	-22.7380	-25.7594	-29.9185	-29.9185	(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	235.9312	208.6518	221.9166	195.9890	190.5156	172.2689	170.5714	177.0888	178.7226	198.5461	210.1594	233.4949	(64)
12Total per year (kWh/year)													2393.8564 (64)
Electric shower(s)													2394 (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	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													
84.3786	74.5435	78.9697	68.8703	66.3860	59.4094	58.3209	60.8563	61.7699	69.3729	74.3745	83.3809	83.3809	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
118.1242	130.7804	118.1242	122.0617	118.1242	122.0617	118.1242	118.1242	122.0617	118.1242	122.0617	118.1242	118.1242	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
227.3583	229.7176	223.7723	211.1155	195.1386	180.1225	170.0909	167.7316	173.6769	186.3337	202.3106	217.3267	217.3267	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	(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)													
-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	(71)
Water heating gains (Table 5)													
113.4121	110.9278	106.1421	95.6532	89.2285	82.5130	78.3884	81.7962	85.7916	93.2431	103.2979	112.0710	112.0710	(72)
Total internal gains													

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522.8802 535.4113 512.0242 492.8160 466.4768 445.6828 427.5890 428.6375 442.5157 461.6865 491.6558 511.5075 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
East				4.1100	19.6403	0.6300	0.7000	0.7700			24.6695 (76)	
West				10.2500	19.6403	0.6300	0.7000	0.7700			61.5238 (80)	
Solar gains	86.1933	168.6124	277.6806	404.9806	496.3190	508.0708	483.7041	415.4947	322.9540	200.0728	107.4729	70.8812 (83)
Total gains	609.0735	704.0237	789.7048	897.7966	962.7958	953.7536	911.2931	844.1322	765.4698	661.7594	599.1287	582.3887 (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	56.3154	56.4783	56.6390	57.4058	57.5516	58.2402	58.2402	58.3695	57.9730	57.5516	57.2574	56.9531
alpha	4.7544	4.7652	4.7759	4.8271	4.8368	4.8827	4.8827	4.8913	4.8649	4.8368	4.8172	4.7969
util living area	0.9897	0.9788	0.9526	0.8728	0.7273	0.5374	0.3941	0.4419	0.6892	0.9186	0.9796	0.9915 (86)
MIT	19.7491	19.9649	20.2745	20.6537	20.8875	20.9795	20.9963	20.9937	20.9352	20.6045	20.1160	19.7186 (87)
Th 2	20.0725	20.0749	20.0773	20.0885	20.0906	20.1004	20.1004	20.1022	20.0966	20.0906	20.0864	20.0819 (88)
util rest of house	0.9870	0.9735	0.9408	0.8438	0.6750	0.4673	0.3148	0.3580	0.6169	0.8927	0.9736	0.9894 (89)
MIT 2	18.6192	18.8936	19.2815	19.7427	19.9963	20.0880	20.0990	20.0996	20.0516	19.6987	19.0955	18.5872 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.8672	19.1288	19.4995	19.9426	20.1919	20.2836	20.2959	20.2959	20.2456	19.8975	19.3195	18.8355 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.8672	19.1288	19.4995	19.9426	20.1919	20.2836	20.2959	20.2959	20.2456	19.8975	19.3195	18.8355 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9823	0.9664	0.9317	0.8386	0.6812	0.4819	0.3322	0.3763	0.6295	0.8862	0.9668	0.9852 (94)
Useful gains	598.2690	680.3906	735.7632	752.8599	655.8516	459.5899	302.7283	317.6760	481.8813	586.4433	579.2634	573.7734 (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	1237.8163	1205.5711	1098.2910	920.5017	706.0823	466.9946	303.6763	319.3929	507.2751	773.0643	1021.2434	1229.6995 (97)
Space heating kWh	475.8232	352.9213	269.7207	120.7021	37.3716	0.0000	0.0000	0.0000	0.0000	138.8460	318.2256	488.0091 (98a)
Space heating requirement - total per year (kWh/year)												2201.6196
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	475.8232	352.9213	269.7207	120.7021	37.3716	0.0000	0.0000	0.0000	0.0000	138.8460	318.2256	488.0091 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2201.6196
Space heating per m2												(98c) / (4) = 26.2473 (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	475.8232	352.9213	269.7207	120.7021	37.3716	0.0000	0.0000	0.0000	0.0000	138.8460	318.2256	488.0091 (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)	514.9602	381.9494	291.9055	130.6300	40.4455	0.0000	0.0000	0.0000	0.0000	150.2663	344.4000	528.1483 (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	235.9312	208.6518	221.9166	195.9890	190.5156	172.2689	170.5714	177.0888	178.7226	198.5461	210.1594	233.4949 (64)
Efficiency of water heater (217)m	85.8522	85.4978	84.8005	83.3740	81.5944	80.3000	80.3000	80.3000	80.3000	83.6293	85.2678	80.3000 (216)
Fuel for water heating, kWh/month	274.8110	244.0434	261.6924	235.0720	233.4910	214.5317	212.4177	220.5341	222.5686	237.4121	246.4697	85.9220 (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	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	24.5439	19.6900	17.7287	12.9888	10.0329	8.1970	9.1524	11.8966	15.4525	20.2745	22.9000	25.2260 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-38.9566	-54.7763	-78.5297	-88.0548	-94.7421	-88.3464	-87.2395	-82.4505	-73.9806	-62.5063	-42.7708	-33.6961 (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	-22.4518	-47.1817	-93.6924	-140.6034	-185.8090	-186.6681	-184.4851	-156.2628	-114.6062	-67.4522	-29.9681	-17.7592 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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												2382.7052	(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												2874.7958	(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)												198.0832	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2072.9896	(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												3468.5947	(238)

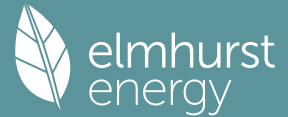
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2382.7052	0.2100	500.3681	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2874.7958	0.2100	603.7071	(264)
Space and water heating			1104.0752	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.0832	0.1443	28.5895	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-826.0497	0.1346	-111.2239	
PV Unit electricity exported	-1246.9399	0.1259	-157.0131	
Total			-268.2370	(269)
Total CO2, kg/year			876.3570	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4500	(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	2382.7052	1.1300	2692.4569	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2874.7958	1.1300	3248.5193	(278)
Space and water heating			5940.9762	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.0832	1.5338	303.8266	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-826.0497	1.4976	-1237.1173	
PV Unit electricity exported	-1246.9399	0.4622	-576.3471	
Total			-1813.4643	(283)
Total Primary energy kWh/year			4561.4393	(286)
Target Primary Energy Rate (TPER)			54.3800	(287)

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Plot Reference	SAP 1033 Plot 2				Issued on Date	07/12/2025	
Assessment Reference	Rev A			Plot Type Ref			
Plot Address	L/A Appletree Cottage, Winchester Road, Botley, Hampshire, SO32 2DH				SAP Version	10.2	
SAP Rating	92 A	DER	9.73	TER	10.45		
Environmental	92 A	% DER < TER				6.89	
CO ₂ Emissions (t/year)	0.67	DFEE	25.10	TFEE	31.88		
Compliance Check	See BREL	% DFEE < TFEE				21.27	
% DPER < TPER	5.46	DPER	51.41	TPER	54.38		
Assessor Details	Mr. Tobias Whiting				Assessor ID	E477-0001	
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	41.9400 (1b)	x 2.4000 (2b)	= 100.6560 (1b) - (3b)
First floor	41.9400 (1c)	x 2.7000 (2c)	= 113.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.8940 (5)

2. Ventilation rate

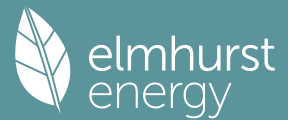
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1403 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3403 (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) = 0.2892 (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	0.3688	0.3615	0.3543	0.3181	0.3109	0.2748	0.2748	0.2675	0.2892	0.3109	0.3254	0.3398 (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	0.5680	0.5653	0.5628	0.5506	0.5483	0.5377	0.5377	0.5358	0.5418	0.5483	0.5529	0.5577 (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							
Front Door			2.1200	1.1000	2.3320		(26a)
Fully Glazed Door/Win			14.3600	1.1450	16.4427		(27)
Heat Loss Floor 1			41.9400	0.1200	5.0328	75.0000	3145.5000 (28a)
External Wall 1	49.9800	16.4800	33.5000	0.1800	6.0300	43.4900	1456.9150 (29a)
External Roof 1	41.9400		41.9400	0.0900	3.7746	10.3700	434.9178 (30)
Total net area of external elements Aum(A, m ²)			133.8600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.6121		(33)
Main dwelling							
Party Wall 1			45.0000	0.0000	0.0000	110.0000	4950.0000 (32)
Party Wall 2			45.0000	0.0000	0.0000	110.0000	4950.0000 (32)
Internal Wall 1			54.1900		9.0000	487.7100	(32c)
Internal Wall 2			74.4000		9.0000	669.6000	(32c)
Internal Floor 1			41.9400		18.0000	754.9200	(32d)
Internal Ceiling 1			41.9400		9.0000	377.4600	(32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17227.0228 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							205.3770 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.5700	0.0000	0.0000
E3 Sill	6.0500	0.0000	0.0000
E4 Jamb	21.6400	0.0000	0.0000
E5 Ground floor (normal)	9.8000	0.0000	0.0000
E6 Intermediate floor within a dwelling	9.8000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.8000	0.0000	0.0000
E18 Party wall between dwellings	20.4000	0.0000	0.0000
P1 Party wall - Ground floor	17.0800	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	17.0800	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	17.0800	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			0.0000 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	33.6121 (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	40.0915	39.9052	39.7225	38.8646	38.7040	37.9568	37.9568	37.8184	38.2446	38.7040	39.0288	39.3683 (38)
Average = Sum(39)m / 12 =	73.7037	73.5173	73.3347	72.4767	72.3162	71.5689	71.5689	71.4306	71.8568	72.3162	72.6409	72.9804 (39)
												72.4759
HLP	0.8787	0.8765	0.8743	0.8641	0.8621	0.8532	0.8532	0.8516	0.8567	0.8621	0.8660	0.8701 (40)
HLP (average)												0.8640
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5324 (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	28.7975	28.3698	27.7675	26.6571	25.8256	24.9035	24.4055	25.0036	25.6547	26.6413	27.7747	28.7001 (42b)
Hot water usage for other uses	40.5640	39.0890	37.6139	36.1388	34.6638	33.1887	33.1887	34.6638	36.1388	37.6139	39.0890	40.5640 (42c)
Average daily hot water use (litres/day)												63.5762 (43)
Daily hot water use	69.3615	67.4588	65.3814	62.7959	60.4893	58.0923	57.5943	59.6674	61.7936	64.2552	66.8636	69.2641 (44)
Energy conte	109.8517	96.0604	100.4888	85.9645	81.4303	71.4312	69.6553	73.8807	76.1977	87.1937	95.2595	108.4509 (45)
Energy content (annual)										Total = Sum(45)m =		1055.8646
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	93.3739	81.6513	85.4155	73.0698	69.2157	60.7165	59.2070	62.7986	64.7680	74.1147	80.9706	92.1833 (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	93.3739	81.6513	85.4155	73.0698	69.2157	60.7165	59.2070	62.7986	64.7680	74.1147	80.9706	92.1833 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		897.4849 (64)
Electric shower(s)	53.3990	47.5789	51.9544	49.5794	50.5098	48.1814	49.7875	50.5098	49.5794	51.9544	50.9774	53.3990 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		607.4102 (64a)
Heat gains from water heating, kWh/month	36.6932	32.3076	34.3425	30.6623	29.9314	27.2245	27.2486	28.3271	28.5869	31.5173	32.9870	36.3956 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.1242	130.7804	118.1242	122.0617	118.1242	122.0617	118.1242	118.1242	122.0617	118.1242	122.0617	118.1242 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.3583	229.7176	223.7723	211.1155	195.1386	180.1225	170.0909	167.7316	173.6769	186.3337	202.3106	217.3267 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619 (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)	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948 (71)
Water heating gains (Table 5)	49.3188	48.0767	46.1592	42.5865	40.2303	37.8118	36.6245	38.0740	39.7040	42.3619	45.8153	48.9188 (72)
Total internal gains	455.7869	469.5603	449.0413	436.7493	414.4787	400.9816	385.8251	384.9154	396.4281	407.8054	431.1731	445.3552 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				4.1100	19.6403	0.6300	0.7000	0.7700	24.6695 (76)			
West				10.2500	19.6403	0.6300	0.7000	0.7700	61.5238 (80)			
Solar gains	86.1933	168.6124	277.6806	404.9806	496.3190	508.0708	483.7041	415.4947	322.9540	200.0728	107.4729	70.8812 (83)
Total gains	541.9803	638.1727	726.7219	841.7299	910.7977	909.0523	869.5292	800.4101	719.3822	607.8782	538.6461	516.2364 (84)

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7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	64.9260	65.0906	65.2527	66.0251	66.1717	66.8626	66.8626	66.9921	66.5948	66.1717	65.8759	65.5694
alpha	5.3284	5.3394	5.3502	5.4017	5.4114	5.4575	5.4575	5.4661	5.4397	5.4114	5.3917	5.3713
util living area	0.9929	0.9826	0.9546	0.8606	0.6947	0.4979	0.3612	0.4086	0.6581	0.9186	0.9840	0.9944 (86)
MIT	19.9063	20.1209	20.4159	20.7583	20.9370	20.9913	20.9987	20.9976	20.9645	20.6931	20.2405	19.8726 (87)
Th 2	20.1857	20.1876	20.1894	20.1982	20.1998	20.2074	20.2074	20.2089	20.2045	20.1998	20.1965	20.1930 (88)
util rest of house	0.9911	0.9783	0.9438	0.8319	0.6465	0.4386	0.2966	0.3393	0.5929	0.8943	0.9793	0.9930 (89)
MIT 2	19.1852	19.3985	19.6868	20.0103	20.1588	20.2033	20.2071	20.2081	20.1853	19.9611	19.5254	19.1576 (90)
Living area fraction									fLA = Living area / (4) =			0.2195 (91)
MIT	19.3435	19.5570	19.8468	20.1745	20.3296	20.3763	20.3808	20.3814	20.3563	20.1218	19.6823	19.3145 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3435	19.5570	19.8468	20.1745	20.3296	20.3763	20.3808	20.3814	20.3563	20.1218	19.6823	19.3145 (93)

8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9886	0.9742	0.9383	0.8310	0.6546	0.4514	0.3108	0.3545	0.6058	0.8915	0.9754	0.9909 (94)
Useful gains	535.8013	621.7055	681.9122	699.4892	596.1960	410.3251	270.2700	283.7491	435.8224	541.9357	525.4121	511.5481 (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	1108.7597	1077.5471	978.7840	817.1373	624.0587	413.4012	270.5890	284.3908	449.5576	688.5780	913.9921	1103.0653 (97)
Space heating kWh	426.2811	306.3256	220.8726	84.7066	20.7299	0.0000	0.0000	0.0000	0.0000	109.1019	279.7777	440.0888 (98a)
Space heating requirement - total per year (kWh/year)												1887.8842
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	426.2811	306.3256	220.8726	84.7066	20.7299	0.0000	0.0000	0.0000	0.0000	109.1019	279.7777	440.0888 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1887.8842
Space heating per m2										(98c) / (4) =		22.5070 (99)

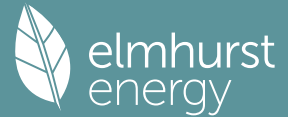
8c. Space cooling requirement												
Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	672.7480	529.6102	542.8723	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9614	0.9830	0.9730	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	646.8108	520.6001	528.2027	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1014.2097	970.4016	891.9531	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	264.5272	334.6523	270.6303	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	66.1318	83.6631	67.6576	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												217.4525 (107)
Energy for space heating												22.5070 (99)
Energy for space cooling												2.5924 (108)
Total												25.0994 (109)
Fabric Energy Efficiency (DFEE)												25.1 (109)

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

1. Overall dwelling characteristics												
Main dwelling						Area (m2)		Storey height (m)			Volume (m3)	
Ground floor						41.9400 (1b)	x	2.4000 (2b)	=		100.6560 (1b) - (3b)	
First floor						41.9400 (1c)	x	2.7000 (2c)	=		113.2380 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)						83.8800					(4)	
Dwelling volume										(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	213.8940 (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)

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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) =
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
30.0000 / (5) = 0.1403 (8)
Yes
Blower Door
5.0000 (17)
0.3903 (18)
2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3317 (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	0.4229	0.4146	0.4064	0.3649	0.3566	0.3151	0.3151	0.3068	0.3317	0.3566	0.3732	0.3898 (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	0.5894	0.5860	0.5826	0.5666	0.5636	0.5497	0.5497	0.5471	0.5550	0.5636	0.5696	0.5760 (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 Semi-glazed door			2.1200	1.0000	2.1200		(26a)
TER Opening Type			14.3600	1.1450	16.4427		(27)
Heat Loss Floor 1			41.9400	0.1300	5.4522		(28a)
External Wall 1	49.9800	16.4800	33.5000	0.1800	6.0300		(29a)
External Roof 1	41.9400		41.9400	0.1100	4.6134		(30)
Total net area of external elements Aum(A, m2)			133.8600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		34.6583		(33)
Main dwelling							
Party Wall 1			45.0000	0.0000	0.0000		(32)
Party Wall 2			45.0000	0.0000	0.0000		(32)

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

205.3770 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	10.5700	0.0500	0.5285
E2 Other lintels (including other steel lintels)	6.0500	0.0500	0.3025
E3 Sill	21.6400	0.0500	1.0820
E4 Jamb	9.8000	0.1600	1.5680
E5 Ground floor (normal)	9.8000	0.0000	0.0000
E6 Intermediate floor within a dwelling	9.8000	0.0600	0.5880
E10 Eaves (insulation at ceiling level)	20.4000	0.0600	1.2240
E18 Party wall between dwellings	17.0800	0.0800	1.3664
P1 Party wall - Ground floor	17.0800	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	17.0800	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	17.0800	0.1200	2.0496
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.7090 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 43.3673 (37)

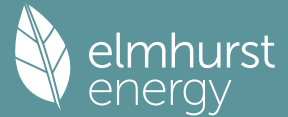
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	41.6056	41.3604	41.1201	39.9915	39.7804	38.7973	38.7973	38.6153	39.1760	39.7804	40.2075	40.6541 (38)
Heat transfer coeff	84.9729	84.7278	84.4875	83.3589	83.1477	82.1647	82.1647	81.9827	82.5433	83.1477	83.5749	84.0215 (39)
Average = Sum(39)m / 12 =												83.3579
HLP	1.0130	1.0101	1.0072	0.9938	0.9913	0.9796	0.9796	0.9774	0.9841	0.9913	0.9964	Dec 1.0017 (40)
HLP (average)												0.9938
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5324 (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												
28.7975	28.3698	27.7675	26.6571	25.8256	24.9035	24.4055	25.0036	25.6547	26.6413	27.7747	28.7001	(42b)
Hot water usage for other uses												
40.5640	39.0890	37.6139	36.1388	34.6638	33.1887	33.1887	34.6638	36.1388	37.6139	39.0890	40.5640	(42c)
Average daily hot water use (litres/day)												63.5762 (43)
Daily hot water use												
69.3615	67.4588	65.3814	62.7959	60.4893	58.0923	57.5943	59.6674	61.7936	64.2552	66.8636	69.2641	(44)
Energy conte	109.8517	96.0604	100.4888	85.9645	81.4303	71.4312	69.6553	73.8807	76.1977	87.1937	95.2595	108.4509 (45)
Energy content (annual)										Total = Sum(45)m =	1055.8646	
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												
93.3739	81.6513	85.4155	73.0698	69.2157	60.7165	59.2070	62.7986	64.7680	74.1147	80.9706	92.1833	(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												
93.3739	81.6513	85.4155	73.0698	69.2157	60.7165	59.2070	62.7986	64.7680	74.1147	80.9706	92.1833	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =	897.4849	(64)
Electric shower(s)											897	(64)
53.3990	47.5789	51.9544	49.5794	50.5098	48.1814	49.7875	50.5098	49.5794	51.9544	50.9774	53.3990	(64a)

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Heat gains from water heating, kWh/month
36.6932 32.3076 34.3425 30.6623 29.9314 27.2245 27.2486 28.3271 28.5869 31.5173 32.9870 36.3956 (65)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 607.4102 (64a)

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	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.1242	130.7804	118.1242	122.0617	118.1242	122.0617	118.1242	118.1242	122.0617	118.1242	122.0617	118.1242	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	227.3583	229.7176	223.7723	211.1155	195.1386	180.1225	170.0909	167.7316	173.6769	186.3337	202.3106	217.3267	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	(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)	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	(71)
Water heating gains (Table 5)	49.3188	48.0767	46.1592	42.5865	40.2303	37.8118	36.6245	38.0740	39.7040	42.3619	45.8153	48.9188	(72)
Total internal gains	455.7869	469.5603	449.0413	436.7493	414.4787	400.9816	385.8251	384.9154	396.4281	407.8054	431.1731	445.3552	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East				4.1100	19.6403	0.6300	0.7000			0.7700			24.6695 (76)
West				10.2500	19.6403	0.6300	0.7000			0.7700			61.5238 (80)

Solar gains	86.1933	168.6124	277.6806	404.9806	496.3190	508.0708	483.7041	415.4947	322.9540	200.0728	107.4729		70.8812 (83)
Total gains	541.9803	638.1727	726.7219	841.7299	910.7977	909.0523	869.5292	800.4101	719.3822	607.8782	538.6461		516.2364 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
tau	56.3154	56.4783	56.6390	57.4058	57.5516	58.2402	58.2402	58.3695	57.9730	57.5516	57.2574	56.9531	
alpha	4.7544	4.7652	4.7759	4.8271	4.8368	4.8827	4.8827	4.8913	4.8649	4.8368	4.8172	4.7969	
util living area	0.9936	0.9856	0.9647	0.8939	0.7546	0.5609	0.4124	0.4648	0.7207	0.9381	0.9866	0.9949	(86)
MIT	19.6506	19.8727	20.1960	20.6057	20.8676	20.9754	20.9955	20.9921	20.9213	20.5465	20.0306	19.6205	(87)
Th 2	20.0725	20.0749	20.0773	20.0885	20.0906	20.1004	20.1004	20.1022	20.0966	20.0906	20.0864	20.0819	(88)
util rest of house	0.9919	0.9818	0.9554	0.8679	0.7034	0.4888	0.3298	0.3771	0.6489	0.9169	0.9825	0.9935	(89)
MIT 2	18.8425	19.0641	19.3825	19.7775	20.0029	20.0887	20.0991	20.0997	20.0532	19.7337	19.2310	18.8199	(90)
Living area fraction									fLA = Living area / (4) =			0.2195	(91)
MIT	19.0199	19.2416	19.5610	19.9593	20.1927	20.2833	20.2958	20.2956	20.2437	19.9121	19.4065	18.9956	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0199	19.2416	19.5610	19.9593	20.1927	20.2833	20.2958	20.2956	20.2437	19.9121	19.4065	18.9956	(93)

8. Space heating requirement

Utilisation	0.9893	0.9774	0.9490	0.8638	0.7095	0.5038	0.3479	0.3963	0.6614	0.9118	0.9784	0.9913	(94)
Useful gains	536.1715	623.7372	689.6475	727.0596	646.2527	458.0037	302.5016	317.2137	475.7794	554.2908	526.9994	511.7527	(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	1250.7896	1215.1301	1103.4946	921.8900	706.1454	466.9642	303.6654	319.3683	507.1202	774.2815	1028.5151	1243.1466	(97)
Space heating kWh	531.6759	397.4161	307.9023	140.2779	44.5602	0.0000	0.0000	0.0000	0.0000	163.6731	361.0913	544.1571	(98a)
Space heating requirement - total per year (kWh/year)												2490.7538	
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	531.6759	397.4161	307.9023	140.2779	44.5602	0.0000	0.0000	0.0000	0.0000	163.6731	361.0913	544.1571	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2490.7538	
Space heating per m ²										(98c) / (4) =		29.6943	(99)

8c. Space cooling requirement

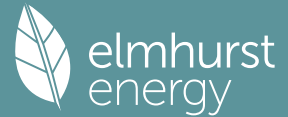
Calculated for June, July and August. See Table 10b

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	772.3481	608.0187	623.0682	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9210	0.9593	0.9407	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	711.3644	583.2749	586.1210	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1014.2097	970.4016	891.9531	0.0000	0.0000	0.0000	0.0000	(103)
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	54.5122	72.0056	56.8848	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												183.4025	(107)
Energy for space heating												29.6943	(99)
Energy for space cooling												2.1865	(108)

Total
Fabric Energy Efficiency (TFEE)

31.8807 (109)
31.9 (109)

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Plot Reference	SAP 1033 Plot 2				Issued on Date	07/12/2025	
Assessment Reference	Rev A			Plot Type Ref			
Plot Address	L/A Appletree Cottage, Winchester Road, Botley, Hampshire, SO32 2DH				SAP Version	10.2	
SAP Rating	92 A	DER	9.73	TER	10.45		
Environmental	92 A	% DER < TER				6.89	
CO ₂ Emissions (t/year)	0.67	DFEE	25.10	TFEE	31.88		
Compliance Check	See BREL	% DFEE < TFEE				21.27	
% DPER < TPER	5.46	DPER	51.41	TPER	54.38		
Assessor Details	Mr. Tobias Whiting				Assessor ID	E477-0001	
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	41.9400 (1b)	x 2.4000 (2b)	= 100.6560 (1b) - (3b)
First floor	41.9400 (1c)	x 2.7000 (2c)	= 113.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.8940 (5)

2. Ventilation rate

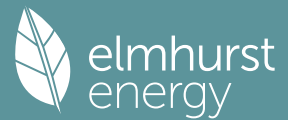
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1870 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3870 (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) = 0.3290 (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	0.4194	0.4112	0.4030	0.3619	0.3536	0.3125	0.3125	0.3043	0.3290	0.3536	0.3701	0.3865 (22b)
Effective ac	0.5880	0.5845	0.5812	0.5655	0.5625	0.5488	0.5488	0.5463	0.5541	0.5625	0.5685	0.5747 (25)

3. Heat losses and heat loss parameter

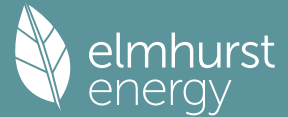
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1200	1.1000	2.3320		(26a)
Fully Glazed Door/Win			14.3600	1.1450	16.4427		(27)
Heat Loss Floor 1			41.9400	0.1200	5.0328	75.0000	3145.5000 (28a)
External Wall 1	49.9800	16.4800	33.5000	0.1800	6.0300	43.4900	1456.9150 (29a)
External Roof 1	41.9400		41.9400	0.0900	3.7746	10.3700	434.9178 (30)
Total net area of external elements Aum(A, m ²)			133.8600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.6121		(33)
Main dwelling							
Party Wall 1			45.0000	0.0000	0.0000	110.0000	4950.0000 (32)
Party Wall 2			45.0000	0.0000	0.0000	110.0000	4950.0000 (32)
Internal Wall 1			54.1900		9.0000		487.7100 (32c)
Internal Wall 2			74.4000		9.0000		669.6000 (32c)
Internal Floor 1			41.9400		18.0000		754.9200 (32d)
Internal Ceiling 1			41.9400		9.0000		377.4600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17227.0228 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							205.3770 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)						10.5700	0.0000	0.0000				
E3 Sill						6.0500	0.0000	0.0000				
E4 Jamb						21.6400	0.0000	0.0000				
E5 Ground floor (normal)						9.8000	0.0000	0.0000				
E6 Intermediate floor within a dwelling						9.8000	0.0000	0.0000				
E10 Baves (insulation at ceiling level)						9.8000	0.0000	0.0000				
E18 Party wall between dwellings						20.4000	0.0000	0.0000				
P1 Party wall - Ground floor						17.0800	0.0000	0.0000				
P2 Party wall - Intermediate floor within a dwelling						17.0800	0.0000	0.0000				
P4 Party wall - Roof (insulation at ceiling level)						17.0800	0.0000	0.0000				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											0.0000	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss									(33) + (36) + (36a) =		33.6121	(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	41.5009	41.2599	41.0236	39.9136	39.7060	38.7393	38.7393	38.5602	39.1116	39.7060	40.1261	40.5653
Average = Sum(39)m / 12 =	75.1131	74.8720	74.6357	73.5258	73.3181	72.3514	72.3514	72.1724	72.7238	73.3181	73.7382	74.1774
												73.5248
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8955	0.8926	0.8898	0.8766	0.8741	0.8626	0.8626	0.8604	0.8670	0.8741	0.8791	0.8843
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												0.8765
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.5324
Hot water usage for mixer showers												66.4238
Hot water usage for baths												28.7001
Hot water usage for other uses												40.5640
Average daily hot water use (litres/day)												125.0522
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	136.0408	133.1360	129.5984	124.2191	119.8508	115.1544	113.3495	116.8717	120.5865	125.5169	130.9791	135.6879
Energy conte	215.4553	189.5838	199.1880	170.0497	161.3422	141.5958	137.0864	144.7116	148.6952	170.3252	186.6037	212.4545
Energy content (annual)										Total = Sum(45)m =		2077.0915
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
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
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
Combi loss	0.6607	0.6034	0.6621	0.6018	0.5992	0.5525	0.5448	0.5547	0.5479	0.5940	0.6100	0.6545
Total heat required for water heating calculated for each month												
WWHRS	216.1160	190.1872	199.8501	170.6516	161.9414	142.1483	137.6312	145.2663	149.2431	170.9192	187.2137	213.1090
PV diverter	-31.1909	-27.5855	-28.8860	-23.9187	-22.2914	-19.0749	-17.8797	-19.0132	-19.7356	-23.2661	-26.3577	-30.6133
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	184.9250	162.6017	170.9641	146.7328	139.6500	123.0734	119.7515	126.2531	129.5075	147.6530	160.8560	182.4956
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				1794.4638
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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												1794
Heat gains from water heating, kWh/month	71.8041	63.1875	66.3955	56.6920	53.7961	47.2187	45.7174	48.2553	49.5781	56.7816	62.1982	70.8047
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	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	118.1242	130.7804	118.1242	122.0617	118.1242	122.0617	118.1242	118.1242	122.0617	118.1242	122.0617	118.1242
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	227.3583	229.7176	223.7723	211.1155	195.1386	180.1225	170.0909	167.7316	173.6769	186.3337	202.3106	217.3267
Pumps, fans	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619
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
Water heating gains (Table 5)	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948
Total internal gains	96.5108	94.0290	89.2413	78.7389	72.3065	65.5816	61.4481	64.8593	68.8585	76.3194	86.3864	95.1677
	505.9789	518.5125	495.1234	475.9017	449.5549	428.7513	410.6488	411.7007	425.5827	444.7628	474.7443	494.6041
6. Solar gains												
[Jan]												
				Area		Solar flux		g		FF		Gains
				m2		Table 6a		W/m2		Specific data		W
						or Table 6b				or Table 6c		
East				4.1100		19.6403		0.6300		0.7000		24.6695
West				10.2500		19.6403		0.6300		0.7000		61.5238
Solar gains	86.1933	168.6124	277.6806	404.9806	496.3190	508.0708	483.7041	415.4947	322.9540	200.0728	107.4729	70.8812
Total gains	592.1722	687.1249	772.8040	880.8823	945.8739	936.8221	894.3529	827.1953	748.5367	644.8357	582.2172	565.4853

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	63.7077	63.9129	64.1152	65.0831	65.2674	66.1395	66.1395	66.3035	65.8008	65.2674	64.8956	64.5113	21.0000 (85)
alpha	5.2472	5.2609	5.2743	5.3389	5.3512	5.4093	5.4093	5.4202	5.3867	5.3512	5.3264	5.3008	
util living area	0.9896	0.9770	0.9449	0.8464	0.6810	0.4887	0.3551	0.3996	0.6426	0.9039	0.9781	0.9917	(86)
MIT	19.9488	20.1594	20.4457	20.7724	20.9403	20.9917	20.9988	20.9978	20.9671	20.7161	20.2810	19.9193	(87)
Th 2	20.1713	20.1738	20.1762	20.1875	20.1896	20.1994	20.1994	20.2013	20.1956	20.1896	20.1853	20.1808	(88)
util rest of house	0.9870	0.9715	0.9322	0.8161	0.6323	0.4298	0.2909	0.3311	0.5773	0.8766	0.9719	0.9896	(89)
MIT 2	19.2156	19.4245	19.7032	20.0121	20.1510	20.1955	20.1991	20.2005	20.1780	19.9718	19.5554	19.1940	(90)
Living area fraction									fLA = Living area /	(4) =		0.2195	(91)
MIT	19.3765	19.5858	19.8662	20.1790	20.3243	20.3703	20.3746	20.3755	20.3512	20.1351	19.7147	19.3532	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3765	19.5858	19.8662	20.1790	20.3243	20.3703	20.3746	20.3755	20.3512	20.1351	19.7147	19.3532	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9666	0.9266	0.8158	0.6407	0.4425	0.3050	0.3461	0.5904	0.8745	0.9675	0.9868	(94)
Useful gains	582.5952	664.1897	716.0790	718.5932	605.9812	414.5480	272.7870	286.3184	441.9217	563.9118	563.2836	558.0215	(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	1132.4445	1099.5560	997.5936	829.2953	632.3160	417.4866	273.0971	286.9220	454.6097	699.0978	930.1838	1124.0261	(97)
Space heating kWh	409.0879	292.5661	209.4468	79.7055	19.5931	0.0000	0.0000	0.0000	0.0000	100.5783	264.1682	421.1074	(98a)
Space heating requirement - total per year (kWh/year)												1796.2534	
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	409.0879	292.5661	209.4468	79.7055	19.5931	0.0000	0.0000	0.0000	0.0000	100.5783	264.1682	421.1074	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1796.2534	
Space heating per m2										(98c) / (4) =		21.4146	(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 %)													88.7000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	409.0879	292.5661	209.4468	79.7055	19.5931	0.0000	0.0000	0.0000	0.0000	100.5783	264.1682	421.1074	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	461.2040	329.8378	236.1294	89.8597	22.0891	0.0000	0.0000	0.0000	0.0000	113.3916	297.8221	474.7547	(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	184.9250	162.6017	170.9641	146.7328	139.6500	123.0734	119.7515	126.2531	129.5075	147.6530	160.8560	182.4956	(64)
Efficiency of water heater (217)m	84.4665	83.8760	82.7152	80.3205	77.7261	76.4000	76.4000	76.4000	76.4000	80.9482	83.6058	84.5829	(216)
Fuel for water heating, kWh/month	218.9329	193.8595	206.6901	182.6841	179.6693	161.0908	156.7428	165.2527	169.5124	182.4044	192.3980	215.7596	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.8382	18.3217	16.4966	12.0861	9.3357	7.6273	8.5163	11.0698	14.3786	18.8655	21.3086	23.4730	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.7119	-25.4250	-42.3376	-54.0338	-63.0282	-60.5071	-59.4252	-53.3966	-43.4201	-31.3544	-18.1986	-13.1161	(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	-4.6594	-11.3881	-27.1007	-47.5840	-69.0405	-71.7913	-70.1041	-55.5917	-35.9015	-17.6111	-6.5387	-3.5340	(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												2025.0884	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.4000	
Water heating fuel used												2224.9966	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												184.3175	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-900.7996	(233)

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Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3619.6029 (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	2025.0884	0.2100	425.2686 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2224.9966	0.2100	467.2493 (264)
Space and water heating			892.5178 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	184.3175	0.1443	26.6027 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.9547	0.1322	-63.4381
PV Unit electricity exported	-420.8449	0.1222	-51.4164
Total			-114.8545 (269)
Total CO2, kg/year			816.1954 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.7300 (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	2025.0884	1.1300	2288.3499 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2224.9966	1.1300	2514.2461 (278)
Space and water heating			4802.5960 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	184.3175	1.5338	282.7124 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.9547	1.4884	-714.3467
PV Unit electricity exported	-420.8449	0.4483	-188.6559
Total			-903.0026 (283)
Total Primary energy kWh/year			4312.4067 (286)
Dwelling Primary energy Rate (DPER)			51.4100 (287)

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

1. Overall dwelling characteristics

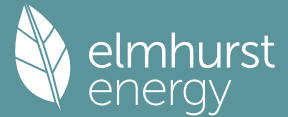
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.9400 (1b)	x 2.4000 (2b)	= 100.6560 (1b) - (3b)
First floor	41.9400 (1c)	x 2.7000 (2c)	= 113.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	213.8940 (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)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1403 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3903 (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) = 0.3317 (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	0.4229	0.4146	0.4064	0.3649	0.3566	0.3151	0.3151	0.3068	0.3317	0.3566	0.3732	0.3898 (22b)
Effective ac	0.5894	0.5860	0.5826	0.5666	0.5636	0.5497	0.5497	0.5471	0.5550	0.5636	0.5696	0.5760 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			2.1200	1.0000	2.1200			(26a)
TER Opening Type			14.3600	1.1450	16.4427			(27)
Heat Loss Floor 1			41.9400	0.1300	5.4522			(28a)
External Wall 1	49.9800	16.4800	33.5000	0.1800	6.0300			(29a)
External Roof 1	41.9400		41.9400	0.1100	4.6134			(30)
Total net area of external elements Aum(A, m2)			133.8600					(31)
Fabric heat loss, W/K = Sum (A x U)								(32)
Main dwelling								
Party Wall 1			45.0000	0.0000	0.0000			(32)
Party Wall 2			45.0000	0.0000	0.0000			(32)

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

205.3770 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	10.5700	0.0500	0.5285	
E3 Sill	6.0500	0.0500	0.3025	
E4 Jamb	21.6400	0.0500	1.0820	
E5 Ground floor (normal)	9.8000	0.1600	1.5680	
E6 Intermediate floor within a dwelling	9.8000	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	9.8000	0.0600	0.5880	
E18 Party wall between dwellings	20.4000	0.0600	1.2240	
P1 Party wall - Ground floor	17.0800	0.0800	1.3664	
P2 Party wall - Intermediate floor within a dwelling	17.0800	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	17.0800	0.1200	2.0496	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.7090 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 43.3673 (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	41.6056	41.3604	41.1201	39.9915	39.7804	38.7973	38.7973	38.6153	39.1760	39.7804	40.2075	40.6541	(38)
Average = Sum(39)m / 12 =	84.9729	84.7278	84.4875	83.3589	83.1477	82.1647	82.1647	81.9827	82.5433	83.1477	83.5749	84.0215	(39)
												83.3579	
HLP	1.0130	1.0101	1.0072	0.9938	0.9913	0.9796	0.9796	0.9774	0.9841	0.9913	0.9964	1.0017	(40)
HLP (average)												0.9938	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

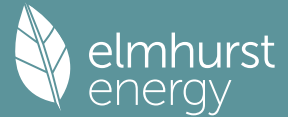
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5324 (42)
Hot water usage for mixer showers													
66.6793	65.6772	64.2170	61.4232	59.3614	57.0621	55.7552	57.2044	58.7929	61.2616	64.1155	66.4238	66.4238	(42a)
Hot water usage for baths													
28.7975	28.3698	27.7675	26.6571	25.8256	24.9035	24.4055	25.0036	25.6547	26.6413	27.7747	28.7001	28.7001	(42b)
Hot water usage for other uses													
40.5640	39.0890	37.6139	36.1388	34.6638	33.1887	33.1887	34.6638	36.1388	37.6139	39.0890	40.5640	40.5640	(42c)
Average daily hot water use (litres/day)													125.0522 (43)
Daily hot water use													
136.0408	133.1360	129.5984	124.2191	119.8508	115.1544	113.3495	116.8717	120.5865	125.5169	130.9791	135.6879	135.6879	(44)
Energy conte	215.4553	189.5838	199.1880	170.0497	161.3422	141.5958	137.0864	144.7116	148.6952	170.3252	186.6037	212.4545	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													2077.0915
32.3183	28.4376	29.8782	25.5075	24.2013	21.2394	20.5630	21.7067	22.3043	25.5488	27.9906	31.8682	31.8682	(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	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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													
266.4142	235.6112	250.1469	219.3648	212.3011	190.9109	188.0453	195.6705	198.0103	221.2841	235.9188	263.4134	263.4134	(62)
WWHRS	-30.4830	-26.9594	-28.2303	-23.3758	-21.7854	-18.6419	-18.5817	-19.2877	-22.7380	-25.7594	-29.9185	-29.9185	(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	235.9312	208.6518	221.9166	195.9890	190.5156	172.2689	170.5714	177.0888	178.7226	198.5461	210.1594	233.4949	(64)
12Total per year (kWh/year)													2393.8564 (64)
Electric shower(s)													2394 (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	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													
84.3786	74.5435	78.9697	68.8703	66.3860	59.4094	58.3209	60.8563	61.7699	69.3729	74.3745	83.3809	83.3809	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	126.6185	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
118.1242	130.7804	118.1242	122.0617	118.1242	122.0617	118.1242	118.1242	122.0617	118.1242	122.0617	118.1242	118.1242	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
227.3583	229.7176	223.7723	211.1155	195.1386	180.1225	170.0909	167.7316	173.6769	186.3337	202.3106	217.3267	217.3267	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	35.6619	(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)													
-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	(71)
Water heating gains (Table 5)													
113.4121	110.9278	106.1421	95.6532	89.2285	82.5130	78.3884	81.7962	85.7916	93.2431	103.2979	112.0710	112.0710	(72)
Total internal gains													

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522.8802 535.4113 512.0242 492.8160 466.4768 445.6828 427.5890 428.6375 442.5157 461.6865 491.6558 511.5075 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d			Gains W
East				4.1100	19.6403	0.6300	0.7000				0.7700			24.6695 (76)
West				10.2500	19.6403	0.6300	0.7000				0.7700			61.5238 (80)
Solar gains	86.1933	168.6124	277.6806	404.9806	496.3190	508.0708	483.7041	415.4947	322.9540	200.0728	107.4729			70.8812 (83)
Total gains	609.0735	704.0237	789.7048	897.7966	962.7958	953.7536	911.2931	844.1322	765.4698	661.7594	599.1287			582.3887 (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	56.3154	56.4783	56.6390	57.4058	57.5516	58.2402	58.2402	58.3695	57.9730	57.5516	57.2574	56.9531
alpha	4.7544	4.7652	4.7759	4.8271	4.8368	4.8827	4.8827	4.8913	4.8649	4.8368	4.8172	4.7969
util living area	0.9897	0.9788	0.9526	0.8728	0.7273	0.5374	0.3941	0.4419	0.6892	0.9186	0.9796	0.9915 (86)
MIT	19.7491	19.9649	20.2745	20.6537	20.8875	20.9795	20.9963	20.9937	20.9352	20.6045	20.1160	19.7186 (87)
Th 2	20.0725	20.0749	20.0773	20.0885	20.0906	20.1004	20.1004	20.1022	20.0966	20.0906	20.0864	20.0819 (88)
util rest of house	0.9870	0.9735	0.9408	0.8438	0.6750	0.4673	0.3148	0.3580	0.6169	0.8927	0.9736	0.9894 (89)
MIT 2	18.6192	18.8936	19.2815	19.7427	19.9963	20.0880	20.0990	20.0996	20.0516	19.6987	19.0955	18.5872 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.8672	19.1288	19.4995	19.9426	20.1919	20.2836	20.2959	20.2959	20.2456	19.8975	19.3195	18.8355 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.8672	19.1288	19.4995	19.9426	20.1919	20.2836	20.2959	20.2959	20.2456	19.8975	19.3195	18.8355 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9823	0.9664	0.9317	0.8386	0.6812	0.4819	0.3322	0.3763	0.6295	0.8862	0.9668	0.9852 (94)
Useful gains	598.2690	680.3906	735.7632	752.8599	655.8516	459.5899	302.7283	317.6760	481.8813	586.4433	579.2634	573.7734 (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	1237.8163	1205.5711	1098.2910	920.5017	706.0823	466.9946	303.6763	319.3929	507.2751	773.0643	1021.2434	1229.6995 (97)
Space heating kWh	475.8232	352.9213	269.7207	120.7021	37.3716	0.0000	0.0000	0.0000	0.0000	138.8460	318.2256	488.0091 (98a)
Space heating requirement - total per year (kWh/year)	2201.6196											
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	475.8232	352.9213	269.7207	120.7021	37.3716	0.0000	0.0000	0.0000	0.0000	138.8460	318.2256	488.0091 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2201.6196											
Space heating per m2	(98c) / (4) = 26.2473 (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	475.8232	352.9213	269.7207	120.7021	37.3716	0.0000	0.0000	0.0000	0.0000	138.8460	318.2256	488.0091 (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)	514.9602	381.9494	291.9055	130.6300	40.4455	0.0000	0.0000	0.0000	0.0000	150.2663	344.4000	528.1483 (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	235.9312	208.6518	221.9166	195.9890	190.5156	172.2689	170.5714	177.0888	178.7226	198.5461	210.1594	233.4949 (64)
Efficiency of water heater (217)m	85.8522	85.4978	84.8005	83.3740	81.5944	80.3000	80.3000	80.3000	80.3000	83.6293	85.2678	80.3000 (216)
Fuel for water heating, kWh/month	274.8110	244.0434	261.6924	235.0720	233.4910	214.5317	212.4177	220.5341	222.5686	237.4121	246.4697	271.7522 (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	24.5439	19.6900	17.7287	12.9888	10.0329	8.1970	9.1524	11.8966	15.4525	20.2745	22.9000	25.2260 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-38.9566	-54.7763	-78.5297	-88.0548	-94.7421	-88.3464	-87.2395	-82.4505	-73.9806	-62.5063	-42.7708	-33.6961 (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	-22.4518	-47.1817	-93.6924	-140.6034	-185.8090	-186.6681	-184.4851	-156.2628	-114.6062	-67.4522	-29.9681	-17.7592 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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												2382.7052	(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												2874.7958	(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)												198.0832	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2072.9896	(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												3468.5947	(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	2382.7052	0.2100	500.3681	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2874.7958	0.2100	603.7071	(264)
Space and water heating			1104.0752	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.0832	0.1443	28.5895	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-826.0497	0.1346	-111.2239	
PV Unit electricity exported	-1246.9399	0.1259	-157.0131	
Total			-268.2370	(269)
Total CO2, kg/year			876.3570	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4500	(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	2382.7052	1.1300	2692.4569	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2874.7958	1.1300	3248.5193	(278)
Space and water heating			5940.9762	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.0832	1.5338	303.8266	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-826.0497	1.4976	-1237.1173	
PV Unit electricity exported	-1246.9399	0.4622	-576.3471	
Total			-1813.4643	(283)
Total Primary energy kWh/year			4561.4393	(286)
Target Primary Energy Rate (TPER)			54.3800	(287)

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Plot Reference	SAP 1033 Plot 2			Issued on Date	07/12/2025
Assessment Reference	Rev A	Plot Type Ref			
Plot Address	L/A Appletree Cottage, Winchester Road, Botley, Hampshire, SO32 2DH			SAP Version	10.2
SAP Rating	92 A	DER	9.73	TER	10.45
Environmental	92 A	% DER < TER			6.89
CO ₂ Emissions (t/year)	0.67	DFEE	25.10	TFEE	31.88
Compliance Check	See BREL	% DFEE < TFEE			21.27
% DPER < TPER	5.46	DPER	51.41	TPER	54.38
Assessor Details	Mr. Tobias Whiting			Assessor ID	E477-0001
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	41.9400 (1b)	x 2.4000 (2b)	= 100.6560 (1b) - (3b)
First floor	41.9400 (1c)	x 2.7000 (2c)	= 113.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.8940 (5)

2. Ventilation rate

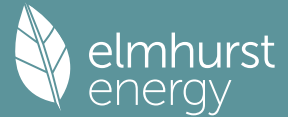
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1870 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3870 (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) = 0.3290 (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	0.4194	0.4112	0.4030	0.3619	0.3536	0.3125	0.3125	0.3043	0.3290	0.3536	0.3701	0.3865 (22b)
Effective ac	0.5880	0.5845	0.5812	0.5655	0.5625	0.5488	0.5488	0.5463	0.5541	0.5625	0.5685	0.5747 (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							
Front Door			2.1200	1.1000	2.3320		(26a)
Fully Glazed Door/Win			14.3600	1.1450	16.4427		(27)
Heat Loss Floor 1			41.9400	0.1200	5.0328	75.0000	3145.5000 (28a)
External Wall 1	49.9800	16.4800	33.5000	0.1800	6.0300	43.4900	1456.9150 (29a)
External Roof 1	41.9400		41.9400	0.0900	3.7746	10.3700	434.9178 (30)
Total net area of external elements Aum(A, m ²)			133.8600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.6121		(33)
Main dwelling							
Party Wall 1			45.0000	0.0000	0.0000	110.0000	4950.0000 (32)
Party Wall 2			45.0000	0.0000	0.0000	110.0000	4950.0000 (32)
Internal Wall 1			54.1900		9.0000		487.7100 (32c)
Internal Wall 2			74.4000		9.0000		669.6000 (32c)
Internal Floor 1			41.9400		18.0000		754.9200 (32d)
Internal Ceiling 1			41.9400		9.0000		377.4600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17227.0228 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							205.3770 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)						10.5700	0.0000	0.0000					
E3 Sill						6.0500	0.0000	0.0000					
E4 Jamb						21.6400	0.0000	0.0000					
E5 Ground floor (normal)						9.8000	0.0000	0.0000					
E6 Intermediate floor within a dwelling						9.8000	0.0000	0.0000					
E10 Baves (insulation at ceiling level)						9.8000	0.0000	0.0000					
E18 Party wall between dwellings						20.4000	0.0000	0.0000					
P1 Party wall - Ground floor						17.0800	0.0000	0.0000					
P2 Party wall - Intermediate floor within a dwelling						17.0800	0.0000	0.0000					
P4 Party wall - Roof (insulation at ceiling level)						17.0800	0.0000	0.0000					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												0.0000	(36)
Point Thermal bridges												0.0000	
Total fabric heat loss												(33) + (36) + (36a) =	33.6121 (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	41.5009	41.2599	41.0236	39.9136	39.7060	38.7393	38.7393	38.5602	39.1116	39.7060	40.1261	40.5653	(38)
Average = Sum(39)m / 12 =	75.1131	74.8720	74.6357	73.5258	73.3181	72.3514	72.3514	72.1724	72.7238	73.3181	73.7382	74.1774	(39)
												73.5248	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8955	0.8926	0.8898	0.8766	0.8741	0.8626	0.8626	0.8604	0.8670	0.8741	0.8791	0.8843	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												0.8765	

4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.5324 (42)
Hot water usage for mixer showers													
Hot water usage for baths	66.6793	65.6772	64.2170	61.4232	59.3614	57.0621	55.7552	57.2044	58.7929	61.2616	64.1155	66.4238	(42a)
Hot water usage for other uses	28.7975	28.3698	27.7675	26.6571	25.8256	24.9035	24.4055	25.0036	25.6547	26.6413	27.7747	28.7001	(42b)
Average daily hot water use (litres/day)	40.5640	39.0890	37.6139	36.1388	34.6638	33.1887	33.1887	34.6638	36.1388	37.6139	39.0890	40.5640	(42c)
												125.0522	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	136.0408	133.1360	129.5984	124.2191	119.8508	115.1544	113.3495	116.8717	120.5865	125.5169	130.9791	135.6879	(44)
Energy content (annual)	215.4553	189.5838	199.1880	170.0497	161.3422	141.5958	137.0864	144.7116	148.6952	170.3252	186.6037	212.4545	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss (or HIU loss):	32.3183	28.4376	29.8782	25.5075	24.2013	21.2394	20.5630	21.7067	22.3043	25.5488	27.9906	31.8682	(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	0.6607	0.6034	0.6621	0.6018	0.5992	0.5525	0.5448	0.5547	0.5479	0.5940	0.6100	0.6545	(61)
Total heat required for water heating calculated for each month	216.1160	190.1872	199.8501	170.6516	161.9414	142.1483	137.6312	145.2663	149.2431	170.9192	187.2137	213.1090	(62)
WWHRS	-31.1909	-27.5855	-28.8860	-23.9187	-22.2914	-19.0749	-17.8797	-19.0132	-19.7356	-23.2661	-26.3577	-30.6133	(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	184.9250	162.6017	170.9641	146.7328	139.6500	123.0734	119.7515	126.2531	129.5075	147.6530	160.8560	182.4956	(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	71.8041	63.1875	66.3955	56.6920	53.7961	47.2187	45.7174	48.2553	49.5781	56.7816	62.1982	70.8047	(65)

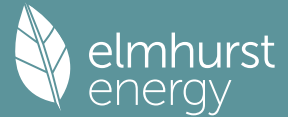
5. Internal gains (see Table 5 and 5a)													

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	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	26.0921	23.1747	18.8470	14.2684	10.6658	9.0045	9.7297	12.6470	16.9748	21.5534	25.1560	26.8172	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	339.3408	342.8621	333.9885	315.0978	291.2516	268.8396	253.8670	250.3457	259.2192	278.1099	301.9561	324.3681	(68)
Pumps, fans	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	(71)
Total internal gains	96.5108	94.0290	89.2413	78.7389	72.3065	65.5816	61.4481	64.8593	68.8585	76.3194	86.3864	95.1677	(72)
	568.3177	566.4398	548.4508	514.4790	480.5979	446.7996	428.4188	431.2259	448.4265	482.3567	519.8725	552.7271	(73)

6. Solar gains													

[Jan]													
				Area		Solar flux							
				m2		Table 6a		g		FF		Access	
						W/m2		Specific data		Specific data		factor	
								or Table 6b		or Table 6c		Table 6d	
East				4.1100		19.6403		0.6300		0.7000		0.7700	
West				10.2500		19.6403		0.6300		0.7000		0.7700	
Solar gains	86.1933	168.6124	277.6806	404.9806	496.3190	508.0708	483.7041	415.4947	322.9540	200.0728	107.4729	70.8812	(83)
Total gains	654.5110	735.0522	826.1314	919.4596	976.9169	954.8704	912.1229	846.7206	771.3806	682.4295	627.3454	623.6082	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	63.7077	63.9129	64.1152	65.0831	65.2674	66.1395	66.1395	66.3035	65.8008	65.2674	64.8956	64.5113	
alpha	5.2472	5.2609	5.2743	5.3389	5.3512	5.4093	5.4093	5.4202	5.3867	5.3512	5.3264	5.3008	
util living area	0.9840	0.9697	0.9302	0.8280	0.6637	0.4799	0.3483	0.3906	0.6266	0.8853	0.9703	0.9871 (86)	
MIT	20.0400	20.2247	20.5059	20.7973	20.9471	20.9924	20.9989	20.9980	20.9707	20.7498	20.3429	20.0057 (87)	
Th 2	20.1713	20.1738	20.1762	20.1875	20.1896	20.1994	20.1994	20.2013	20.1956	20.1896	20.1853	20.1808 (88)	
util rest of house	0.9801	0.9627	0.9150	0.7961	0.6152	0.4219	0.2853	0.3235	0.5619	0.8548	0.9622	0.9840 (89)	
MIT 2	19.3053	19.4877	19.7591	20.0328	20.1557	20.1959	20.1991	20.2006	20.1801	20.0004	19.6150	19.2792 (90)	
Living area fraction									fLA = Living area / (4) =				0.2195 (91)
MIT	19.4665	19.6495	19.9230	20.2006	20.3294	20.3707	20.3746	20.3756	20.3536	20.1648	19.7748	19.4387 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.4665	19.6495	19.9230	20.2006	20.3294	20.3707	20.3746	20.3756	20.3536	20.1648	19.7748	19.4387 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9760	0.9574	0.9096	0.7967	0.6238	0.4344	0.2991	0.3382	0.5750	0.8538	0.9572	0.9804 (94)
Useful gains	638.8181	703.7244	751.4655	732.5195	609.4069	414.8264	272.8196	286.3918	443.5634	582.6548	600.5157	611.3725 (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	1139.2057	1104.3217	1001.8357	830.8865	632.6883	417.5164	273.1008	286.9303	454.7869	701.2765	934.6151	1130.3658 (97)
Space heating kWh	372.2884	269.2014	186.2755	70.8242	17.3214	0.0000	0.0000	0.0000	0.0000	88.2545	240.5515	386.1310 (98a)
Space heating requirement - total per year (kWh/year)												1630.8479
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	372.2884	269.2014	186.2755	70.8242	17.3214	0.0000	0.0000	0.0000	0.0000	88.2545	240.5515	386.1310 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1630.8479
Space heating per m2										(98c) / (4) =		19.4426 (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 %)													88.7000 (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	372.2884	269.2014	186.2755	70.8242	17.3214	0.0000	0.0000	0.0000	0.0000	88.2545	240.5515	386.1310 (98)	
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)	
Space heating fuel (main heating system)	419.7163	303.4965	210.0062	79.8469	19.5280	0.0000	0.0000	0.0000	0.0000	99.4978	271.1967	435.3225 (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	184.9250	162.6017	170.9641	146.7328	139.6500	123.0734	119.7515	126.2531	129.5075	147.6530	160.8560	182.4956 (64)	
Efficiency of water heater												76.4000 (216)	
(217)m	84.2011	83.6299	82.3548	80.0120	77.5872	76.4000	76.4000	76.4000	76.4000	80.5803	83.3243	84.3421 (217)	
Fuel for water heating, kWh/month	219.6230	194.4300	207.5946	183.3886	179.9909	161.0908	156.7428	165.2527	169.5124	183.2372	193.0481	216.3756 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	22.8382	18.3217	16.4966	12.0861	9.3357	7.6273	8.5163	11.0698	14.3786	18.8655	21.3086	23.4730 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.7119	-25.4250	-42.3376	-54.0338	-63.0282	-60.5071	-59.4252	-53.3966	-43.4201	-31.3544	-18.1986	-13.1161 (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	-4.6594	-11.3881	-27.1007	-47.5840	-69.0405	-71.7913	-70.1041	-55.5917	-35.9015	-17.6111	-6.5387	-3.5340 (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													1838.6109 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													76.4000
Water heating fuel used													2230.2868 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													184.3175 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-900.7996 (233)
Wind generation													0.0000 (234)

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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	3438.4157 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1838.6109	3.6400	66.9254 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2230.2868	3.6400	81.1824 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	184.3175	16.4900	30.3940 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.9547	16.4900	-79.1445
PV Unit electricity exported	-420.8449	5.5900	-23.5252
Total			-102.6698 (252)
Total energy cost			182.0135 (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] =	0.5084 (257)
SAP value		91.7586
SAP rating (Section 12)		92 (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	1838.6109	0.2100	386.1083 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2230.2868	0.2100	468.3602 (264)
Space and water heating			854.4685 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	184.3175	0.1443	26.6027 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.9547	0.1322	-63.4381
PV Unit electricity exported	-420.8449	0.1222	-51.4164
Total			-114.8545 (269)
Total CO2, kg/year			778.1460 (272)
CO2 emissions per m2			9.2800 (273)
EI value			91.9094
EI rating			92 (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

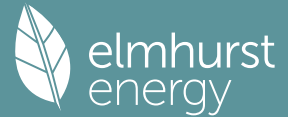
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.9400 (1b)	x 2.4000 (2b)	= 100.6560 (1b) - (3b)
First floor	41.9400 (1c)	x 2.7000 (2c)	= 113.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	213.8940 (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) = 0.1870 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3870 (18)

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Number of sides sheltered

2 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.3290 \quad (21)$$

Wind speed	Jan 4.2000	Feb 3.9000	Mar 4.0000	Apr 3.8000	May 3.8000	Jun 3.7000	Jul 3.6000	Aug 3.5000	Sep 3.4000	Oct 3.7000	Nov 3.5000	Dec 3.7000	(22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250	(22a)
Adj infilt rate	0.3454	0.3207	0.3290	0.3125	0.3125	0.3043	0.2961	0.2878	0.2796	0.3043	0.2878	0.3043	(22b)
Effective ac	0.5597	0.5514	0.5541	0.5488	0.5488	0.5463	0.5438	0.5414	0.5391	0.5463	0.5414	0.5463	(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								
Front Door			2.1200	1.1000	2.3320			(26a)
Fully Glazed Door/Win			14.3600	1.1450	16.4427			(27)
Heat Loss Floor 1			41.9400	0.1200	5.0328	75.0000	3145.5000	(28a)
External Wall 1	49.9800	16.4800	33.5000	0.1800	6.0300	43.4900	1456.9150	(29a)
External Roof 1	41.9400		41.9400	0.0900	3.7746	10.3700	434.9178	(30)
Total net area of external elements Aum(A, m ²)			133.8600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.6121			(33)
Main dwelling								
Party Wall 1			45.0000	0.0000	0.0000	110.0000	4950.0000	(32)
Party Wall 2			45.0000	0.0000	0.0000	110.0000	4950.0000	(32)
Internal Wall 1			54.1900		9.0000		487.7100	(32c)
Internal Wall 2			74.4000		9.0000		669.6000	(32c)
Internal Floor 1			41.9400			18.0000	754.9200	(32d)
Internal Ceiling 1			41.9400			9.0000	377.4600	(32e)

Heat capacity Cm = Sum(A x k)

$$(28)...(30) + (32) + (32a)...(32e) = 17227.0228 \quad (34)$$

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

$$205.3770 \quad (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.5700	0.0000	0.0000
E3 Sill	6.0500	0.0000	0.0000
E4 Jamb	21.6400	0.0000	0.0000
E5 Ground floor (normal)	9.8000	0.0000	0.0000
E6 Intermediate floor within a dwelling	9.8000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.8000	0.0000	0.0000
E18 Party wall between dwellings	20.4000	0.0000	0.0000
P1 Party wall - Ground floor	17.0800	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	17.0800	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	17.0800	0.0000	0.0000

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

$$0.0000 \quad (36)$$

Point Thermal bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 33.6121 \quad (37)$$

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

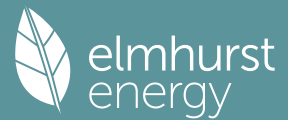
(38)m	Jan 39.5031	Feb 38.9230	Mar 39.1116	Apr 38.7393	May 38.7393	Jun 38.5602	Jul 38.3860	Aug 38.2165	Sep 38.0518	Oct 38.5602	Nov 38.2165	Dec 38.5602	(38)
Heat transfer coeff	73.1152	72.5352	72.7238	72.3514	72.3514	72.1724	71.9981	71.8287	71.6640	72.1724	71.8287	72.1724	(39)
Average = Sum(39)m / 12 =													72.2428

HLP	Jan 0.8717	Feb 0.8647	Mar 0.8670	Apr 0.8626	May 0.8626	Jun 0.8604	Jul 0.8583	Aug 0.8563	Sep 0.8544	Oct 0.8604	Nov 0.8563	Dec 0.8604	(40)
HLP (average)													0.8613
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5324	(42)
Hot water usage for mixer showers														
66.6793	65.6772	64.2170	61.4232	59.3614	57.0621	55.7552	57.2044	58.7929	61.2616	64.1155	66.4238		(42a)	
Hot water usage for baths														
28.7975	28.3698	27.7675	26.6571	25.8256	24.9035	24.4055	25.0036	25.6547	26.6413	27.7747	28.7001		(42b)	
Hot water usage for other uses														
40.5640	39.0890	37.6139	36.1388	34.6638	33.1887	33.1887	34.6638	36.1388	37.6139	39.0890	40.5640		(42c)	
Average daily hot water use (litres/day)													125.0522	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	136.0408	133.1360	129.5984	124.2191	119.8508	115.1544	113.3495	116.8717	120.5865	125.5169	130.9791	135.6879	(44)	
Energy conte	215.4553	189.5838	199.1880	170.0497	161.3422	141.5958	137.0864	144.7116	148.6952	170.3252	186.6037	212.4545	(45)	
Energy content (annual)										Total = Sum(45)m =		2077.0915		
Distribution loss (46)m = 0.15 x (45)m	32.3183	28.4376	29.8782	25.5075	24.2013	21.2394	20.5630	21.7067	22.3043	25.5488	27.9906	31.8682	(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	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	0.6607	0.6034	0.6621	0.6018	0.5992	0.5525	0.5448	0.5547	0.5479	0.5940	0.6100	0.6545	(61)	
Total heat required for water heating calculated for each month														
216.1160	190.1872	199.8501	170.6516	161.9414	142.1483	137.6312	145.2663	149.2431	170.9192	187.2137	213.1090	(62)		
WWHRS	-31.1909	-27.5855	-28.8860	-23.9187	-22.2914	-19.0749	-17.8797	-19.0132	-19.7356	-23.2661	-26.3577	-30.6133	(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	184.9250	162.6017	170.9641	146.7328	139.6500	123.0734	119.7515	126.2531	129.5075	147.6530	160.8560	182.4956	(64)	
								Total per year (kWh/year) = Sum(64)m =				1794.4638	(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	71.8041	63.1875	66.3955	56.6920	53.7961	47.2187	45.7174	48.2553	49.5781	56.7816	62.1982	70.8047	(65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0921	23.1747	18.8470	14.2684	10.6658	9.0045	9.7297	12.6470	16.9748	21.5534	25.1560	26.8172 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	339.3408	342.8621	333.9885	315.0978	291.2516	268.8396	253.8670	250.3457	259.2192	278.1099	301.9561	324.3681 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266 (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)	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948 (71)
Water heating gains (Table 5)	96.5108	94.0290	89.2413	78.7389	72.3065	65.5816	61.4481	64.8593	68.8585	76.3194	86.3864	95.1677 (72)
Total internal gains	568.3177	566.4398	548.4508	514.4790	480.5979	446.7996	428.4188	431.2259	448.4265	482.3567	519.8725	552.7271 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
East	4.1100		25.1925		0.6300		0.7000		0.7700		31.6436 (76)	
West	10.2500		25.1925		0.6300		0.7000		0.7700		78.9165 (80)	
Solar gains	110.5601	183.9714	304.5930	445.0532	516.7672	573.9549	542.4122	478.5742	373.5360	235.3401	137.4025	89.3694 (83)
Total gains	678.8777	750.4112	853.0438	959.5322	997.3651	1020.7545	970.8310	909.8001	821.9625	717.6968	657.2750	642.0965 (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	65.4485	65.9719	65.8008	66.1395	66.1395	66.3035	66.4640	66.6208	66.7739	66.3035	66.6208	66.3035
alpha	5.3632	5.3981	5.3867	5.4093	5.4093	5.4202	5.4309	5.4414	5.4516	5.4202	5.4414	5.4202
util living area	0.9772	0.9614	0.9076	0.7782	0.5985	0.4013	0.2890	0.3076	0.5396	0.8290	0.9525	0.9811 (86)
MIT	20.1876	20.3391	20.6140	20.8647	20.9714	20.9972	20.9996	20.9995	20.9874	20.8448	20.5003	20.1681 (87)
Th 2	20.1917	20.1976	20.1956	20.1994	20.1994	20.2013	20.2030	20.2048	20.2065	20.2013	20.2048	20.2013 (88)
util rest of house	0.9718	0.9527	0.8886	0.7415	0.5477	0.3458	0.2301	0.2450	0.4755	0.7885	0.9399	0.9765 (89)
MIT 2	19.4669	19.6185	19.8764	20.1002	20.1823	20.2001	20.2030	20.2047	20.2004	20.0914	19.7826	19.4560 (90)
Living area fraction	19.6251	19.7766	20.0383	20.2680	20.3555	20.3750	20.3778	20.3791	20.3732	20.2567	19.9402	19.6123 (92)
MIT	19.6251	19.7766	20.0383	20.2680	20.3555	20.3750	20.3778	20.3791	20.3732	20.2567	19.9402	19.6123 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6251	19.7766	20.0383	20.2680	20.3555	20.3750	20.3778	20.3791	20.3732	20.2567	19.9402	19.6123 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9671	0.9473	0.8844	0.7448	0.5578	0.3579	0.2430	0.2588	0.4892	0.7915	0.9350	0.9723 (94)
Useful gains	656.5448	710.8900	754.4210	714.6552	556.3608	365.3680	235.9137	235.4220	402.0879	568.0793	614.5453	624.3022 (95)
Ext temp.	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000 (96)
Heat loss rate W	1076.6275	1050.0646	948.1943	779.0792	568.3581	366.2775	235.9961	235.5338	406.5620	639.2121	864.8279	1054.6050 (97)
Space heating kWh	312.5415	227.9253	144.1673	46.3853	8.9261	0.0000	0.0000	0.0000	0.0000	52.9228	180.2034	320.1452 (98a)
Space heating requirement - total per year (kWh/year)												1293.2170
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	312.5415	227.9253	144.1673	46.3853	8.9261	0.0000	0.0000	0.0000	0.0000	52.9228	180.2034	320.1452 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1293.2170
Space heating per m ²										(98c) / (4) =		15.4175 (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 %)												88.7000 (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	312.5415	227.9253	144.1673	46.3853	8.9261	0.0000	0.0000	0.0000	0.0000	52.9228	180.2034	320.1452 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	352.3579	256.9620	162.5336	52.2946	10.0632	0.0000	0.0000	0.0000	0.0000	59.6650	203.1606	360.9304 (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	184.9250	162.6017	170.9641	146.7328	139.6500	123.0734	119.7515	126.2531	129.5075	147.6530	160.8560	182.4956 (64)
Efficiency of water heater												76.4000 (216)

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(217)m	83.6913	83.1277	81.5750	79.0323	77.0418	76.4000	76.4000	76.4000	76.4000	79.3015	82.4402	83.8016	(217)
Fuel for water heating, kWh/month	220.9609	195.6046	209.5790	185.6618	181.2651	161.0908	156.7428	165.2527	169.5124	186.1919	195.1183	217.7712	(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	7.0685	(230)
Lighting	22.8382	18.3217	16.4966	12.0861	9.3357	7.6273	8.5163	11.0698	14.3786	18.8655	21.3086	23.4730	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.5700	-27.4420	-45.6054	-57.8420	-64.8825	-65.2244	-63.8104	-58.5570	-48.1897	-35.6932	-22.4612	-16.1411	(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	-6.7408	-13.0274	-31.1661	-54.6705	-73.5363	-85.1272	-82.3531	-67.8800	-44.2769	-22.3506	-9.3902	-4.9923	(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												1457.9673	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.4000	
Water heating fuel used												2244.7515	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												184.3175	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1020.9301	(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												2952.1061	(238)

10a. Fuel costs - using BEDF prices (587)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1457.9673	6.5500	95.4969 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2244.7515	6.5500	147.0312 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	28.4300	24.4498 (249)
Energy for lighting	184.3175	28.4300	52.4015 (250)
Additional standing charges			104.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-525.4187	28.4300	-149.3765
PV Unit electricity exported	-495.5114	5.8100	-28.7892
Total			-178.1658 (252)
Total energy cost			245.2136 (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	1457.9673	0.2100	306.1731 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2244.7515	0.2100	471.3978 (264)
Space and water heating			777.5709 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	184.3175	0.1443	26.6027 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-525.4187	0.1325	-69.6185
PV Unit electricity exported	-495.5114	0.1222	-60.5393
Total			-130.1578 (269)
Total CO2, kg/year			685.9451 (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	1457.9673	1.1300	1647.5030 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2244.7515	1.1300	2536.5692 (278)
Space and water heating			4184.0722 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	184.3175	1.5338	282.7124 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-525.4187	1.4896	-782.6502
PV Unit electricity exported	-495.5114	0.4482	-222.0817
Total			-1004.7319 (283)
Total Primary energy kWh/year			3592.1535 (286)

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SAP 10 EPC IMPROVEMENTS

Rev A

Current energy efficiency rating: A 92
Current environmental impact rating: A 92

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

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

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.6 -£ 33 -166 kg (24.2%)

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

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 587 TEST (28 Nov 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Southern England):

	Current	Potential	Saving
Electricity	£77	£77	£0
Mains gas	£347	£347	£0
Space heating	£224	£224	£0
Water heating	£147	£147	£0
Lighting	£52	£52	£0
Generated (PV)	-£178	-£178	£0
Total cost of fuels	£246	£246	£0
Total cost of uses	£245	£245	£0
Delivered energy	35 kWh/m²	35 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	43 kWh/m²	43 kWh/m²	0 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	41.9400 (1b)	x 2.4000 (2b)	= 100.6560 (1b) - (3b)
First floor	41.9400 (1c)	x 2.7000 (2c)	= 113.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	83.8800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	213.8940 (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) = 0.1870 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3870 (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) = 0.3290 (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	0.4194	0.4112	0.4030	0.3619	0.3536	0.3125	0.3125	0.3043	0.3290	0.3536	0.3701	0.3865 (22b)
Effective ac	0.5880	0.5845	0.5812	0.5655	0.5625	0.5488	0.5488	0.5463	0.5541	0.5625	0.5685	0.5747 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
Front Door			2.1200	1.1000	2.3320			(26a)					
Fully Glazed Door/Win			14.3600	1.1450	16.4427			(27)					
Heat Loss Floor 1			41.9400	0.1200	5.0328	75.0000	3145.5000	(28a)					
External Wall 1	49.9800	16.4800	33.5000	0.1800	6.0300	43.4900	1456.9150	(29a)					
External Roof 1	41.9400		41.9400	0.0900	3.7746	10.3700	434.9178	(30)					
Total net area of external elements Aum (A, m2)			133.8600					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.6121			(33)					
Main dwelling													
Party Wall 1			45.0000	0.0000	0.0000	110.0000	4950.0000	(32)					
Party Wall 2			45.0000	0.0000	0.0000	110.0000	4950.0000	(32)					
Internal Wall 1			54.1900			9.0000	487.7100	(32c)					
Internal Wall 2			74.4000			9.0000	669.6000	(32c)					
Internal Floor 1			41.9400			18.0000	754.9200	(32d)					
Internal Ceiling 1			41.9400			9.0000	377.4600	(32e)					
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) = 17227.0228 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								205.3770 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				10.5700	0.0000		0.0000						
E3 Sill				6.0500	0.0000		0.0000						
E4 Jamb				21.6400	0.0000		0.0000						
E5 Ground floor (normal)				9.8000	0.0000		0.0000						
E6 Intermediate floor within a dwelling				9.8000	0.0000		0.0000						
E10 Eaves (insulation at ceiling level)				9.8000	0.0000		0.0000						
E18 Party wall between dwellings				20.4000	0.0000		0.0000						
P1 Party wall - Ground floor				17.0800	0.0000		0.0000						
P2 Party wall - Intermediate floor within a dwelling				17.0800	0.0000		0.0000						
P4 Party wall - Roof (insulation at ceiling level)				17.0800	0.0000		0.0000						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								0.0000 (36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	33.6121 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 41.5009	Feb 41.2599	Mar 41.0236	Apr 39.9136	May 39.7060	Jun 38.7393	Jul 38.7393	Aug 38.5602	Sep 39.1116	Oct 39.7060	Nov 40.1261	Dec 40.5653	(38)
Heat transfer coeff	75.1131	74.8720	74.6357	73.5258	73.3181	72.3514	72.3514	72.1724	72.7238	73.3181	73.7382	74.1774	(39)
Average = Sum(39)m / 12 =												73.5248	
HLP	Jan 0.8955	Feb 0.8926	Mar 0.8898	Apr 0.8766	May 0.8741	Jun 0.8626	Jul 0.8626	Aug 0.8604	Sep 0.8670	Oct 0.8741	Nov 0.8791	Dec 0.8843	(40)
HLP (average)												0.8765	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

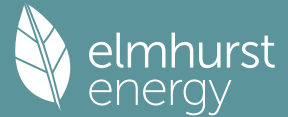
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5324 (42)
Hot water usage for mixer showers	66.6793	65.6772	64.2170	61.4232	59.3614	57.0621	55.7552	57.2044	58.7929	61.2616	64.1155	66.4238 (42a)	
Hot water usage for baths	28.7975	28.3698	27.7675	26.6571	25.8256	24.9035	24.4055	25.0036	25.6547	26.6413	27.7747	28.7001 (42b)	
Hot water usage for other uses	40.5640	39.0890	37.6139	36.1388	34.6638	33.1887	33.1887	34.6638	36.1388	37.6139	39.0890	40.5640 (42c)	
Average daily hot water use (litres/day)													125.0522 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	136.0408	133.1360	129.5984	124.2191	119.8508	115.1544	113.3495	116.8717	120.5865	125.5169	130.9791	135.6879 (44)	
Distribution loss (46)m = 0.15 x (45)m	215.4553	189.5838	199.1880	170.0497	161.3422	141.5958	137.0864	144.7116	148.6952	170.3252	186.6037	212.4545 (45)	
Water storage loss (or HIU loss):													Total = Sum(45)m = 2077.0915
Total storage loss	32.3183	28.4376	29.8782	25.5075	24.2013	21.2394	20.5630	21.7067	22.3043	25.5488	27.9906	31.8682 (46)	
	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	0.6607	0.6034	0.6621	0.6018	0.5992	0.5525	0.5448	0.5547	0.5479	0.5940	0.6100	0.6545 (61)	
Total heat required for water heating calculated for each month	216.1160	190.1872	199.8501	170.6516	161.9414	142.1483	137.6312	145.2663	149.2431	170.9192	187.2137	213.1090 (62)	
WWHRS	-31.1909	-27.5855	-28.8860	-23.9187	-22.2914	-19.0749	-17.8797	-19.0132	-19.7356	-23.2661	-26.3577	-30.6133 (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	184.9250	162.6017	170.9641	146.7328	139.6500	123.0734	119.7515	126.2531	129.5075	147.6530	160.8560	182.4956 (64)	
Electric shower(s)	Total per year (kWh/year) = Sum(64)m = 1794.4638 (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	71.8041	63.1875	66.3955	56.6920	53.7961	47.2187	45.7174	48.2553	49.5781	56.7816	62.1982	70.8047 (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	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0921	23.1747	18.8470	14.2684	10.6658	9.0045	9.7297	12.6470	16.9748	21.5534	25.1560	26.8172 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	339.3408	342.8621	333.9885	315.0978	291.2516	268.8396	253.8670	250.3457	259.2192	278.1099	301.9561	324.3681 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266 (69)

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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)	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948 (71)
Water heating gains (Table 5)	96.5108	94.0290	89.2413	78.7389	72.3065	65.5816	61.4481	64.8593	68.8585	76.3194	86.3864	95.1677 (72)
Total internal gains	568.3177	566.4398	548.4508	514.4790	480.5979	446.7996	428.4188	431.2259	448.4265	482.3567	519.8725	552.7271 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East				4.1100	19.6403	0.6300	0.7000			0.7700			24.6695 (76)
West				10.2500	19.6403	0.6300	0.7000			0.7700			61.5238 (80)
Solar gains	86.1933	168.6124	277.6806	404.9806	496.3190	508.0708	483.7041	415.4947	322.9540	200.0728	107.4729	70.8812 (83)	
Total gains	654.5110	735.0522	826.1314	919.4596	976.9169	954.8704	912.1229	846.7206	771.3806	682.4295	627.3454	623.6082 (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)												
tau	63.7077	63.9129	64.1152	65.0831	65.2674	66.1395	66.1395	66.3035	65.8008	65.2674	64.8956	64.5113
alpha	5.2472	5.2609	5.2743	5.3389	5.3512	5.4093	5.4093	5.4202	5.3867	5.3512	5.3264	5.3008
util living area	0.9840	0.9697	0.9302	0.8280	0.6637	0.4799	0.3483	0.3906	0.6266	0.8853	0.9703	0.9871 (86)
MIT	20.0400	20.2247	20.5059	20.7973	20.9471	20.9924	20.9989	20.9980	20.9707	20.7498	20.3429	20.0057 (87)
Th 2	20.1713	20.1738	20.1762	20.1875	20.1896	20.1994	20.1994	20.2013	20.1956	20.1896	20.1853	20.1808 (88)
util rest of house	0.9801	0.9627	0.9150	0.7961	0.6152	0.4219	0.2853	0.3235	0.5619	0.8548	0.9622	0.9840 (89)
MIT 2	19.3053	19.4877	19.7591	20.0328	20.1557	20.1959	20.1991	20.2006	20.1801	20.0004	19.6150	19.2792 (90)
Living area fraction	19.4665	19.6495	19.9230	20.2006	20.3294	20.3707	20.3746	20.3756	20.3536	20.1648	19.7748	19.4387 (92)
MIT	19.4665	19.6495	19.9230	20.2006	20.3294	20.3707	20.3746	20.3756	20.3536	20.1648	19.7748	19.4387 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4665	19.6495	19.9230	20.2006	20.3294	20.3707	20.3746	20.3756	20.3536	20.1648	19.7748	19.4387 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9760	0.9574	0.9096	0.7967	0.6238	0.4344	0.2991	0.3382	0.5750	0.8538	0.9572	0.9804 (94)
Ext temp.	638.8181	703.7244	751.4655	732.5195	609.4069	414.8264	272.8196	286.3918	443.5634	582.6548	600.5157	611.3725 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1139.2057	1104.3217	1001.8357	830.8865	632.6883	417.5164	273.1008	286.9303	454.7869	701.2765	934.6151	1130.3658 (97)
Space heating requirement - total per year (kWh/year)	372.2884	269.2014	186.2755	70.8242	17.3214	0.0000	0.0000	0.0000	0.0000	88.2545	240.5515	386.1310 (98a)
Solar heating kWh												1630.8479
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh	372.2884	269.2014	186.2755	70.8242	17.3214	0.0000	0.0000	0.0000	0.0000	88.2545	240.5515	386.1310 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1630.8479
Space heating per m2										(98c) / (4) =		19.4426 (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 %)												88.7000 (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	372.2884	269.2014	186.2755	70.8242	17.3214	0.0000	0.0000	0.0000	0.0000	88.2545	240.5515	386.1310 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	419.7163	303.4965	210.0062	79.8469	19.5280	0.0000	0.0000	0.0000	0.0000	99.4978	271.1967	435.3225 (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	184.9250	162.6017	170.9641	146.7328	139.6500	123.0734	119.7515	126.2531	129.5075	147.6530	160.8560	182.4956 (64)
Efficiency of water heater (217)m	84.2011	83.6299	82.3548	80.0120	77.5872	76.4000	76.4000	76.4000	76.4000	80.5803	83.3243	76.4000 (216)
Fuel for water heating, kWh/month	219.6230	194.4300	207.5946	183.3886	179.9909	161.0908	156.7428	165.2527	169.5124	183.2372	193.0481	84.3421 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	22.8382	18.3217	16.4966	12.0861	9.3357	7.6273	8.5163	11.0698	14.3786	18.8655	21.3086	23.4730 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-15.7119	-25.4250	-42.3376	-54.0338	-63.0282	-60.5071	-59.4252	-53.3966	-43.4201	-31.3544	-18.1986	-13.1161 (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)												

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(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	-4.6594	-11.3881	-27.1007	-47.5840	-69.0405	-71.7913	-70.1041	-55.5917	-35.9015	-17.6111	-6.5387	-3.5340	(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												1838.6109	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.4000	
Water heating fuel used												2230.2868	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												184.3175	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-900.7996	(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												3438.4157	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1838.6109	3.6400	66.9254	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2230.2868	3.6400	81.1824	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	184.3175	16.4900	30.3940	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.9547	16.4900	-79.1445	
PV Unit electricity exported	-420.8449	5.5900	-23.5252	
Total			-102.6698	(252)
Total energy cost			182.0135	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5084	(257)
SAP value		91.7586	
SAP rating (Section 12)		92	(258)
SAP band		A	

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

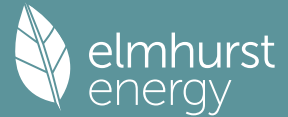
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1838.6109	0.2100	386.1083	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2230.2868	0.2100	468.3602	(264)
Space and water heating			854.4685	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	184.3175	0.1443	26.6027	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-479.9547	0.1322	-63.4381	
PV Unit electricity exported	-420.8449	0.1222	-51.4164	
Total			-114.8545	(269)
Total CO2, kg/year			778.1460	(272)
CO2 emissions per m2			9.2800	(273)
EI value			91.9094	
EI rating			92	(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	41.9400 (1b)	x 2.4000 (2b)	= 100.6560 (1b) - (3b)	
Ground floor				

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First floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 83.8800 41.9400 (1c) x 2.7000 (2c) = 113.2380 (1c) - (3c)
Dwelling volume (4)
(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 213.8940 (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)

Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1870 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 4.0000 (17)
Infiltration rate 0.3870 (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) = 0.3290 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250
Adj infilt rate												
	0.3454	0.3207	0.3290	0.3125	0.3125	0.3043	0.2961	0.2878	0.2796	0.3043	0.2878	0.3043
Effective ac	0.5597	0.5514	0.5541	0.5488	0.5488	0.5463	0.5438	0.5414	0.5391	0.5463	0.5414	0.5463

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							
Front Door			2.1200	1.1000	2.3320		(26a)
Fully Glazed Door/Win			14.3600	1.1450	16.4427		(27)
Heat Loss Floor 1			41.9400	0.1200	5.0328	75.0000	3145.5000 (28a)
External Wall 1	49.9800	16.4800	33.5000	0.1800	6.0300	43.4900	1456.9150 (29a)
External Roof 1	41.9400		41.9400	0.0900	3.7746	10.3700	434.9178 (30)
Total net area of external elements Aum(A, m2)			133.8600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.6121		(33)
Main dwelling							
Party Wall 1			45.0000	0.0000	0.0000	110.0000	4950.0000 (32)
Party Wall 2			45.0000	0.0000	0.0000	110.0000	4950.0000 (32)
Internal Wall 1			54.1900			9.0000	487.7100 (32c)
Internal Wall 2			74.4000			9.0000	669.6000 (32c)
Internal Floor 1			41.9400			18.0000	754.9200 (32d)
Internal Ceiling 1			41.9400			9.0000	377.4600 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 17227.0228 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							205.3770 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.5700	0.0000	0.0000	
E3 Sill				6.0500	0.0000	0.0000	
E4 Jamb				21.6400	0.0000	0.0000	
E5 Ground floor (normal)				9.8000	0.0000	0.0000	
E6 Intermediate floor within a dwelling				9.8000	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)				9.8000	0.0000	0.0000	
E18 Party wall between dwellings				20.4000	0.0000	0.0000	
P1 Party wall - Ground floor				17.0800	0.0000	0.0000	
P2 Party wall - Intermediate floor within a dwelling				17.0800	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				17.0800	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							0.0000 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 33.6121 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.5031	38.9230	39.1116	38.7393	38.7393	38.5602	38.3860	38.2165	38.0518	38.5602	38.2165	38.5602
Heat transfer coeff	73.1152	72.5352	72.7238	72.3514	72.3514	72.1724	71.9981	71.8287	71.6640	72.1724	71.8287	72.1724
Average = Sum(39)m / 12 =												
	72.2428											

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8717	0.8647	0.8670	0.8626	0.8626	0.8604	0.8583	0.8563	0.8544	0.8604	0.8563	0.8604
HLP (average)												
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

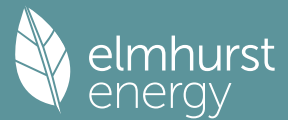
Assumed occupancy 2.5324 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
66.6793	65.6772	64.2170	61.4232	59.3614	57.0621	55.7552	57.2044	58.7929	61.2616	64.1155	66.4238	
Hot water usage for baths	28.7975	28.3698	27.7675	26.6571	25.8256	24.9035	24.4055	25.0036	25.6547	26.6413	27.7747	28.7001
Hot water usage for other uses	40.5640	39.0890	37.6139	36.1388	34.6638	33.1887	33.1887	34.6638	36.1388	37.6139	39.0890	40.5640
Average daily hot water use (litres/day)												
	136.0408	133.1360	129.5984	124.2191	119.8508	115.1544	113.3495	116.8717	120.5865	125.5169	130.9791	135.6879

Daily hot water use (44)

Full SAP Calculation Printout



Energy conte	215.4553	189.5838	199.1880	170.0497	161.3422	141.5958	137.0864	144.7116	148.6952	170.3252	186.6037	212.4545 (45)
Energy content (annual)										Total =	Sum(45)m =	2077.0915
Distribution loss (46)m = 0.15 x (45)m												
	32.3183	28.4376	29.8782	25.5075	24.2013	21.2394	20.5630	21.7067	22.3043	25.5488	27.9906	31.8682 (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	0.6607	0.6034	0.6621	0.6018	0.5992	0.5525	0.5448	0.5547	0.5479	0.5940	0.6100	0.6545 (61)
Total heat required for water heating calculated for each month												
	216.1160	190.1872	199.8501	170.6516	161.9414	142.1483	137.6312	145.2663	149.2431	170.9192	187.2137	213.1090 (62)
WWHRS	-31.1909	-27.5855	-28.8860	-23.9187	-22.2914	-19.0749	-17.8797	-19.0132	-19.7356	-23.2661	-26.3577	-30.6133 (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												
	184.9250	162.6017	170.9641	146.7328	139.6500	123.0734	119.7515	126.2531	129.5075	147.6530	160.8560	182.4956 (64)
										Total per year (kWh/year) =	Sum(64)m =	1794.4638 (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)
Heat gains from water heating, kWh/month												
	71.8041	63.1875	66.3955	56.6920	53.7961	47.2187	45.7174	48.2553	49.5781	56.7816	62.1982	70.8047 (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	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423	151.9423 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	26.0921	23.1747	18.8470	14.2684	10.6658	9.0045	9.7297	12.6470	16.9748	21.5534	25.1560	26.8172 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	339.3408	342.8621	333.9885	315.0978	291.2516	268.8396	253.8670	250.3457	259.2192	278.1099	301.9561	324.3681 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266	52.7266 (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)												
	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948	-101.2948 (71)
Water heating gains (Table 5)												
	96.5108	94.0290	89.2413	78.7389	72.3065	65.5816	61.4481	64.8593	68.8585	76.3194	86.3864	95.1677 (72)
Total internal gains												
	568.3177	566.4398	548.4508	514.4790	480.5979	446.7996	428.4188	431.2259	448.4265	482.3567	519.8725	552.7271 (73)

6. Solar gains

[Jan]												
			Area		Solar flux		g		FF		Access	Gains
			m2		Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
East			4.1100		25.1925		0.6300		0.7000		0.7700	31.6436 (76)
West			10.2500		25.1925		0.6300		0.7000		0.7700	78.9165 (80)
Solar gains	110.5601	183.9714	304.5930	445.0532	516.7672	573.9549	542.4122	478.5742	373.5360	235.3401	137.4025	89.3694 (83)
Total gains	678.8777	750.4112	853.0438	959.5322	997.3651	1020.7545	970.8310	909.8001	821.9625	717.6968	657.2750	642.0965 (84)

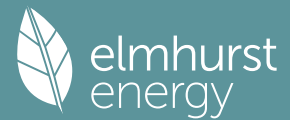
7. Mean internal temperature (heating season)

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	65.4485	65.9719	65.8008	66.1395	66.1395	66.3035	66.4640	66.6208	66.7739	66.3035	66.6208	66.3035
alpha	5.3632	5.3981	5.3867	5.4093	5.4093	5.4202	5.4309	5.4414	5.4516	5.4202	5.4414	5.4202
util living area												
	0.9772	0.9614	0.9076	0.7782	0.5985	0.4013	0.2890	0.3076	0.5396	0.8290	0.9525	0.9811 (86)
MIT	20.1876	20.3391	20.6140	20.8647	20.9714	20.9972	20.9996	20.9995	20.9874	20.8448	20.5003	20.1681 (87)
Th 2	20.1917	20.1976	20.1956	20.1994	20.1994	20.2013	20.2030	20.2048	20.2065	20.2013	20.2048	20.2013 (88)
util rest of house												
	0.9718	0.9527	0.8886	0.7415	0.5477	0.3458	0.2301	0.2450	0.4755	0.7885	0.9399	0.9765 (89)
MIT 2	19.4669	19.6185	19.8764	20.1002	20.1823	20.2001	20.2030	20.2047	20.2004	20.0914	19.7826	19.4560 (90)
Living area fraction												
MIT	19.6251	19.7766	20.0383	20.2680	20.3555	20.3750	20.3778	20.3791	20.3732	20.2567	19.9402	19.6123 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6251	19.7766	20.0383	20.2680	20.3555	20.3750	20.3778	20.3791	20.3732	20.2567	19.9402	19.6123 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9671	0.9473	0.8844	0.7448	0.5578	0.3579	0.2430	0.2588	0.4892	0.7915	0.9350	0.9723 (94)
Ext temp.	656.5448	710.8900	754.4210	714.6552	556.3608	365.3680	235.9137	235.4220	402.0879	568.0793	614.5453	624.3022 (95)
Heat loss rate W	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000 (96)
Space heating kWh												
	1076.6275	1050.0646	948.1943	779.0792	568.3581	366.2775	235.9961	235.5338	406.5620	639.2121	864.8279	1054.6050 (97)
Space heating requirement - total per year (kWh/year)												
	312.5415	227.9253	144.1673	46.3853	8.9261	0.0000	0.0000	0.0000	0.0000	52.9228	180.2034	320.1452 (98a)
Solar heating kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												
	312.5415	227.9253	144.1673	46.3853	8.9261	0.0000	0.0000	0.0000	0.0000	52.9228	180.2034	320.1452 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
												1293.2170
Space heating per m2												
										(98c) / (4) =		15.4175 (99)

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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 %)												88.7000	(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	312.5415	227.9253	144.1673	46.3853	8.9261	0.0000	0.0000	0.0000	0.0000	52.9228	180.2034	320.1452	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	352.3579	256.9620	162.5336	52.2946	10.0632	0.0000	0.0000	0.0000	0.0000	59.6650	203.1606	360.9304	(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	184.9250	162.6017	170.9641	146.7328	139.6500	123.0734	119.7515	126.2531	129.5075	147.6530	160.8560	182.4956	(64)
Efficiency of water heater (217)m	83.6913	83.1277	81.5750	79.0323	77.0418	76.4000	76.4000	76.4000	76.4000	79.3015	82.4402	83.8016	(216)
Fuel for water heating, kWh/month	220.9609	195.6046	209.5790	185.6618	181.2651	161.0908	156.7428	165.2527	169.5124	186.1919	195.1183	217.7712	(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	7.0685	(231)
Lighting	22.8382	18.3217	16.4966	12.0861	9.3357	7.6273	8.5163	11.0698	14.3786	18.8655	21.3086	23.4730	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-19.5700	-27.4420	-45.6054	-57.8420	-64.8825	-65.2244	-63.8104	-58.5570	-48.1897	-35.6932	-22.4612	-16.1411	(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	-6.7408	-13.0274	-31.1661	-54.6705	-73.5363	-85.1272	-82.3531	-67.8800	-44.2769	-22.3506	-9.3902	-4.9923	(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												1457.9673	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												76.4000	
Water heating fuel used												2244.7515	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												184.3175	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1020.9301	(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												2952.1061	(238)

10a. Fuel costs - using BEDF prices (587)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1457.9673	6.5500	95.4969 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2244.7515	6.5500	147.0312 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	28.4300	24.4498 (249)
Energy for lighting	184.3175	28.4300	52.4015 (250)
Additional standing charges			104.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-525.4187	28.4300	-149.3765
PV Unit electricity exported	-495.5114	5.8100	-28.7892
Total			-178.1658 (252)
Total energy cost			245.2136 (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	1457.9673	0.2100	306.1731 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2244.7515	0.2100	471.3978 (264)
Space and water heating			777.5709 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	184.3175	0.1443	26.6027 (268)
Energy saving/generation technologies			

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PV Unit electricity used in dwelling	-525.4187	0.1325	-69.6185
PV Unit electricity exported	-495.5114	0.1222	-60.5393
Total			-130.1578 (269)
Total CO2, kg/year			685.9451 (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	1457.9673	1.1300	1647.5030 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2244.7515	1.1300	2536.5692 (278)
Space and water heating			4184.0722 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	184.3175	1.5338	282.7124 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-525.4187	1.4896	-782.6502
PV Unit electricity exported	-495.5114	0.4482	-222.0817
Total			-1004.7319 (283)
Total Primary energy kWh/year			3592.1535 (286)