

Summary for Input Data



Plot Reference	SAP 1033 Plot 1		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	91 B	DER	10.24	TER	10.49
Environmental	91 B	% DER < TER			2.38
CO ₂ Emissions (t/year)	0.72	DFEE	27.15	TFEE	31.86
Compliance Check	See BREL	% DFEE < TFEE			14.76
% DPER < TPER	0.79	DPER	54.14	TPER	54.57

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, End-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	148.77	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	18.37 m	41.29 m²	2.40 m
		18.37 m	41.29 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	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.18	60.00	43.49	26.58	0.00	None	16.91	Enter Gross Area

9.1 Party Walls	Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
	Party Wall 1	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	Plasterboard, insulated at ceiling level	0.09	9.00	41.29	41.29	None	0.00	Enter Gross 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	41.29

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)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.12	None	0.00	75.00	41.29

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	41.29

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	3.70	
Side Elevation	Fully Glazed Door/win	External Wall 1	South	0.84	
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)	Non Gov Approved Schemes	11.49	0.03	0.03	No
E3 Sill	Non Gov Approved Schemes	6.97	0.02	0.02	No
E4 Jamb	Non Gov Approved Schemes	23.46	0.02	0.02	No
E5 Ground floor (normal)	Non Gov Approved Schemes	18.37	0.04	0.04	No
E6 Intermediate floor within a dwelling	Non Gov Approved Schemes	18.37	0.00	0.00	No
E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	9.82	0.05	0.05	No
E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	8.54	0.03	0.03	No
E16 Corner (normal)	Non Gov Approved Schemes	15.30	0.04	0.04	No
E17 Corner (inverted – internal area greater than external area)	Non Gov Approved Schemes	5.10	-0.07	-0.07	No
E18 Party wall between dwellings	Non Gov Approved Schemes	10.20	0.05	0.05	No
P1 Party wall - Ground floor	Non Gov Approved Schemes	8.54	0.04	0.04	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	8.54	0.00	0.00	No
P4 Party wall - Roof (insulation at ceiling level)	Non Gov Approved Schemes	8.54	0.03	0.03	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 m²/(h.m²) @ 50 Pa

Test Method

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	10.00	1000.00	12

Summary for Input Data

24.0 Main Heating 1

Database	Database
Percentage of Heat	100.00 %
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
Delayed Start Stat	No
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

26.0 Heat Networks

None

27.0 Secondary Heating

None

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	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

32.0 Photovoltaic Unit

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

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

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout



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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	41.2900 (1b)	x 2.4000 (2b)	= 99.0960 (1b) - (3b)
First floor	41.2900 (1c)	x 2.7000 (2c)	= 111.4830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.5790 (5)

2. Ventilation rate

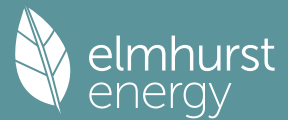
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1900 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3900 (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) = 0.3315 (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	0.4226	0.4143	0.4060	0.3646	0.3563	0.3149	0.3149	0.3066	0.3315	0.3563	0.3729	0.3895 (22b)
Effective ac	0.5893	0.5858	0.5824	0.5665	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5758 (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			14.7900	1.1450	16.9351		(27)
Heatloss Floor 1			41.2900	0.1200	4.9548	75.0000	3096.7500 (28a)
External Wall 1	43.4900	16.9100	26.5800	0.1800	4.7844	60.0000	1594.8000 (29a)
External Roof 1	41.2900		41.2900	0.0900	3.7161	9.0000	371.6100 (30)
Total net area of external elements Aum(A, m ²)			126.0700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.7224		(33)
Main dwelling							
Party Wall 1			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			41.2900			18.0000	743.2200 (32d)
Internal Ceiling 1			41.2900			9.0000	371.6100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12285.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							148.7685 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.4900	0.0300	0.3447	

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E3 Sill									6.9700	0.0200	0.1394	
E4 Jamb									23.4600	0.0200	0.4692	
E5 Ground floor (normal)									18.3700	0.0400	0.7348	
E6 Intermediate floor within a dwelling									18.3700	0.0000	0.0000	
E10 Baves (insulation at ceiling level)									9.8200	0.0500	0.4910	
E12 Gable (insulation at ceiling level)									8.5400	0.0300	0.2562	
E16 Corner (normal)									15.3000	0.0400	0.6120	
E17 Corner (inverted - internal area greater than external area)									5.1000	-0.0700	-0.3570	
E18 Party wall between dwellings									10.2000	0.0500	0.5100	
P1 Party wall - Ground floor									8.5400	0.0400	0.3416	
P2 Party wall - Intermediate floor within a dwelling									8.5400	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)									8.5400	0.0300	0.2562	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												3.7981 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 36.5205 (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	40.9511	40.7101	40.4739	39.3645	39.1569	38.1907	38.1907	38.0117	38.5629	39.1569	39.5768	40.0158 (38)
Average = Sum(39)m / 12 =	77.4716	77.2306	76.9944	75.8850	75.6775	74.7112	74.7112	74.5323	75.0834	75.6775	76.0974	76.5364 (39)
												75.8840
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9381	0.9352	0.9324	0.9189	0.9164	0.9047	0.9047	0.9025	0.9092	0.9164	0.9215	0.9268 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												0.9189
												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.5100 (42)
Hot water usage for mixer showers												
	66.3041	65.3076	63.8557	61.0776	59.0274	56.7411	55.4415	56.8825	58.4621	60.9169	63.7547	66.0500 (42a)
Hot water usage for baths												
	28.6361	28.2109	27.6120	26.5077	25.6809	24.7640	24.2688	24.8635	25.5110	26.4921	27.6191	28.5393 (42b)
Hot water usage for other uses												
	40.3348	38.8681	37.4014	35.9347	34.4680	33.0012	33.0012	34.4680	35.9347	37.4014	38.8681	40.3348 (42c)
Average daily hot water use (litres/day)												124.3484 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	135.2750	132.3866	128.8690	123.5199	119.1762	114.5063	112.7115	116.2139	119.9078	124.8104	130.2419	134.9242 (44)
Energy content (annual)	214.2426	188.5168	198.0669	169.0926	160.4341	140.7989	136.3148	143.8971	147.8583	169.3665	185.5534	211.2587 (45)
Distribution loss (46)m = 0.15 x (45)m												2065.4007
	32.1364	28.2775	29.7100	25.3639	24.0651	21.1198	20.4472	21.5846	22.1787	25.4050	27.8330	31.6888 (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	0.6635	0.6056	0.6642	0.6032	0.6002	0.5530	0.5452	0.5554	0.5488	0.5954	0.6120	0.6572 (61)
Total heat required for water heating calculated for each month												
	214.9061	189.1224	198.7311	169.6958	161.0343	141.3519	136.8600	144.4525	148.4071	169.9619	186.1654	211.9159 (62)
WWHRS	-31.0154	-27.4303	-28.7234	-23.7841	-22.1660	-18.9676	-17.7791	-18.9063	-19.6246	-23.1352	-26.2094	-30.4411 (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	183.8907	161.6921	170.0076	145.9117	138.8683	122.3843	119.0809	125.5462	128.7825	146.8267	159.9560	181.4749 (64)
12Total per year (kWh/year)												1784.4220 (64)
Electric shower(s)												1784 (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												
	71.4015	62.8332	66.0233	56.3741	53.4944	46.9539	45.4610	47.9846	49.3001	56.4632	61.8495	70.4078 (65)

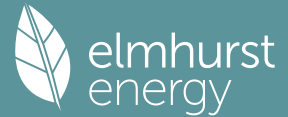
5. Internal gains (see Table 5 and 5a)												

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	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.8739	128.2889	115.8739	119.7363	115.8739	119.7363	115.8739	115.8739	119.7363	115.8739	119.7363	115.8739 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	224.7481	227.0802	221.2032	208.6917	192.8982	178.0546	168.1381	165.8059	171.6829	184.1944	199.9879	214.8316 (68)
Pumps, fans	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997 (71)
Total internal gains	95.9698	93.5018	88.7410	78.2974	71.9010	65.2137	61.1035	64.4955	68.4723	75.8914	85.9021	94.6342 (72)
	500.2417	512.5209	489.4680	470.3754	444.3231	423.6545	405.7653	406.8252	420.5415	439.6096	469.2763	488.9895 (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			3.7000	19.6403	0.6300	0.7000	0.7700	22.2086 (76)				
South			0.8400	46.7521	0.6300	0.7000	0.7700	12.0020 (78)				
West			10.2500	19.6403	0.6300	0.7000	0.7700	61.5238 (80)				
Solar gains	95.7343	183.4544	294.7908	421.7166	511.6374	521.9438	497.6219	430.5596	339.8888	215.5614	118.6308	79.2282 (83)
Total gains	595.9760	695.9753	784.2588	892.0920	955.9605	945.5984	903.3872	837.3848	760.4303	655.1710	587.9071	568.2178 (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	44.0495	44.1869	44.3225	44.9704	45.0938	45.6770	45.6770	45.7867	45.4506	45.0938	44.8450	44.5877
alpha	3.9366	3.9458	3.9548	3.9980	4.0063	4.0451	4.0451	4.0524	4.0300	4.0063	3.9897	3.9725
util living area	0.9739	0.9527	0.9109	0.8113	0.6636	0.4893	0.3600	0.4029	0.6272	0.8662	0.9549	0.9779 (86)
MIT	19.5561	19.8243	20.1849	20.6042	20.8586	20.9684	20.9928	20.9888	20.9160	20.5529	19.9906	19.5172 (87)
Th 2	20.1352	20.1377	20.1401	20.1514	20.1536	20.1635	20.1635	20.1653	20.1597	20.1536	20.1493	20.1448 (88)
util rest of house	0.9691	0.9444	0.8956	0.7820	0.6181	0.4306	0.2932	0.3325	0.5655	0.8376	0.9456	0.9738 (89)
MIT 2	18.8211	19.0852	19.4349	19.8335	20.0540	20.1461	20.1608	20.1608	20.1088	19.7987	19.2604	18.7902 (90)
Living area fraction	fLA = Living area / (4) =											0.2229 (91)
MIT	18.9850	19.2500	19.6021	20.0054	20.2334	20.3294	20.3462	20.3454	20.2887	19.9669	19.4231	18.9523 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9850	19.2500	19.6021	20.0054	20.2334	20.3294	20.3462	20.3454	20.2887	19.9669	19.4231	18.9523 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9610	0.9341	0.8846	0.7765	0.6226	0.4425	0.3079	0.3479	0.5754	0.8305	0.9358	0.9664 (94)
Useful gains	572.7573	650.0821	693.7773	692.7387	595.1493	418.3815	278.1936	291.2966	437.5676	544.0937	550.1906	549.1402 (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	1137.6689	1108.2589	1008.7906	842.7304	645.7847	428.0509	279.8863	294.0569	464.6709	708.8603	937.7591	1129.0860 (97)
Space heating kWh	420.2942	307.8948	234.3698	107.9940	37.6727	0.0000	0.0000	0.0000	0.0000	122.5864	279.0493	431.4797 (98a)
Space heating requirement - total per year (kWh/year)												1941.3409
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	420.2942	307.8948	234.3698	107.9940	37.6727	0.0000	0.0000	0.0000	0.0000	122.5864	279.0493	431.4797 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1941.3409
Space heating per m2	(98c) / (4) =											23.5086 (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	420.2942	307.8948	234.3698	107.9940	37.6727	0.0000	0.0000	0.0000	0.0000	122.5864	279.0493	431.4797 (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)	473.8379	347.1193	264.2275	121.7520	42.4720	0.0000	0.0000	0.0000	0.0000	138.2033	314.5990	486.4483 (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	183.8907	161.6921	170.0076	145.9117	138.8683	122.3843	119.0809	125.5462	128.7825	146.8267	159.9560	181.4749 (64)
Efficiency of water heater	84.5567	84.0412	83.0769	81.1885	78.7297	76.4000	76.4000	76.4000	76.4000	81.5452	83.7852	76.4000 (216)
Fuel for water heating, kWh/month	217.4763	192.3963	204.6388	179.7196	176.3861	160.1889	155.8651	164.3275	168.5635	180.0556	190.9122	84.6645 (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	22.4031	17.9726	16.1824	11.8559	9.1578	7.4820	8.3541	10.8589	14.1047	18.5061	20.9026	23.0258 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-15.6882	-25.3707	-42.2180	-53.8413	-62.7686	-60.2459	-59.1701	-53.1850	-43.2726	-31.2744	-18.1663	-13.0980 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-4.6831	-11.4424	-27.2204	-47.7765	-69.3000	-72.0524	-70.3592	-55.8033	-36.0490	-17.6911	-6.5710	-3.5522 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2188.6594 (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												2204.8758 (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)												180.8062 (232)

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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	3759.5417 (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	2188.6594	0.2100	459.6185 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2204.8758	0.2100	463.0239 (264)
Space and water heating			922.6424 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	180.8062	0.1443	26.0959 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-478.2991	0.1322	-63.2254
PV Unit electricity exported	-422.5005	0.1222	-51.6223
Total			-114.8477 (269)
Total CO2, kg/year			845.8198 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.2400 (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	2188.6594	1.1300	2473.1851 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2204.8758	1.1300	2491.5096 (278)
Space and water heating			4964.6948 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	180.8062	1.5338	277.3265 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-478.2991	1.4884	-711.9055
PV Unit electricity exported	-422.5005	0.4483	-189.4119
Total			-901.3174 (283)
Total Primary energy kWh/year			4470.8046 (286)
Dwelling Primary energy Rate (DPER)			54.1400 (287)

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

1. Overall dwelling characteristics

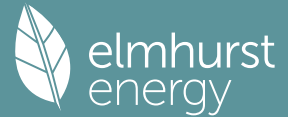
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.2900 (1b)	x 2.4000 (2b)	= 99.0960 (1b) - (3b)
First floor	41.2900 (1c)	x 2.7000 (2c)	= 111.4830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	210.5790 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1425 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3925 (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) = 0.3336 (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	0.4253	0.4170	0.4087	0.3670	0.3586	0.3169	0.3169	0.3086	0.3336	0.3586	0.3753	0.3920 (22b)

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Effective ac 0.5905 0.5869 0.5835 0.5673 0.5643 0.5502 0.5502 0.5476 0.5556 0.5643 0.5704 0.5768 (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			14.7900	1.1450	16.9351			(27)
Heatloss Floor 1			41.2900	0.1300	5.3677			(28a)
External Wall 1	43.4900	16.9100	26.5800	0.1800	4.7844			(29a)
External Roof 1	41.2900		41.2900	0.1100	4.5419			(30)
Total net area of external elements Aum(A, m2)			126.0700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.7491			(33)
Main dwelling								
Party Wall 1			45.0000	0.0000	0.0000			(32)

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

148.7685 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	11.4900	0.0500	0.5745	
E3 Sill	6.9700	0.0500	0.3485	
E4 Jamb	23.4600	0.0500	1.1730	
E5 Ground floor (normal)	18.3700	0.1600	2.9392	
E6 Intermediate floor within a dwelling	18.3700	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	9.8200	0.0600	0.5892	
E12 Gable (insulation at ceiling level)	8.5400	0.0600	0.5124	
E16 Corner (normal)	15.3000	0.0900	1.3770	
E17 Corner (inverted - internal area greater than external area)	5.1000	-0.0900	-0.4590	
E18 Party wall between dwellings	10.2000	0.0600	0.6120	
P1 Party wall - Ground floor	8.5400	0.0800	0.6832	
P2 Party wall - Intermediate floor within a dwelling	8.5400	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.5400	0.1200	1.0248	

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

9.3748 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 43.1239 (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	41.0313	40.7872	40.5480	39.4242	39.2140	38.2352	38.2352	38.0540	38.6122	39.2140	39.6393	40.0840	(38)
Heat transfer coeff	84.1552	83.9111	83.6719	82.5481	82.3379	81.3591	81.3591	81.1779	81.7361	82.3379	82.7632	83.2079	(39)
Average = Sum(39)m / 12 =												82.5471	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0191	1.0161	1.0132	0.9996	0.9971	0.9852	0.9852	0.9830	0.9898	0.9971	1.0022	1.0076	(40)
HLP (average)												0.9996	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

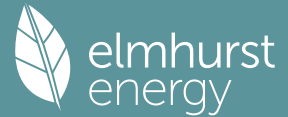
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5100 (42)
Hot water usage for mixer showers													
66.3041	65.3076	63.8557	61.0776	59.0274	56.7411	55.4415	56.8825	58.4621	60.9169	63.7547	66.0500	66.0500	(42a)
Hot water usage for baths													
28.6361	28.2109	27.6120	26.5077	25.6809	24.7640	24.2688	24.8635	25.5110	26.4921	27.6191	28.5393	28.5393	(42b)
Hot water usage for other uses													
40.3348	38.8681	37.4014	35.9347	34.4680	33.0012	33.0012	34.4680	35.9347	37.4014	38.8681	40.3348	40.3348	(42c)
Average daily hot water use (litres/day)												124.3484	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	135.2750	132.3866	128.8690	123.5199	119.1762	114.5063	112.7115	116.2139	119.9078	124.8104	130.2419	134.9242	(44)
Energy conte	214.2426	188.5168	198.0669	169.0926	160.4341	140.7989	136.3148	143.8971	147.8583	169.3665	185.5534	211.2587	(45)
Energy content (annual)										Total = Sum(45)m =		2065.4007	
Distribution loss (46)m = 0.15 x (45)m													
32.1364	28.2775	29.7100	25.3639	24.0651	21.1198	20.4472	21.5846	22.1787	25.4050	27.8330	31.6888	31.6888	(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	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													
265.2015	234.5442	249.0258	218.4077	211.3930	190.1139	187.2737	194.8560	197.1734	220.3254	234.8685	262.2176	262.2176	(62)
WWHRS	-30.3114	-26.8077	-28.0715	-23.2443	-21.6628	-18.5370	-17.3755	-18.4771	-19.1791	-22.6101	-25.6145	-29.7501	(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	234.8901	207.7365	220.9543	195.1634	189.7301	171.5769	169.8982	176.3789	177.9942	197.7153	209.2540	232.4675	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2383.7594	(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	83.9754	74.1887	78.5970	68.5521	66.0841	59.1444	58.0644	60.5855	61.4916	69.0541	74.0253	82.9832	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
115.8739	128.2889	115.8739	119.7363	115.8739	119.7363	115.8739	115.8739	115.8739	119.7363	115.8739	119.7363	115.8739	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
224.7481	227.0802	221.2032	208.6917	192.8982	178.0546	168.1381	165.8059	171.6829	184.1944	199.9879	214.8316	214.8316	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	(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)

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Losses e.g. evaporation (negative values) (Table 5)	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	(71)
Water heating gains (Table 5)	112.8702	110.3998	105.6411	95.2112	88.8227	82.1450	78.0436	81.4322	85.4051	92.8146	102.8129	111.5366	(72)
Total internal gains	517.1420	529.4189	506.3681	487.2892	461.2447	440.5858	422.7054	423.7619	437.4742	456.5328	486.1871	505.8920	(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					3.7000	19.6403	0.6300	0.7000			0.7700			22.2086 (76)
South					0.8400	46.7521	0.6300	0.7000			0.7700			12.0020 (78)
West					10.2500	19.6403	0.6300	0.7000			0.7700			61.5238 (80)
Solar gains	95.7343	183.4544	294.7908	421.7166	511.6374	521.9438	497.6219	430.5596	339.8888	215.5614	118.6308	79.2282	(83)	
Total gains	612.8763	712.8733	801.1589	909.0058	972.8821	962.5296	920.3273	854.3215	777.3630	672.0942	604.8179	585.1202	(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	40.5511	40.6690	40.7853	41.3405	41.4461	41.9447	41.9447	42.0383	41.7512	41.4461	41.2331	41.0127		
alpha	3.7034	3.7113	3.7190	3.7560	3.7631	3.7963	3.7963	3.8026	3.7834	3.7631	3.7489	3.7342		
util living area	0.9734	0.9537	0.9155	0.8252	0.6870	0.5155	0.3823	0.4263	0.6501	0.8737	0.9553	0.9771	(86)	
MIT	19.3996	19.6710	20.0491	20.5053	20.8062	20.9511	20.9877	20.9816	20.8831	20.4643	19.8616	19.3601	(87)	
Th 2	20.0675	20.0699	20.0723	20.0837	20.0858	20.0957	20.0957	20.0975	20.0919	20.0858	20.0815	20.0770	(88)	
util rest of house	0.9684	0.9453	0.9003	0.7958	0.6393	0.4506	0.3065	0.3470	0.5844	0.8449	0.9458	0.9728	(89)	
MIT 2	18.2053	18.5476	19.0186	19.5736	19.9107	20.0614	20.0898	20.0881	20.0011	19.5412	18.7999	18.1619	(90)	
Living area fraction	18.4715	18.7981	19.2484	19.7813	20.1103	20.2597	20.2900	20.2873	20.1978	19.7470	19.0366	18.4290	(92)	
MIT	18.4715	18.7981	19.2484	19.7813	20.1103	20.2597	20.2900	20.2873	20.1978	19.7470	19.0366	18.4290	(93)	
Temperature adjustment												0.0000		
adjusted MIT	18.4715	18.7981	19.2484	19.7813	20.1103	20.2597	20.2900	20.2873	20.1978	19.7470	19.0366	18.4290	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9568	0.9306	0.8841	0.7850	0.6406	0.4628	0.3231	0.3640	0.5925	0.8325	0.9317	0.9623	(94)	
Ext temp.	586.4069	663.4078	708.3368	713.5763	623.2484	445.4143	297.3239	311.0141	460.6224	559.5221	563.5323	563.0435	(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	1192.6090	1166.2027	1066.6804	898.2325	692.4883	460.4718	300.2148	315.5615	498.4070	753.1437	987.9133	1183.9638	(97)	
Space heating requirement - total per year (kWh/year)	451.0144	337.8782	266.6076	132.9525	51.5144	0.0000	0.0000	0.0000	0.0000	144.0545	305.5543	461.9647	(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)	451.0144	337.8782	266.6076	132.9525	51.5144	0.0000	0.0000	0.0000	0.0000	144.0545	305.5543	461.9647	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2151.5406		
Space heating per m ²										(98c) / (4) =		26.0540	(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	451.0144	337.8782	266.6076	132.9525	51.5144	0.0000	0.0000	0.0000	0.0000	144.0545	305.5543	461.9647	(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)	488.1108	365.6690	288.5364	143.8879	55.7516	0.0000	0.0000	0.0000	0.0000	155.9031	330.6865	499.9618	(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	234.8901	207.7365	220.9543	195.1634	189.7301	171.5769	169.8982	176.3789	177.9942	197.7153	209.2540	232.4675	(64)	
Efficiency of water heater (217)m	85.7548	85.4170	84.7850	83.5760	81.9937	80.3000	80.3000	80.3000	80.3000	83.7134	85.1914	85.8231	(217)	
Fuel for water heating, kWh/month	273.9088	243.2028	260.6056	233.5160	231.3959	213.6698	211.5793	219.6499	221.6615	236.1813	245.6280	270.8683	(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	7.0685	7.3041	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)	
Lighting	24.0763	19.3149	17.3909	12.7413	9.8418	8.0408	8.9780	11.6699	15.1581	19.8883	22.4637	24.7455	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-38.3906	-54.0011	-77.4497	-86.8830	-93.5174	-87.2200	-86.1278	-81.3810	-72.9929	-61.6387	-42.1567	-33.2042	(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	-22.0661	-46.3768	-92.1032	-138.2313	-182.6856	-183.5323	-181.3854	-153.6326	-112.6710	-66.3056	-29.4548	-17.4537	(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												2328.5071	(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												2861.8672	(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)												194.3096	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2040.8617	(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												3429.8222	(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	2328.5071	0.2100	488.9865	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2861.8672	0.2100	600.9921	(264)
Space and water heating			1089.9786	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	194.3096	0.1443	28.0449	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.9633	0.1346	-109.7234	
PV Unit electricity exported	-1225.8984	0.1259	-154.3604	
Total			-264.0838	(269)
Total CO2, kg/year			865.8689	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4900	(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	2328.5071	1.1300	2631.2130	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2861.8672	1.1300	3233.9100	(278)
Space and water heating			5865.1230	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	194.3096	1.5338	298.0385	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.9633	1.4976	-1220.4848	
PV Unit electricity exported	-1225.8984	0.4622	-566.6097	
Total			-1787.0945	(283)
Total Primary energy kWh/year			4506.1677	(286)
Target Primary Energy Rate (TPER)			54.5700	(287)

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Plot Reference	SAP 1033 Plot 1				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	91 B	DER	10.24	TER	10.49	
Environmental	91 B	% DER < TER				2.38
CO ₂ Emissions (t/year)	0.72	DFEE	27.15	TFEE	31.86	
Compliance Check	See BREL	% DFEE < TFEE				14.76
% DPER < TPER	0.79	DPER	54.14	TPER	54.57	
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	41.2900 (1b)	x 2.4000 (2b)	= 99.0960 (1b) - (3b)
First floor	41.2900 (1c)	x 2.7000 (2c)	= 111.4830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.5790 (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) = 0.1425 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3425 (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) = 0.2911 (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	0.3711	0.3639	0.3566	0.3202	0.3129	0.2765	0.2765	0.2693	0.2911	0.3129	0.3275	0.3420 (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	0.5689	0.5662	0.5636	0.5513	0.5490	0.5382	0.5382	0.5363	0.5424	0.5490	0.5536	0.5585 (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			14.7900	1.1450	16.9351		(27)
Heatloss Floor 1			41.2900	0.1200	4.9548	75.0000	3096.7500 (28a)
External Wall 1	43.4900	16.9100	26.5800	0.1800	4.7844	60.0000	1594.8000 (29a)
External Roof 1	41.2900		41.2900	0.0900	3.7161	9.0000	371.6100 (30)
Total net area of external elements Aum(A, m ²)			126.0700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.7224		(33)
Main dwelling							
Party Wall 1			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			41.2900			18.0000	743.2200 (32d)
Internal Ceiling 1			41.2900			9.0000	371.6100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12285.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							148.7685 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.4900	0.0300	0.3447
E3 Sill	6.9700	0.0200	0.1394
E4 Jamb	23.4600	0.0200	0.4692
E5 Ground floor (normal)	18.3700	0.0400	0.7348
E6 Intermediate floor within a dwelling	18.3700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.8200	0.0500	0.4910
E12 Gable (insulation at ceiling level)	8.5400	0.0300	0.2562
E16 Corner (normal)	15.3000	0.0400	0.6120
E17 Corner (inverted - internal area greater than external area)	5.1000	-0.0700	-0.3570
E18 Party wall between dwellings	10.2000	0.0500	0.5100
P1 Party wall - Ground floor	8.5400	0.0400	0.3416
P2 Party wall - Intermediate floor within a dwelling	8.5400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.5400	0.0300	0.2562
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.7981 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	36.5205 (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	39.5317	39.3459	39.1637	38.3080	38.1479	37.4027	37.4027	37.2647	37.6897	38.1479	38.4718	38.8104 (38)
Average = Sum(39)m / 12 =	76.0522	75.8664	75.6842	74.8285	74.6684	73.9232	73.9232	73.7852	74.2103	74.6684	74.9923	75.3309 (39)
												74.8278
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9210	0.9187	0.9165	0.9061	0.9042	0.8952	0.8952	0.8935	0.8986	0.9042	0.9081	0.9122 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.5100 (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	28.6361	28.2109	27.6120	26.5077	25.6809	24.7640	24.2688	24.8635	25.5110	26.4921	27.6191	28.5393 (42b)
Hot water usage for other uses	40.3348	38.8681	37.4014	35.9347	34.4680	33.0012	33.0012	34.4680	35.9347	37.4014	38.8681	40.3348 (42c)
Average daily hot water use (litres/day)												63.2183 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	68.9710	67.0790	65.0134	62.4424	60.1488	57.7653	57.2700	59.3314	61.4457	63.8935	66.4872	68.8742 (44)
Energy content (annual)	109.2332	95.5196	99.9231	85.4805	80.9719	71.0291	69.2631	73.4647	75.7687	86.7028	94.7232	107.8403 (45)
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	92.8482	81.1916	84.9347	72.6584	68.8261	60.3747	58.8737	62.4450	64.4034	73.6974	80.5147	91.6643 (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)
FV 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	92.8482	81.1916	84.9347	72.6584	68.8261	60.3747	58.8737	62.4450	64.4034	73.6974	80.5147	91.6643 (64)
12Total per year (kWh/year)												892.4322 (64)
Electric shower(s)	53.0985	47.3112	51.6620	49.3004	50.2255	47.9103	49.5073	50.2255	49.3004	51.6620	50.6906	53.0985 (64a)
Heat gains from water heating, kWh/month	36.4867	32.1257	34.1492	30.4897	29.7629	27.0713	27.0952	28.1676	28.4260	31.3399	32.8013	36.1907 (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	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.8739	128.2889	115.8739	119.7363	115.8739	119.7363	115.8739	115.8739	119.7363	115.8739	119.7363	115.8739 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.7481	227.0802	221.2032	208.6917	192.8982	178.0546	168.1381	165.8059	171.6829	184.1944	199.9879	214.8316 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500 (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)	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997 (71)
Water heating gains (Table 5)	49.0412	47.8061	45.8994	42.3468	40.0039	37.5990	36.4183	37.8597	39.4805	42.1235	45.5574	48.6434 (72)
Total internal gains	450.3131	463.8252	443.6264	431.4248	409.4259	396.0398	381.0802	380.1894	391.5497	402.8417	425.9316	439.9988 (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	3.7000	19.6403	0.6300	0.7000	0.7700	22.2086 (76)	
South	0.8400	46.7521	0.6300	0.7000	0.7700	12.0020 (78)	
West	10.2500	19.6403	0.6300	0.7000	0.7700	61.5238 (80)	

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Solar gains	95.7343	183.4544	294.7908	421.7166	511.6374	521.9438	497.6219	430.5596	339.8888	215.5614	118.6308	79.2282 (83)
Total gains	546.0474	647.2796	738.4172	853.1414	921.0633	917.9836	878.7021	810.7491	731.4384	618.4031	544.5624	519.2270 (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	44.8716	44.9815	45.0898	45.6054	45.7032	46.1639	46.1639	46.2503	45.9853	45.7032	45.5058	45.3012
alpha	3.9914	3.9988	4.0060	4.0404	4.0469	4.0776	4.0776	4.0834	4.0657	4.0469	4.0337	4.0201
util living area	0.9801	0.9613	0.9224	0.8247	0.6761	0.4980	0.3661	0.4116	0.6411	0.8814	0.9638	0.9834 (86)
MIT	19.5051	19.7803	20.1522	20.5877	20.8534	20.9674	20.9927	20.9883	20.9117	20.5268	19.9434	19.4605 (87)
Th 2	20.1497	20.1516	20.1535	20.1623	20.1639	20.1716	20.1716	20.1730	20.1687	20.1639	20.1606	20.1571 (88)
util rest of house	0.9764	0.9543	0.9088	0.7967	0.6310	0.4391	0.2989	0.3405	0.5797	0.8550	0.9561	0.9803 (89)
MIT 2	18.7823	19.0538	19.4156	19.8292	20.0601	20.1536	20.1688	20.1682	20.1147	19.7850	19.2240	18.7438 (90)
Living area fraction	18.9434	19.2158	19.5798	19.9983	20.2370	20.3350	20.3525	20.3511	20.2924	19.9504	19.3844	18.9036 (91)
MIT	18.9434	19.2158	19.5798	19.9983	20.2370	20.3350	20.3525	20.3511	20.2924	19.9504	19.3844	18.9036 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9434	19.2158	19.5798	19.9983	20.2370	20.3350	20.3525	20.3511	20.2924	19.9504	19.3844	18.9036 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9695	0.9448	0.8980	0.7907	0.6351	0.4510	0.3137	0.3560	0.5893	0.8473	0.9472	0.9742 (94)
Useful gains	529.3885	611.5804	663.0665	674.5449	585.0004	413.9776	275.6649	288.6478	431.0159	523.9699	515.8152	505.8097 (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	1113.6647	1086.0846	989.9344	830.4666	637.4435	423.9500	277.3938	291.5299	459.5389	698.1796	921.2328	1107.6342 (97)
Space heating kWh	434.7016	318.8668	243.1897	112.2636	39.0177	0.0000	0.0000	0.0000	0.0000	129.6120	291.9007	447.7575 (98a)
Space heating requirement - total per year (kWh/year)												2017.3095
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	434.7016	318.8668	243.1897	112.2636	39.0177	0.0000	0.0000	0.0000	0.0000	129.6120	291.9007	447.7575 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2017.3095
Space heating per m2												(98c) / (4) = 24.4285 (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	694.8780	547.0316	560.7674	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9236	0.9571	0.9411	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	641.8020	523.5840	527.7109	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1026.3246	982.7315	905.5923	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	276.8563	341.6057	281.1438	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	69.2141	85.4014	70.2859	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												224.9015 (107)
Energy for space heating												24.4285 (99)
Energy for space cooling												2.7234 (108)
Total												27.1520 (109)
Fabric Energy Efficiency (DFEE)												27.2 (109)

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

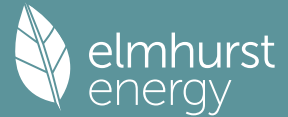
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	41.2900 (1b)	x 2.4000 (2b)	= 99.0960 (1b) - (3b)
First floor	41.2900 (1c)	x 2.7000 (2c)	= 111.4830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	210.5790 (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)

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Number of blocked chimneys
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

0 * 20 = 0.0000 (6f)
3 * 10 = 30.0000 (7a)
0 * 10 = 0.0000 (7b)
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) = 0.1425 (8)
Yes
Blower Door
5.0000 (17)
0.3925 (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) = 0.3336 (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	0.4253	0.4170	0.4087	0.3670	0.3586	0.3169	0.3169	0.3086	0.3336	0.3586	0.3753	0.3920	(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	0.5905	0.5869	0.5835	0.5673	0.5643	0.5502	0.5502	0.5476	0.5556	0.5643	0.5704	0.5768	(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			14.7900	1.1450	16.9351			(27)
Heatloss Floor 1			41.2900	0.1300	5.3677			(28a)
External Wall 1	43.4900	16.9100	26.5800	0.1800	4.7844			(29a)
External Roof 1	41.2900		41.2900	0.1100	4.5419			(30)
Total net area of external elements Aum(A, m2)			126.0700					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	33.7491		(33)
Main dwelling								
Party Wall 1			45.0000	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							148.7685	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	11.4900	0.0500	0.5745	
E3 Sill	6.9700	0.0500	0.3485	
E4 Jamb	23.4600	0.0500	1.1730	
E5 Ground floor (normal)	18.3700	0.1600	2.9392	
E6 Intermediate floor within a dwelling	18.3700	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	9.8200	0.0600	0.5892	
E12 Gable (insulation at ceiling level)	8.5400	0.0600	0.5124	
E16 Corner (normal)	15.3000	0.0900	1.3770	
E17 Corner (inverted - internal area greater than external area)	5.1000	-0.0900	-0.4590	
E18 Party wall between dwellings	10.2000	0.0600	0.6120	
P1 Party wall - Ground floor	8.5400	0.0800	0.6832	
P2 Party wall - Intermediate floor within a dwelling	8.5400	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.5400	0.1200	1.0248	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.3748	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 43.1239 (37)

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

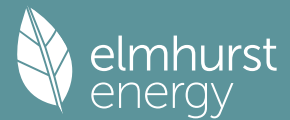
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.0313	40.7872	40.5480	39.4242	39.2140	38.2352	38.2352	38.0540	38.6122	39.2140	39.6393	40.0840	(38)
Heat transfer coeff	84.1552	83.9111	83.6719	82.5481	82.3379	81.3591	81.3591	81.1779	81.7361	82.3379	82.7632	83.2079	(39)
Average = Sum(39)m / 12 =												82.5471	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0191	1.0161	1.0132	0.9996	0.9971	0.9852	0.9852	0.9830	0.9898	0.9971	1.0022	1.0076	(40)
HLP (average)												0.9996	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5100 (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	28.6361	28.2109	27.6120	26.5077	25.6809	24.7640	24.2688	24.8635	25.5110	26.4921	27.6191	28.5393	(42b)
Hot water usage for other uses	40.3348	38.8681	37.4014	35.9347	34.4680	33.0012	33.0012	34.4680	35.9347	37.4014	38.8681	40.3348	(42c)
Average daily hot water use (litres/day)												63.2183	(43)
Daily hot water use	68.9710	67.0790	65.0134	62.4424	60.1488	57.7653	57.2700	59.3314	61.4457	63.8935	66.4872	68.8742	(44)
Energy conte	109.2332	95.5196	99.9231	85.4805	80.9719	71.0291	69.2631	73.4647	75.7687	86.7028	94.7232	107.8403	(45)
Energy content (annual)										Total = Sum(45)m =		1049.9202	
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													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month	92.8482	81.1916	84.9347	72.6584	68.8261	60.3747	58.8737	62.4450	64.4034	73.6974	80.5147	91.6643	(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													

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	92.8482	81.1916	84.9347	72.6584	68.8261	60.3747	58.8737	62.4450	64.4034	73.6974	80.5147	91.6643 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											892.4322 (64)
Electric shower(s)	53.0985	47.3112	51.6620	49.3004	50.2255	47.9103	49.5073	50.2255	49.3004	51.6620	50.6906	53.0985 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											603.9924 (64a)
Heat gains from water heating, kWh/month	36.4867	32.1257	34.1492	30.4897	29.7629	27.0713	27.0952	28.1676	28.4260	31.3399	32.8013	36.1907 (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	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.8739	128.2889	115.8739	119.7363	115.8739	119.7363	115.8739	115.8739	119.7363	115.8739	119.7363	115.8739 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	224.7481	227.0802	221.2032	208.6917	192.8982	178.0546	168.1381	165.8059	171.6829	184.1944	199.9879	214.8316 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500 (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)	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997 (71)
Water heating gains (Table 5)	49.0412	47.8061	45.8994	42.3468	40.0039	37.5990	36.4183	37.8597	39.4805	42.1235	45.5574	48.6434 (72)
Total internal gains	450.3131	463.8252	443.6264	431.4248	409.4259	396.0398	381.0802	380.1894	391.5497	402.8417	425.9316	439.9988 (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				3.7000	19.6403	0.6300	0.7000		0.7700		22.2086 (76)	
South				0.8400	46.7521	0.6300	0.7000		0.7700		12.0020 (78)	
West				10.2500	19.6403	0.6300	0.7000		0.7700		61.5238 (80)	
Solar gains	95.7343	183.4544	294.7908	421.7166	511.6374	521.9438	497.6219	430.5596	339.8888	215.5614	118.6308	79.2282 (83)
Total gains	546.0474	647.2796	738.4172	853.1414	921.0633	917.9836	878.7021	810.7491	731.4384	618.4031	544.5624	519.2270 (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	40.5511	40.6690	40.7853	41.3405	41.4461	41.9447	41.9447	42.0383	41.7512	41.4461	41.2331	41.0127
alpha	3.7034	3.7113	3.7190	3.7560	3.7631	3.7963	3.7963	3.8026	3.7834	3.7631	3.7489	3.7342
util living area	0.9813	0.9650	0.9317	0.8471	0.7118	0.5367	0.3993	0.4472	0.6783	0.8964	0.9672	0.9843 (86)
MIT	19.2795	19.5616	19.9590	20.4506	20.7807	20.9440	20.9858	20.9784	20.8647	20.3988	19.7600	19.2397 (87)
Th 2	20.0675	20.0699	20.0723	20.0837	20.0858	20.0957	20.0957	20.0975	20.0919	20.0858	20.0815	20.0770 (88)
util rest of house	0.9777	0.9583	0.9188	0.8197	0.6646	0.4703	0.3206	0.3648	0.6127	0.8711	0.9598	0.9812 (89)
MIT 2	18.4983	18.7775	19.1663	19.6383	19.9299	20.0648	20.0903	20.0888	20.0089	19.6033	18.9847	18.4659 (90)
Living area fraction	FLA = Living area / (4) =											0.2229 (91)
MIT	18.6724	18.9523	19.3430	19.8194	20.1196	20.2608	20.2900	20.2871	20.1997	19.7807	19.1575	18.6384 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6724	18.9523	19.3430	19.8194	20.1196	20.2608	20.2900	20.2871	20.1997	19.7807	19.1575	18.6384 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9704	0.9482	0.9066	0.8109	0.6665	0.4828	0.3378	0.3826	0.6210	0.8612	0.9503	0.9748 (94)
Ext temp.	529.9117	613.7702	669.4432	691.8032	613.8853	443.1918	296.8417	310.1612	454.2500	532.5785	517.4952	506.1243 (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	1209.5155	1179.1467	1074.5961	901.3755	693.2505	460.5609	300.2127	315.5475	498.5643	755.9171	997.9200	1201.3905 (97)
Space heating requirement - total per year (kWh/year)	505.6252	379.9329	301.4338	150.8921	59.0477	0.0000	0.0000	0.0000	0.0000	166.1640	345.9059	517.2780 (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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating kWh	505.6252	379.9329	301.4338	150.8921	59.0477	0.0000	0.0000	0.0000	0.0000	166.1640	345.9059	517.2780 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2426.2797
Space heating per m2												(98c) / (4) = 29.3810 (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	764.7757	602.0575	616.9518	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8897	0.9334	0.9120	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	680.3918	561.9305	562.6634	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1026.3246	982.7315	905.5923	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	249.0716	313.0759	255.1391	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)												

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Space cooling kWh	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 requirement	0.0000	0.0000	0.0000	0.0000	0.0000	62.2679	78.2690	63.7848	0.0000	0.0000	0.0000	0.0000	(107)
Energy for space heating													204.3217 (107)
Energy for space cooling													29.3810 (99)
Total													2.4742 (108)
Fabric Energy Efficiency (TFEE)													31.8552 (109)
													31.9 (109)

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Plot Reference	SAP 1033 Plot 1			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	91 B	DER	10.24	TER	10.49
Environmental	91 B	% DER < TER			2.38
CO ₂ Emissions (t/year)	0.72	DFEE	27.15	TFEE	31.86
Compliance Check	See BREL	% DFEE < TFEE			14.76
% DPER < TPER	0.79	DPER	54.14	TPER	54.57
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	41.2900 (1b)	x 2.4000 (2b)	= 99.0960 (1b) - (3b)
First floor	41.2900 (1c)	x 2.7000 (2c)	= 111.4830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.5790 (5)

2. Ventilation rate

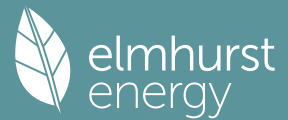
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1900 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3900 (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) = 0.3315 (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	0.4226	0.4143	0.4060	0.3646	0.3563	0.3149	0.3149	0.3066	0.3315	0.3563	0.3729	0.3895 (22b)
Effective ac	0.5893	0.5858	0.5824	0.5665	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5758 (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			14.7900	1.1450	16.9351		(27)
Heatloss Floor 1			41.2900	0.1200	4.9548	75.0000	3096.7500 (28a)
External Wall 1	43.4900	16.9100	26.5800	0.1800	4.7844	60.0000	1594.8000 (29a)
External Roof 1	41.2900		41.2900	0.0900	3.7161	9.0000	371.6100 (30)
Total net area of external elements Aum(A, m ²)			126.0700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.7224		(33)
Main dwelling							
Party Wall 1			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			41.2900			18.0000	743.2200 (32d)
Internal Ceiling 1			41.2900			9.0000	371.6100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12285.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							148.7685 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.4900	0.0300	0.3447	

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E3 Sill									6.9700	0.0200	0.1394	
E4 Jamb									23.4600	0.0200	0.4692	
E5 Ground floor (normal)									18.3700	0.0400	0.7348	
E6 Intermediate floor within a dwelling									18.3700	0.0000	0.0000	
E10 Baves (insulation at ceiling level)									9.8200	0.0500	0.4910	
E12 Gable (insulation at ceiling level)									8.5400	0.0300	0.2562	
E16 Corner (normal)									15.3000	0.0400	0.6120	
E17 Corner (inverted - internal area greater than external area)									5.1000	-0.0700	-0.3570	
E18 Party wall between dwellings									10.2000	0.0500	0.5100	
P1 Party wall - Ground floor									8.5400	0.0400	0.3416	
P2 Party wall - Intermediate floor within a dwelling									8.5400	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)									8.5400	0.0300	0.2562	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												3.7981 (36)
Point Thermal bridges												0.0000
Total fabric heat loss											(33) + (36) + (36a) =	36.5205 (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	40.9511	40.7101	40.4739	39.3645	39.1569	38.1907	38.1907	38.0117	38.5629	39.1569	39.5768	40.0158 (38)
Average = Sum(39)m / 12 =	77.4716	77.2306	76.9944	75.8850	75.6775	74.7112	74.7112	74.5323	75.0834	75.6775	76.0974	76.5364 (39)
												75.8840
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9381	0.9352	0.9324	0.9189	0.9164	0.9047	0.9047	0.9025	0.9092	0.9164	0.9215	0.9268 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												0.9189
												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.5100 (42)
Hot water usage for mixer showers												
	66.3041	65.3076	63.8557	61.0776	59.0274	56.7411	55.4415	56.8825	58.4621	60.9169	63.7547	66.0500 (42a)
Hot water usage for baths												
	28.6361	28.2109	27.6120	26.5077	25.6809	24.7640	24.2688	24.8635	25.5110	26.4921	27.6191	28.5393 (42b)
Hot water usage for other uses												
	40.3348	38.8681	37.4014	35.9347	34.4680	33.0012	33.0012	34.4680	35.9347	37.4014	38.8681	40.3348 (42c)
Average daily hot water use (litres/day)												124.3484 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	135.2750	132.3866	128.8690	123.5199	119.1762	114.5063	112.7115	116.2139	119.9078	124.8104	130.2419	134.9242 (44)
Energy content (annual)	214.2426	188.5168	198.0669	169.0926	160.4341	140.7989	136.3148	143.8971	147.8583	169.3665	185.5534	211.2587 (45)
Distribution loss (46)m = 0.15 x (45)m												2065.4007
	32.1364	28.2775	29.7100	25.3639	24.0651	21.1198	20.4472	21.5846	22.1787	25.4050	27.8330	31.6888 (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	0.6635	0.6056	0.6642	0.6032	0.6002	0.5530	0.5452	0.5554	0.5488	0.5954	0.6120	0.6572 (61)
Total heat required for water heating calculated for each month												
WWHRS	214.9061	189.1224	198.7311	169.6958	161.0343	141.3519	136.8600	144.4525	148.4071	169.9619	186.1654	211.9159 (62)
PV diverter	-31.0154	-27.4303	-28.7234	-23.7841	-22.1660	-18.9676	-17.7791	-18.9063	-19.6246	-23.1352	-26.2094	-30.4411 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
	183.8907	161.6921	170.0076	145.9117	138.8683	122.3843	119.0809	125.5462	128.7825	146.8267	159.9560	181.4749 (64)
12Total per year (kWh/year)												1784.4220 (64)
Electric shower(s)												1784 (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												
	71.4015	62.8332	66.0233	56.3741	53.4944	46.9539	45.4610	47.9846	49.3001	56.4632	61.8495	70.4078 (65)

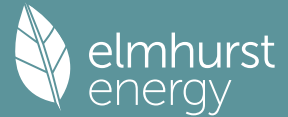
5. Internal gains (see Table 5 and 5a)												

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	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.8739	128.2889	115.8739	119.7363	115.8739	119.7363	115.8739	115.8739	119.7363	115.8739	119.7363	115.8739 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	224.7481	227.0802	221.2032	208.6917	192.8982	178.0546	168.1381	165.8059	171.6829	184.1944	199.9879	214.8316 (68)
Pumps, fans	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997 (71)
Total internal gains	95.9698	93.5018	88.7410	78.2974	71.9010	65.2137	61.1035	64.4955	68.4723	75.8914	85.9021	94.6342 (72)
	500.2417	512.5209	489.4680	470.3754	444.3231	423.6545	405.7653	406.8252	420.5415	439.6096	469.2763	488.9895 (73)

6. Solar gains												

[Jan]												
Area												
Solar flux												
Specific data												
Specific data												
Access factor												
Gains W												
East	3.7000											22.2086 (76)
South	0.8400											12.0020 (78)
West	10.2500											61.5238 (80)
Solar gains	95.7343	183.4544	294.7908	421.7166	511.6374	521.9438	497.6219	430.5596	339.8888	215.5614	118.6308	79.2282 (83)
Total gains	595.9760	695.9753	784.2588	892.0920	955.9605	945.5984	903.3872	837.3848	760.4303	655.1710	587.9071	568.2178 (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	44.0495	44.1869	44.3225	44.9704	45.0938	45.6770	45.6770	45.7867	45.4506	45.0938	44.8450	44.5877
alpha	3.9366	3.9458	3.9548	3.9980	4.0063	4.0451	4.0451	4.0524	4.0300	4.0063	3.9897	3.9725
util living area	0.9739	0.9527	0.9109	0.8113	0.6636	0.4893	0.3600	0.4029	0.6272	0.8662	0.9549	0.9779 (86)
MIT	19.5561	19.8243	20.1849	20.6042	20.8586	20.9684	20.9928	20.9888	20.9160	20.5529	19.9906	19.5172 (87)
Th 2	20.1352	20.1377	20.1401	20.1514	20.1536	20.1635	20.1635	20.1653	20.1597	20.1536	20.1493	20.1448 (88)
util rest of house	0.9691	0.9444	0.8956	0.7820	0.6181	0.4306	0.2932	0.3325	0.5655	0.8376	0.9456	0.9738 (89)
MIT 2	18.8211	19.0852	19.4349	19.8335	20.0540	20.1461	20.1608	20.1608	20.1088	19.7987	19.2604	18.7902 (90)
Living area fraction	fLA = Living area / (4) = 0.2229 (91)											
MIT	18.9850	19.2500	19.6021	20.0054	20.2334	20.3294	20.3462	20.3454	20.2887	19.9669	19.4231	18.9523 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9850	19.2500	19.6021	20.0054	20.2334	20.3294	20.3462	20.3454	20.2887	19.9669	19.4231	18.9523 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9610	0.9341	0.8846	0.7765	0.6226	0.4425	0.3079	0.3479	0.5754	0.8305	0.9358	0.9664 (94)
Useful gains	572.7573	650.0821	693.7773	692.7387	595.1493	418.3815	278.1936	291.2966	437.5676	544.0937	550.1906	549.1402 (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	1137.6689	1108.2589	1008.7906	842.7304	645.7847	428.0509	279.8863	294.0569	464.6709	708.8603	937.7591	1129.0860 (97)
Space heating kWh	420.2942	307.8948	234.3698	107.9940	37.6727	0.0000	0.0000	0.0000	0.0000	122.5864	279.0493	431.4797 (98a)
Space heating requirement - total per year (kWh/year)	1941.3409											
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	420.2942	307.8948	234.3698	107.9940	37.6727	0.0000	0.0000	0.0000	0.0000	122.5864	279.0493	431.4797 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1941.3409											
Space heating per m2	(98c) / (4) = 23.5086 (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	420.2942	307.8948	234.3698	107.9940	37.6727	0.0000	0.0000	0.0000	0.0000	122.5864	279.0493	431.4797 (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)	473.8379	347.1193	264.2275	121.7520	42.4720	0.0000	0.0000	0.0000	0.0000	138.2033	314.5990	486.4483 (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	183.8907	161.6921	170.0076	145.9117	138.8683	122.3843	119.0809	125.5462	128.7825	146.8267	159.9560	181.4749 (64)
Efficiency of water heater	84.5567	84.0412	83.0769	81.1885	78.7297	76.4000	76.4000	76.4000	76.4000	81.5452	83.7852	76.4000 (216)
Fuel for water heating, kWh/month	217.4763	192.3963	204.6388	179.7196	176.3861	160.1889	155.8651	164.3275	168.5635	180.0556	190.9122	214.3460 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	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	22.4031	17.9726	16.1824	11.8559	9.1578	7.4820	8.3541	10.8589	14.1047	18.5061	20.9026	23.0258 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-15.6882	-25.3707	-42.2180	-53.8413	-62.7686	-60.2459	-59.1701	-53.1850	-43.2726	-31.2744	-18.1663	-13.0980 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-4.6831	-11.4424	-27.2204	-47.7765	-69.3000	-72.0524	-70.3592	-55.8033	-36.0490	-17.6911	-6.5710	-3.5522 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1	2188.6594 (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	2204.8758 (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)	180.8062 (232)											

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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	3759.5417 (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	2188.6594	0.2100	459.6185 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2204.8758	0.2100	463.0239 (264)
Space and water heating			922.6424 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	180.8062	0.1443	26.0959 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-478.2991	0.1322	-63.2254
PV Unit electricity exported	-422.5005	0.1222	-51.6223
Total			-114.8477 (269)
Total CO2, kg/year			845.8198 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.2400 (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	2188.6594	1.1300	2473.1851 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2204.8758	1.1300	2491.5096 (278)
Space and water heating			4964.6948 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	180.8062	1.5338	277.3265 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-478.2991	1.4884	-711.9055
PV Unit electricity exported	-422.5005	0.4483	-189.4119
Total			-901.3174 (283)
Total Primary energy kWh/year			4470.8046 (286)
Dwelling Primary energy Rate (DPER)			54.1400 (287)

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

1. Overall dwelling characteristics

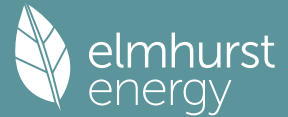
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.2900 (1b)	x 2.4000 (2b)	= 99.0960 (1b) - (3b)
First floor	41.2900 (1c)	x 2.7000 (2c)	= 111.4830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.5790 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1425 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3925 (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) = 0.3336 (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	0.4253	0.4170	0.4087	0.3670	0.3586	0.3169	0.3169	0.3086	0.3336	0.3586	0.3753	0.3920 (22b)

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Effective ac 0.5905 0.5869 0.5835 0.5673 0.5643 0.5502 0.5502 0.5476 0.5556 0.5643 0.5704 0.5768 (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			14.7900	1.1450	16.9351			(27)
Heatloss Floor 1			41.2900	0.1300	5.3677			(28a)
External Wall 1	43.4900	16.9100	26.5800	0.1800	4.7844			(29a)
External Roof 1	41.2900		41.2900	0.1100	4.5419			(30)
Total net area of external elements Aum(A, m2)			126.0700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.7491			(33)
Main dwelling								
Party Wall 1			45.0000	0.0000	0.0000			(32)

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

148.7685 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	11.4900	0.0500	0.5745	
E3 Sill	6.9700	0.0500	0.3485	
E4 Jamb	23.4600	0.0500	1.1730	
E5 Ground floor (normal)	18.3700	0.1600	2.9392	
E6 Intermediate floor within a dwelling	18.3700	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	9.8200	0.0600	0.5892	
E12 Gable (insulation at ceiling level)	8.5400	0.0600	0.5124	
E16 Corner (normal)	15.3000	0.0900	1.3770	
E17 Corner (inverted - internal area greater than external area)	5.1000	-0.0900	-0.4590	
E18 Party wall between dwellings	10.2000	0.0600	0.6120	
P1 Party wall - Ground floor	8.5400	0.0800	0.6832	
P2 Party wall - Intermediate floor within a dwelling	8.5400	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.5400	0.1200	1.0248	

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

9.3748 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 43.1239 (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	41.0313	40.7872	40.5480	39.4242	39.2140	38.2352	38.2352	38.0540	38.6122	39.2140	39.6393	40.0840	(38)
Heat transfer coeff	84.1552	83.9111	83.6719	82.5481	82.3379	81.3591	81.3591	81.1779	81.7361	82.3379	82.7632	83.2079	(39)
Average = Sum(39)m / 12 =												82.5471	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0191	1.0161	1.0132	0.9996	0.9971	0.9852	0.9852	0.9830	0.9898	0.9971	1.0022	1.0076	(40)
HLP (average)												0.9996	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

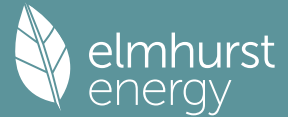
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5100 (42)
Hot water usage for mixer showers													
66.3041	65.3076	63.8557	61.0776	59.0274	56.7411	55.4415	56.8825	58.4621	60.9169	63.7547	66.0500	66.0500	(42a)
Hot water usage for baths													
28.6361	28.2109	27.6120	26.5077	25.6809	24.7640	24.2688	24.8635	25.5110	26.4921	27.6191	28.5393	28.5393	(42b)
Hot water usage for other uses													
40.3348	38.8681	37.4014	35.9347	34.4680	33.0012	33.0012	34.4680	35.9347	37.4014	38.8681	40.3348	40.3348	(42c)
Average daily hot water use (litres/day)													124.3484 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	135.2750	132.3866	128.8690	123.5199	119.1762	114.5063	112.7115	116.2139	119.9078	124.8104	130.2419	134.9242	(44)
Energy conte	214.2426	188.5168	198.0669	169.0926	160.4341	140.7989	136.3148	143.8971	147.8583	169.3665	185.5534	211.2587	(45)
Energy content (annual)										Total = Sum(45)m =		2065.4007	
Distribution loss (46)m = 0.15 x (45)m													
32.1364	28.2775	29.7100	25.3639	24.0651	21.1198	20.4472	21.5846	22.1787	25.4050	27.8330	31.6888	31.6888	(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	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													
265.2015	234.5442	249.0258	218.4077	211.3930	190.1139	187.2737	194.8560	197.1734	220.3254	234.8685	262.2176	262.2176	(62)
WWHRS	-30.3114	-26.8077	-28.0715	-23.2443	-21.6628	-18.5370	-17.3755	-18.4771	-19.1791	-22.6101	-25.6145	-29.7501	(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	234.8901	207.7365	220.9543	195.1634	189.7301	171.5769	169.8982	176.3789	177.9942	197.7153	209.2540	232.4675	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2383.7594	(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	83.9754	74.1887	78.5970	68.5521	66.0841	59.1444	58.0644	60.5855	61.4916	69.0541	74.0253	82.9832	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	125.4997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
115.8739	128.2889	115.8739	119.7363	115.8739	119.7363	115.8739	115.8739	115.8739	119.7363	115.8739	119.7363	115.8739	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
224.7481	227.0802	221.2032	208.6917	192.8982	178.0546	168.1381	165.8059	171.6829	184.1944	199.9879	214.8316	214.8316	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	35.5500	(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)

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Losses e.g. evaporation (negative values) (Table 5)	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	(71)
Water heating gains (Table 5)	112.8702	110.3998	105.6411	95.2112	88.8227	82.1450	78.0436	81.4322	85.4051	92.8146	102.8129	111.5366	(72)
Total internal gains	517.1420	529.4189	506.3681	487.2892	461.2447	440.5858	422.7054	423.7619	437.4742	456.5328	486.1871	505.8920	(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					3.7000	19.6403	0.6300	0.7000			0.7700			22.2086 (76)
South					0.8400	46.7521	0.6300	0.7000			0.7700			12.0020 (78)
West					10.2500	19.6403	0.6300	0.7000			0.7700			61.5238 (80)
Solar gains	95.7343	183.4544	294.7908	421.7166	511.6374	521.9438	497.6219	430.5596	339.8888	215.5614	118.6308	79.2282	(83)	
Total gains	612.8763	712.8733	801.1589	909.0058	972.8821	962.5296	920.3273	854.3215	777.3630	672.0942	604.8179	585.1202	(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	40.5511	40.6690	40.7853	41.3405	41.4461	41.9447	41.9447	42.0383	41.7512	41.4461	41.2331	41.0127		
alpha	3.7034	3.7113	3.7190	3.7560	3.7631	3.7963	3.7963	3.8026	3.7834	3.7631	3.7489	3.7342		
util living area	0.9734	0.9537	0.9155	0.8252	0.6870	0.5155	0.3823	0.4263	0.6501	0.8737	0.9553	0.9771	(86)	
MIT	19.3996	19.6710	20.0491	20.5053	20.8062	20.9511	20.9877	20.9816	20.8831	20.4643	19.8616	19.3601	(87)	
Th 2	20.0675	20.0699	20.0723	20.0837	20.0858	20.0957	20.0957	20.0975	20.0919	20.0858	20.0815	20.0770	(88)	
util rest of house	0.9684	0.9453	0.9003	0.7958	0.6393	0.4506	0.3065	0.3470	0.5844	0.8449	0.9458	0.9728	(89)	
MIT 2	18.2053	18.5476	19.0186	19.5736	19.9107	20.0614	20.0898	20.0881	20.0011	19.5412	18.7999	18.1619	(90)	
Living area fraction	18.4715	18.7981	19.2484	19.7813	20.1103	20.2597	20.2900	20.2873	20.1978	19.7470	19.0366	18.4290	(92)	
MIT	18.4715	18.7981	19.2484	19.7813	20.1103	20.2597	20.2900	20.2873	20.1978	19.7470	19.0366	18.4290	(93)	
Temperature adjustment												0.0000		
adjusted MIT	18.4715	18.7981	19.2484	19.7813	20.1103	20.2597	20.2900	20.2873	20.1978	19.7470	19.0366	18.4290	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9568	0.9306	0.8841	0.7850	0.6406	0.4628	0.3231	0.3640	0.5925	0.8325	0.9317	0.9623	(94)	
Ext temp.	586.4069	663.4078	708.3368	713.5763	623.2484	445.4143	297.3239	311.0141	460.6224	559.5221	563.5323	563.0435	(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	1192.6090	1166.2027	1066.6804	898.2325	692.4883	460.4718	300.2148	315.5615	498.4070	753.1437	987.9133	1183.9638	(97)	
Space heating requirement - total per year (kWh/year)	451.0144	337.8782	266.6076	132.9525	51.5144	0.0000	0.0000	0.0000	0.0000	144.0545	305.5543	461.9647	(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)	451.0144	337.8782	266.6076	132.9525	51.5144	0.0000	0.0000	0.0000	0.0000	144.0545	305.5543	461.9647	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2151.5406		
Space heating per m ²										(98c) / (4) =		26.0540	(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	451.0144	337.8782	266.6076	132.9525	51.5144	0.0000	0.0000	0.0000	0.0000	144.0545	305.5543	461.9647	(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)	488.1108	365.6690	288.5364	143.8879	55.7516	0.0000	0.0000	0.0000	0.0000	155.9031	330.6865	499.9618	(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	234.8901	207.7365	220.9543	195.1634	189.7301	171.5769	169.8982	176.3789	177.9942	197.7153	209.2540	232.4675	(64)	
Efficiency of water heater (217)m	85.7548	85.4170	84.7850	83.5760	81.9937	80.3000	80.3000	80.3000	80.3000	83.7134	85.1914	85.8231	(216)	
Fuel for water heating, kWh/month	273.9088	243.2028	260.6056	233.5160	231.3959	213.6698	211.5793	219.6499	221.6615	236.1813	245.6280	270.8683	(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	7.0685	7.3041	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)	
Lighting	24.0763	19.3149	17.3909	12.7413	9.8418	8.0408	8.9780	11.6699	15.1581	19.8883	22.4637	24.7455	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-38.3906	-54.0011	-77.4497	-86.8830	-93.5174	-87.2200	-86.1278	-81.3810	-72.9929	-61.6387	-42.1567	-33.2042	(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	-22.0661	-46.3768	-92.1032	-138.2313	-182.6856	-183.5323	-181.3854	-153.6326	-112.6710	-66.3056	-29.4548	-17.4537	(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												2328.5071	(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												2861.8672	(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)												194.3096	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2040.8617	(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												3429.8222	(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	2328.5071	0.2100	488.9865	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2861.8672	0.2100	600.9921	(264)
Space and water heating			1089.9786	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	194.3096	0.1443	28.0449	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.9633	0.1346	-109.7234	
PV Unit electricity exported	-1225.8984	0.1259	-154.3604	
Total			-264.0838	(269)
Total CO2, kg/year			865.8689	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4900	(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	2328.5071	1.1300	2631.2130	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2861.8672	1.1300	3233.9100	(278)
Space and water heating			5865.1230	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	194.3096	1.5338	298.0385	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-814.9633	1.4976	-1220.4848	
PV Unit electricity exported	-1225.8984	0.4622	-566.6097	
Total			-1787.0945	(283)
Total Primary energy kWh/year			4506.1677	(286)
Target Primary Energy Rate (TPER)			54.5700	(287)

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Plot Reference	SAP 1033 Plot 1			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	91 B	DER	10.24	TER	10.49
Environmental	91 B	% DER < TER			2.38
CO ₂ Emissions (t/year)	0.72	DFEE	27.15	TFEE	31.86
Compliance Check	See BREL	% DFEE < TFEE			14.76
% DPER < TPER	0.79	DPER	54.14	TPER	54.57
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	41.2900 (1b)	x 2.4000 (2b)	= 99.0960 (1b) - (3b)
First floor	41.2900 (1c)	x 2.7000 (2c)	= 111.4830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.5790 (5)

2. Ventilation rate

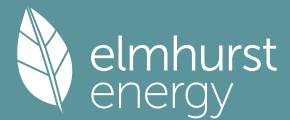
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1900 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3900 (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) = 0.3315 (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	0.4226	0.4143	0.4060	0.3646	0.3563	0.3149	0.3149	0.3066	0.3315	0.3563	0.3729	0.3895 (22b)
Effective ac	0.5893	0.5858	0.5824	0.5665	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5758 (25)

3. Heat losses and heat loss parameter

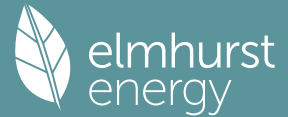
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Front Door			2.1200	1.1000	2.3320		(26a)
Fully Glazed Door/win			14.7900	1.1450	16.9351		(27)
Heatloss Floor 1			41.2900	0.1200	4.9548	75.0000	3096.7500 (28a)
External Wall 1	43.4900	16.9100	26.5800	0.1800	4.7844	60.0000	1594.8000 (29a)
External Roof 1	41.2900		41.2900	0.0900	3.7161	9.0000	371.6100 (30)
Total net area of external elements Aum(A, m ²)			126.0700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.7224		(33)
Main dwelling							
Party Wall 1			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			41.2900			18.0000	743.2200 (32d)
Internal Ceiling 1			41.2900			9.0000	371.6100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12285.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							148.7685 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.4900	0.0300	0.3447	

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E3 Sill								6.9700	0.0200	0.1394		
E4 Jamb								23.4600	0.0200	0.4692		
E5 Ground floor (normal)								18.3700	0.0400	0.7348		
E6 Intermediate floor within a dwelling								18.3700	0.0000	0.0000		
E10 Baves (insulation at ceiling level)								9.8200	0.0500	0.4910		
E12 Gable (insulation at ceiling level)								8.5400	0.0300	0.2562		
E16 Corner (normal)								15.3000	0.0400	0.6120		
E17 Corner (inverted - internal area greater than external area)								5.1000	-0.0700	-0.3570		
E18 Party wall between dwellings								10.2000	0.0500	0.5100		
P1 Party wall - Ground floor								8.5400	0.0400	0.3416		
P2 Party wall - Intermediate floor within a dwelling								8.5400	0.0000	0.0000		
P4 Party wall - Roof (insulation at ceiling level)								8.5400	0.0300	0.2562		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											3.7981	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	36.5205 (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	40.9511	40.7101	40.4739	39.3645	39.1569	38.1907	38.1907	38.0117	38.5629	39.1569	39.5768	40.0158 (38)
Average = Sum(39)m / 12 =	77.4716	77.2306	76.9944	75.8850	75.6775	74.7112	74.7112	74.5323	75.0834	75.6775	76.0974	76.5364 (39)
												75.8840
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9381	0.9352	0.9324	0.9189	0.9164	0.9047	0.9047	0.9025	0.9092	0.9164	0.9215	0.9268 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												0.9189
												31
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.5100 (42)
Hot water usage for mixer showers												
	66.3041	65.3076	63.8557	61.0776	59.0274	56.7411	55.4415	56.8825	58.4621	60.9169	63.7547	66.0500 (42a)
Hot water usage for baths												
	28.6361	28.2109	27.6120	26.5077	25.6809	24.7640	24.2688	24.8635	25.5110	26.4921	27.6191	28.5393 (42b)
Hot water usage for other uses												
	40.3348	38.8681	37.4014	35.9347	34.4680	33.0012	33.0012	34.4680	35.9347	37.4014	38.8681	40.3348 (42c)
Average daily hot water use (litres/day)												124.3484 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	135.2750	132.3866	128.8690	123.5199	119.1762	114.5063	112.7115	116.2139	119.9078	124.8104	130.2419	134.9242 (44)
Energy content (annual)	214.2426	188.5168	198.0669	169.0926	160.4341	140.7989	136.3148	143.8971	147.8583	169.3665	185.5534	211.2587 (45)
Distribution loss (46)m = 0.15 x (45)m												2065.4007
	32.1364	28.2775	29.7100	25.3639	24.0651	21.1198	20.4472	21.5846	22.1787	25.4050	27.8330	31.6888 (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												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6635	0.6056	0.6642	0.6032	0.6002	0.5530	0.5452	0.5554	0.5488	0.5954	0.6120	0.6572 (61)
Total heat required for water heating calculated for each month												
WWHRS	214.9061	189.1224	198.7311	169.6958	161.0343	141.3519	136.8600	144.4525	148.4071	169.9619	186.1654	211.9159 (62)
PV diverter	-31.0154	-27.4303	-28.7234	-23.7841	-22.1660	-18.9676	-17.7791	-18.9063	-19.6246	-23.1352	-26.2094	-30.4411 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	183.8907	161.6921	170.0076	145.9117	138.8683	122.3843	119.0809	125.5462	128.7825	146.8267	159.9560	181.4749 (64)
												1784.4220 (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												
	71.4015	62.8332	66.0233	56.3741	53.4944	46.9539	45.4610	47.9846	49.3001	56.4632	61.8495	70.4078 (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	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	25.5950	22.7332	18.4879	13.9965	10.4626	8.8329	9.5443	12.4061	16.6514	21.1428	24.6767	26.3063 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	335.4449	338.9257	330.1541	311.4802	287.9078	265.7531	250.9524	247.4715	256.2432	274.9170	298.4894	320.6442 (68)
Pumps, fans	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700 (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)	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997 (71)
Total internal gains	95.9698	93.5018	88.7410	78.2974	71.9010	65.2137	61.1035	64.4955	68.4723	75.8914	85.9021	94.6342 (72)
	562.7795	560.9306	543.1528	509.5439	476.0413	442.5696	424.3700	427.1429	444.1367	477.7211	514.8381	547.3545 (73)
6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
East	3.7000											22.2086 (76)
South	0.8400											12.0020 (78)
West	10.2500											61.5238 (80)
Solar gains	95.7343	183.4544	294.7908	421.7166	511.6374	521.9438	497.6219	430.5596	339.8888	215.5614	118.6308	79.2282 (83)
Total gains	658.5138	744.3850	837.9436	931.2606	987.6787	964.5134	921.9918	857.7025	784.0255	693.2824	633.4689	626.5827 (84)

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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	44.0495	44.1869	44.3225	44.9704	45.0938	45.6770	45.6770	45.7867	45.4506	45.0938	44.8450	44.5877	21.0000 (85)
alpha	3.9366	3.9458	3.9548	3.9980	4.0063	4.0451	4.0451	4.0524	4.0300	4.0063	3.9897	3.9725	
util living area	0.9643	0.9424	0.8943	0.7942	0.6481	0.4807	0.3530	0.3938	0.6126	0.8475	0.9438	0.9697	(86)
MIT	19.6666	19.9023	20.2558	20.6366	20.8702	20.9703	20.9933	20.9897	20.9229	20.5938	20.0647	19.6227	(87)
Th 2	20.1352	20.1377	20.1401	20.1514	20.1536	20.1635	20.1635	20.1653	20.1597	20.1536	20.1493	20.1448	(88)
util rest of house													
	0.9581	0.9327	0.8771	0.7638	0.6025	0.4227	0.2874	0.3248	0.5513	0.8167	0.9326	0.9643	(89)
MIT 2	18.9290	19.1602	19.5009	19.8613	20.0627	20.1472	20.1609	20.1611	20.1132	19.8342	19.3312	18.8935	(90)
Living area fraction													
MIT	19.0935	19.3256	19.6692	20.0342	20.2427	20.3307	20.3465	20.3459	20.2937	20.0035	19.4947	19.0561	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0935	19.3256	19.6692	20.0342	20.2427	20.3307	20.3465	20.3459	20.2937	20.0035	19.4947	19.0561	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9486	0.9218	0.8664	0.7592	0.6075	0.4345	0.3019	0.3399	0.5615	0.8106	0.9222	0.9556	(94)
Useful gains	624.6944	686.1390	725.9807	707.0554	600.0366	419.0857	278.3331	291.5565	440.1917	561.9507	584.2118	598.7772	(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	1146.0727	1114.0980	1013.9554	844.9166	646.4889	428.1481	279.9060	294.0933	465.0430	711.6356	943.2053	1137.0306	(97)
Space heating kWh	387.9054	287.5885	214.2532	99.2601	34.5605	0.0000	0.0000	0.0000	0.0000	111.3656	258.4753	400.4605	(98a)
Space heating requirement - total per year (kWh/year)												1793.8690	
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	387.9054	287.5885	214.2532	99.2601	34.5605	0.0000	0.0000	0.0000	0.0000	111.3656	258.4753	400.4605	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1793.8690	
Space heating per m2										(98c) / (4) =		21.7228	(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	387.9054	287.5885	214.2532	99.2601	34.5605	0.0000	0.0000	0.0000	0.0000	111.3656	258.4753	400.4605	(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)	437.3229	324.2260	241.5481	111.9054	38.9633	0.0000	0.0000	0.0000	0.0000	125.5531	291.4039	451.4775	(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	183.8907	161.6921	170.0076	145.9117	138.8683	122.3843	119.0809	125.5462	128.7825	146.8267	159.9560	181.4749	(64)
Efficiency of water heater (217)m	84.3335	83.8421	82.8021	80.9444	78.5712	76.4000	76.4000	76.4000	76.4000	81.2604	83.5575	76.4000	(216)
Fuel for water heating, kWh/month	218.0517	192.8530	205.3179	180.2617	176.7419	160.1889	155.8651	164.3275	168.5635	180.6868	191.4323	214.8658	(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	22.4031	17.9726	16.1824	11.8559	9.1578	7.4820	8.3541	10.8589	14.1047	18.5061	20.9026	23.0258	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.6882	-25.3707	-42.2180	-53.8413	-62.7686	-60.2459	-59.1701	-53.1850	-43.2726	-31.2744	-18.1663	-13.0980	(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	-4.6831	-11.4424	-27.2204	-47.7765	-69.3000	-72.0524	-70.3592	-55.8033	-36.0490	-17.6911	-6.5710	-3.5522	(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													2022.4002 (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													2209.1562 (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)													180.8062 (232)

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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	3597.5630 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2022.4002	3.6400	73.6154 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2209.1562	3.6400	80.4133 (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	180.8062	16.4900	29.8149 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-478.2991	16.4900	-78.8715
PV Unit electricity exported	-422.5005	5.5900	-23.6178
Total			-102.4893 (252)
Total energy cost			187.5357 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5292 (257)
SAP value		91.4220
SAP rating (Section 12)		91 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2022.4002	0.2100	424.7041 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2209.1562	0.2100	463.9228 (264)
Space and water heating			888.6269 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	180.8062	0.1443	26.0959 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-478.2991	0.1322	-63.2254
PV Unit electricity exported	-422.5005	0.1222	-51.6223
Total			-114.8477 (269)
Total CO2, kg/year			811.8043 (272)
CO2 emissions per m2			9.8300 (273)
EI value			91.4734
EI rating			91 (274)
EI band			B

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

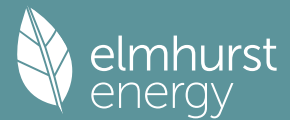
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.2900 (1b)	x 2.4000 (2b)	= 99.0960 (1b) - (3b)
First floor	41.2900 (1c)	x 2.7000 (2c)	= 111.4830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	210.5790 (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) = 0.1900 (8)
Pressure test	Yes

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

Blower Door
4.0000 (17)
0.3900 (18)
2 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 (20)$$
$$(21) = (18) \times (20) = 0.3315 (21)$$

Infiltration rate adjusted to include shelter factor

	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	(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	0.3480	0.3232	0.3315	0.3149	0.3149	0.3066	0.2983	0.2900	0.2817	0.3066	0.2900	0.3066	(22b)
Effective ac	0.5606	0.5522	0.5549	0.5496	0.5496	0.5470	0.5445	0.5421	0.5397	0.5470	0.5421	0.5470	(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								
Front Door			2.1200	1.1000	2.3320			(26a)
Fully Glazed Door/win			14.7900	1.1450	16.9351			(27)
Heatloss Floor 1			41.2900	0.1200	4.9548	75.0000	3096.7500	(28a)
External Wall 1	43.4900	16.9100	26.5800	0.1800	4.7844	60.0000	1594.8000	(29a)
External Roof 1	41.2900		41.2900	0.0900	3.7161	9.0000	371.6100	(30)
Total net area of external elements Aum (A, m2)			126.0700					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 32.7224			(33)
Main dwelling								
Party Wall 1			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			41.2900			18.0000	743.2200	(32d)
Internal Ceiling 1			41.2900			9.0000	371.6100	(32e)

Heat capacity Cm = Sum(A x k)

$$(28)...(30) + (32) + (32a)...(32e) = 12285.3000 (34)$$

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

$$148.7685 (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.4900	0.0300	0.3447
E3 Sill	6.9700	0.0200	0.1394
E4 Jamb	23.4600	0.0200	0.4692
E5 Ground floor (normal)	18.3700	0.0400	0.7348
E6 Intermediate floor within a dwelling	18.3700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.8200	0.0500	0.4910
E12 Gable (insulation at ceiling level)	8.5400	0.0300	0.2562
E16 Corner (normal)	15.3000	0.0400	0.6120
E17 Corner (inverted - internal area greater than external area)	5.1000	-0.0700	-0.3570
E18 Party wall between dwellings	10.2000	0.0500	0.5100
P1 Party wall - Ground floor	8.5400	0.0400	0.3416
P2 Party wall - Intermediate floor within a dwelling	8.5400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.5400	0.0300	0.2562

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

$$3.7981 (36)$$

Point Thermal bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 36.5205 (37)$$

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

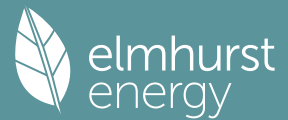
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.9541	38.3744	38.5629	38.1907	38.1907	38.0117	37.8376	37.6682	37.5036	38.0117	37.6682	38.0117	(38)
Heat transfer coeff	75.4747	74.8949	75.0834	74.7112	74.7112	74.5323	74.3581	74.1887	74.0241	74.5323	74.1887	74.5323	(39)
Average = Sum(39)m / 12 =													74.6026

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9140	0.9069	0.9092	0.9047	0.9047	0.9025	0.9004	0.8984	0.8964	0.9025	0.8984	0.9025	(40)
HLP (average)													0.9034
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5100 (42)
Hot water usage for mixer showers													
66.3041	65.3076	63.8557	61.0776	59.0274	56.7411	55.4415	56.8825	58.4621	60.9169	63.7547	66.0500		(42a)
Hot water usage for baths													
28.6361	28.2109	27.6120	26.5077	25.6809	24.7640	24.2688	24.8635	25.5110	26.4921	27.6191	28.5393		(42b)
Hot water usage for other uses													
40.3348	38.8681	37.4014	35.9347	34.4680	33.0012	33.0012	34.4680	35.9347	37.4014	38.8681	40.3348		(42c)
Average daily hot water use (litres/day)													124.3484 (43)
Daily hot water use													
135.2750	132.3866	128.8690	123.5199	119.1762	114.5063	112.7115	116.2139	119.9078	124.8104	130.2419	134.9242		(44)
Energy conte	214.2426	188.5168	198.0669	169.0926	160.4341	140.7989	136.3148	143.8971	147.8583	169.3665	185.5534	211.2587	(45)
Energy content (annual)													Total = Sum(45)m = 2065.4007
Distribution loss (46)m = 0.15 x (45)m													
32.1364	28.2775	29.7100	25.3639	24.0651	21.1198	20.4472	21.5846	22.1787	25.4050	27.8330	31.6888		(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	0.6635	0.6056	0.6642	0.6032	0.6002	0.5530	0.5452	0.5554	0.5488	0.5954	0.6120	0.6572	(61)
Total heat required for water heating calculated for each month													
214.9061	189.1224	198.7311	169.6958	161.0343	141.3519	136.8600	144.4525	148.4071	169.9619	186.1654	211.9159		(62)
WWHRS	-31.0154	-27.4303	-28.7234	-23.7841	-22.1660	-18.9676	-17.7791	-18.9063	-19.6246	-23.1352	-26.2094	-30.4411	(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	(64)
Output from w/h	183.8907	161.6921	170.0076	145.9117	138.8683	122.3843	119.0809	125.5462	128.7825	146.8267	159.9560	181.4749	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)

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Heat gains from water heating, kWh/month
71.4015 62.8332 66.0233 56.3741 53.4944 46.9539 45.4610 47.9846 49.3001 56.4632 61.8495 70.4078 (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	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.5950	22.7332	18.4879	13.9965	10.4626	8.8329	9.5443	12.4061	16.6514	21.1428	24.6767	26.3063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	335.4449	338.9257	330.1541	311.4802	287.9078	265.7531	250.9524	247.4715	256.2432	274.9170	298.4894	320.6442	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	(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)	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	(71)
Water heating gains (Table 5)	95.9698	93.5018	88.7410	78.2974	71.9010	65.2137	61.1035	64.4955	68.4723	75.8914	85.9021	94.6342	(72)
Total internal gains	562.7795	560.9306	543.1528	509.5439	476.0413	442.5696	424.3700	427.1429	444.1367	477.7211	514.8381	547.3545	(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			3.7000	25.1925	0.6300	0.7000		0.7700	28.4869	(76)			
South			0.8400	56.7559	0.6300	0.7000		0.7700	14.5701	(78)			
West			10.2500	25.1925	0.6300	0.7000		0.7700	78.9165	(80)			
Solar gains	121.9735	198.9562	321.8243	461.9561	531.5943	588.6534	556.9893	494.5806	391.4984	252.1392	150.6748	99.2079	(83)
Total gains	684.7530	759.8869	864.9771	971.5001	1007.6356	1031.2230	981.3593	921.7235	835.6351	729.8603	665.5129	646.5624	(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	45.2150	45.5650	45.4506	45.6770	45.6770	45.7867	45.8939	45.9987	46.1010	45.7867	45.9987	45.7867	
alpha	4.0143	4.0377	4.0300	4.0451	4.0451	4.0524	4.0596	4.0666	4.0734	4.0524	4.0666	4.0524	
util living area	0.9537	0.9317	0.8708	0.7497	0.5903	0.4052	0.2940	0.3120	0.5339	0.7940	0.9208	0.9599	(86)
MIT	19.8544	20.0446	20.3919	20.7327	20.9179	20.9858	20.9970	20.9963	20.9586	20.7220	20.2649	19.8306	(87)
Th 2	20.1557	20.1616	20.1597	20.1635	20.1635	20.1653	20.1671	20.1689	20.1706	20.1653	20.1689	20.1653	(88)
util rest of house	0.9457	0.9204	0.8506	0.7155	0.5418	0.3483	0.2319	0.2464	0.4712	0.7553	0.9054	0.9527	(89)
MIT 2	19.1287	19.3168	19.6448	19.9559	20.1090	20.1583	20.1662	20.1677	20.1476	19.9567	19.5390	19.1136	(90)
Living area fraction	19.2905	19.4791	19.8113	20.1291	20.2893	20.3428	20.3514	20.3524	20.3284	20.1273	19.7008	19.2734	(92)
MIT	19.2905	19.4791	19.8113	20.1291	20.2893	20.3428	20.3514	20.3524	20.3284	20.1273	19.7008	19.2734	(93)
Temperature adjustment												0.0000	
adjusted MIT	19.2905	19.4791	19.8113	20.1291	20.2893	20.3428	20.3514	20.3524	20.3284	20.1273	19.7008	19.2734	(93)

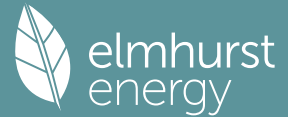
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9356	0.9096	0.8413	0.7140	0.5493	0.3606	0.2457	0.2610	0.4835	0.7534	0.8953	0.9433	(94)
Useful gains	640.6766	691.2067	727.7236	693.6298	553.4826	371.8297	241.1498	240.5266	404.0020	549.8866	595.8079	609.8894	(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	1086.1167	1061.9406	961.9183	794.1092	581.9504	375.8520	241.7678	241.2926	416.6391	650.4675	875.4876	1063.8316	(97)
Space heating kWh	331.4074	249.1332	174.2408	72.3452	21.1800	0.0000	0.0000	0.0000	0.0000	74.8321	201.3694	337.7330	(98a)
Space heating requirement - total per year (kWh/year)												1462.2411	
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	331.4074	249.1332	174.2408	72.3452	21.1800	0.0000	0.0000	0.0000	0.0000	74.8321	201.3694	337.7330	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1462.2411	
Space heating per m2										(98c) / (4) =		17.7070	(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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	331.4074	249.1332	174.2408	72.3452	21.1800	0.0000	0.0000	0.0000	0.0000	74.8321	201.3694	337.7330	(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)	373.6273	280.8717	196.4384	81.5616	23.8783	0.0000	0.0000	0.0000	0.0000	84.3654	227.0230	380.7587	(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)													

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	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	183.8907	161.6921	170.0076	145.9117	138.8683	122.3843	119.0809	125.5462	128.7825	146.8267	159.9560	181.4749	(64)
Efficiency of water heater	83.8808	83.4145	82.1671	80.0809	77.8282	76.4000	76.4000	76.4000	76.4000	80.1523	82.7988	83.9746	(216)
(217)m	83.8808	83.4145	82.1671	80.0809	77.8282	76.4000	76.4000	76.4000	76.4000	80.1523	82.7988	83.9746	(217)
Fuel for water heating, kWh/month	219.2286	193.8417	206.9047	182.2054	178.4292	160.1889	155.8651	164.3275	168.5635	183.1846	193.1864	216.1067	(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	22.4031	17.9726	16.1824	11.8559	9.1578	7.4820	8.3541	10.8589	14.1047	18.5061	20.9026	23.0258	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.5364	-27.3805	-45.4697	-57.6249	-64.6088	-64.9239	-63.5190	-58.3066	-48.0127	-35.5939	-22.4158	-16.1158	(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	-6.7744	-13.0889	-31.3018	-54.8876	-73.8100	-85.4276	-82.6445	-68.1304	-44.4539	-22.4499	-9.4355	-5.0176	(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												1648.5244	(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												2222.0324	(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)												180.8062	(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												3116.4328	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1648.5244	6.5500	107.9783	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2222.0324	6.5500	145.5431	(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	180.8062	28.4300	51.4032	(250)
Additional standing charges			104.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.5081	28.4300	-148.8333	
PV Unit electricity exported	-497.4221	5.8100	-28.9002	
Total			-177.7336	(252)
Total energy cost			255.6409	(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	1648.5244	0.2100	346.1901	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2222.0324	0.2100	466.6268	(264)
Space and water heating			812.8169	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	180.8062	0.1443	26.0959	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.5081	0.1325	-69.3727	
PV Unit electricity exported	-497.4221	0.1222	-60.7776	
Total			-130.1503	(269)
Total CO2, kg/year			720.6918	(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	1648.5244	1.1300	1862.8326	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2222.0324	1.1300	2510.8966	(278)
Space and water heating			4373.7292	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	180.8062	1.5338	277.3265	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.5081	1.4896	-779.8320	
PV Unit electricity exported	-497.4221	0.4482	-222.9562	

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Total
Total Primary energy kWh/year

-1002.7881 (283)
3778.3684 (286)

SAP 10 EPC IMPROVEMENTS

Rev A

Current energy efficiency rating: B 91
Current environmental impact rating: B 91

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 -165 kg (22.9%)

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

Potential energy efficiency rating: B 91
Potential environmental impact rating: B 91

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	£76	£76	£0
Mains gas	£358	£358	£0
Space heating	£236	£236	£0
Water heating	£146	£146	£0
Lighting	£51	£51	£0
Generated (PV)	-£178	-£178	£0
Total cost of fuels	£256	£256	£0
Total cost of uses	£255	£255	£0
Delivered energy	38 kWh/m²	38 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	9 kg/m²	9 kg/m²	0 kg/m²
Primary energy	46 kWh/m²	46 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

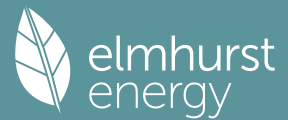
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	41.2900 (1b)	x 2.4000 (2b)	= 99.0960 (1b) - (3b)
First floor	41.2900 (1c)	x 2.7000 (2c)	= 111.4830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	210.5790 (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) = 0.1900 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3900 (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) = 0.3315 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4226	0.4143	0.4060	0.3646	0.3563	0.3149	0.3149	0.3066	0.3315	0.3563	0.3729	0.3895 (22b)
	0.5893	0.5858	0.5824	0.5665	0.5635	0.5496	0.5496	0.5470	0.5549	0.5635	0.5695	0.5758 (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							
Front Door			2.1200	1.1000	2.3320		(26a)
Fully Glazed Door/win			14.7900	1.1450	16.9351		(27)
Heatloss Floor 1			41.2900	0.1200	4.9548	75.0000	3096.7500 (28a)
External Wall 1	43.4900	16.9100	26.5800	0.1800	4.7844	60.0000	1594.8000 (29a)
External Roof 1	41.2900		41.2900	0.0900	3.7161	9.0000	371.6100 (30)
Total net area of external elements Aum(A, m2)			126.0700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.7224		(33)
Main dwelling							
Party Wall 1			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			41.2900			18.0000	743.2200 (32d)
Internal Ceiling 1			41.2900			9.0000	371.6100 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12285.3000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 148.7685 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.4900	0.0300	0.3447
E3 Sill	6.9700	0.0200	0.1394
E4 Jamb	23.4600	0.0200	0.4692
E5 Ground floor (normal)	18.3700	0.0400	0.7348
E6 Intermediate floor within a dwelling	18.3700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.8200	0.0500	0.4910
E12 Gable (insulation at ceiling level)	8.5400	0.0300	0.2562
E16 Corner (normal)	15.3000	0.0400	0.6120
E17 Corner (inverted - internal area greater than external area)	5.1000	-0.0700	-0.3570
E18 Party wall between dwellings	10.2000	0.0500	0.5100
P1 Party wall - Ground floor	8.5400	0.0400	0.3416
P2 Party wall - Intermediate floor within a dwelling	8.5400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.5400	0.0300	0.2562

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.7981 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 36.5205 (37)

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

(38)m	Jan 40.9511	Feb 40.7101	Mar 40.4739	Apr 39.3645	May 39.1569	Jun 38.1907	Jul 38.1907	Aug 38.0117	Sep 38.5629	Oct 39.1569	Nov 39.5768	Dec 40.0158 (38)
Heat transfer coeff	77.4716	77.2306	76.9944	75.8850	75.6775	74.7112	74.7112	74.5323	75.0834	75.6775	76.0974	76.5364 (39)
Average = Sum(39)m / 12 =												75.8840

HLP	Jan 0.9381	Feb 0.9352	Mar 0.9324	Apr 0.9189	May 0.9164	Jun 0.9047	Jul 0.9047	Aug 0.9025	Sep 0.9092	Oct 0.9164	Nov 0.9215	Dec 0.9268 (40)
HLP (average)												0.9189
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

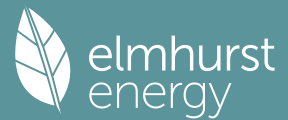
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5100 (42)
Hot water usage for mixer showers													
66.3041	65.3076	63.8557	61.0776	59.0274	56.7411	55.4415	56.8825	58.4621	60.9169	63.7547	66.0500	(42a)	
Hot water usage for baths													
28.6361	28.2109	27.6120	26.5077	25.6809	24.7640	24.2688	24.8635	25.5110	26.4921	27.6191	28.5393	(42b)	
Hot water usage for other uses													
40.3348	38.8681	37.4014	35.9347	34.4680	33.0012	33.0012	34.4680	35.9347	37.4014	38.8681	40.3348	(42c)	
Average daily hot water use (litres/day)												124.3484 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
135.2750	132.3866	128.8690	123.5199	119.1762	114.5063	112.7115	116.2139	119.9078	124.8104	130.2419	134.9242	(44)	
Energy content (annual)	214.2426	188.5168	198.0669	169.0926	160.4341	140.7989	136.3148	143.8971	147.8583	169.3665	185.5534	211.2587 (45)	
Distribution loss (46)m = 0.15 x (45)m	32.1364	28.2775	29.7100	25.3639	24.0651	21.1198	20.4472	21.5846	22.1787	25.4050	27.8330	31.6888 (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	0.6635	0.6056	0.6642	0.6032	0.6002	0.5530	0.5452	0.5554	0.5488	0.5954	0.6120	0.6572 (61)	
Total heat required for water heating calculated for each month													
214.9061	189.1224	198.7311	169.6958	161.0343	141.3519	136.8600	144.4525	148.4071	169.9619	186.1654	211.9159	(62)	
WWHRS	-31.0154	-27.4303	-28.7234	-23.7841	-22.1660	-18.9676	-17.7791	-18.9063	-19.6246	-23.1352	-26.2094	-30.4411 (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	183.8907	161.6921	170.0076	145.9117	138.8683	122.3843	119.0809	125.5462	128.7825	146.8267	159.9560	181.4749 (64)	
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)	
Heat gains from water heating, kWh/month	71.4015	62.8332	66.0233	56.3741	53.4944	46.9539	45.4610	47.9846	49.3001	56.4632	61.8495	70.4078 (65)	

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.5950	22.7332	18.4879	13.9965	10.4626	8.8329	9.5443	12.4061	16.6514	21.1428	24.6767	26.3063	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	335.4449	338.9257	330.1541	311.4802	287.9078	265.7531	250.9524	247.4715	256.2432	274.9170	298.4894	320.6442	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	(71)
Water heating gains (Table 5)	95.9698	93.5018	88.7410	78.2974	71.9010	65.2137	61.1035	64.4955	68.4723	75.8914	85.9021	94.6342	(72)
Total internal gains	562.7795	560.9306	543.1528	509.5439	476.0413	442.5696	424.3700	427.1429	444.1367	477.7211	514.8381	547.3545	(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				3.7000	19.6403	0.6300	0.7000		0.7700		22.2086 (76)	
South				0.8400	46.7521	0.6300	0.7000		0.7700		12.0020 (78)	
West				10.2500	19.6403	0.6300	0.7000		0.7700		61.5238 (80)	
Solar gains	95.7343	183.4544	294.7908	421.7166	511.6374	521.9438	497.6219	430.5596	339.8888	215.5614	118.6308	79.2282 (83)
Total gains	658.5138	744.3850	837.9436	931.2606	987.6787	964.5134	921.9918	857.7025	784.0255	693.2824	633.4689	626.5827 (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	44.0495	44.1869	44.3225	44.9704	45.0938	45.6770	45.6770	45.7867	45.4506	45.0938	44.8450	44.5877	
alpha	3.9366	3.9458	3.9548	3.9980	4.0063	4.0451	4.0451	4.0524	4.0300	4.0063	3.9897	3.9725	
util living area	0.9643	0.9424	0.8943	0.7942	0.6481	0.4807	0.3530	0.3938	0.6126	0.8475	0.9438	0.9697	(86)
MIT	19.6666	19.9023	20.2558	20.6366	20.8702	20.9703	20.9933	20.9897	20.9229	20.5938	20.0647	19.6227	(87)
Th 2	20.1352	20.1377	20.1401	20.1514	20.1536	20.1635	20.1635	20.1653	20.1597	20.1536	20.1493	20.1448	(88)
util rest of house	0.9581	0.9327	0.8771	0.7638	0.6025	0.4227	0.2874	0.3248	0.5513	0.8167	0.9326	0.9643	(89)
MIT 2	18.9290	19.1602	19.5009	19.8613	20.0627	20.1472	20.1609	20.1611	20.1132	19.8342	19.3312	18.8935	(90)
Living area fraction									fLA = Living area / (4) =			0.2229	(91)
MIT	19.0935	19.3256	19.6692	20.0342	20.2427	20.3307	20.3465	20.3459	20.2937	20.0035	19.4947	19.0561	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0935	19.3256	19.6692	20.0342	20.2427	20.3307	20.3465	20.3459	20.2937	20.0035	19.4947	19.0561	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9486	0.9218	0.8664	0.7592	0.6075	0.4345	0.3019	0.3399	0.5615	0.8106	0.9222	0.9556	(94)
Ext temp.	624.6944	686.1390	725.9807	707.0554	600.0366	419.0857	278.3331	291.5565	440.1917	561.9507	584.2118	598.7772	(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	1146.0727	1114.0980	1013.9554	844.9166	646.4889	428.1481	279.9060	294.0933	465.0430	711.6356	943.2053	1137.0306	(97)
Space heating requirement - total per year (kWh/year)	387.9054	287.5885	214.2532	99.2601	34.5605	0.0000	0.0000	0.0000	0.0000	111.3656	258.4753	400.4605	(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)	387.9054	287.5885	214.2532	99.2601	34.5605	0.0000	0.0000	0.0000	0.0000	111.3656	258.4753	400.4605	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1793.8690	
Space heating per m ²										(98c) / (4) =		21.7228	(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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating efficiency (main heating system 1)	387.9054	287.5885	214.2532	99.2601	34.5605	0.0000	0.0000	0.0000	0.0000	111.3656	258.4753	400.4605	(98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	437.3229	324.2260	241.5481	111.9054	38.9633	0.0000	0.0000	0.0000	0.0000	125.5531	291.4039	451.4775	(211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	183.8907	161.6921	170.0076	145.9117	138.8683	122.3843	119.0809	125.5462	128.7825	146.8267	159.9560	181.4749	(64)
Efficiency of water heater (217)m	84.3335	83.8421	82.8021	80.9444	78.5712	76.4000	76.4000	76.4000	76.4000	81.2604	83.5575	84.4596	(216)
Fuel for water heating, kWh/month	218.0517	192.8530	205.3179	180.2617	176.7419	160.1889	155.8651	164.3275	168.5635	180.6868	191.4323	214.8658	(219)

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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	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	7.0685	(231)
Lighting	22.4031	17.9726	16.1824	11.8559	9.1578	7.4820	8.3541	10.8589	14.1047	18.5061	20.9026	23.0258	23.0258	(232)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-15.6882	-25.3707	-42.2180	-53.8413	-62.7686	-60.2459	-59.1701	-53.1850	-43.2726	-31.2744	-18.1663	-13.0980	-13.0980	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-4.6831	-11.4424	-27.2204	-47.7765	-69.3000	-72.0524	-70.3592	-55.8033	-36.0490	-17.6911	-6.5710	-3.5522	-3.5522	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													2022.4002	(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													2209.1562	(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)													180.8062	(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													3597.5630	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2022.4002	3.6400	73.6154	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2209.1562	3.6400	80.4133	(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	180.8062	16.4900	29.8149	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2991	16.4900	-78.8715	
PV Unit electricity exported	-422.5005	5.5900	-23.6178	
Total			-102.4893	(252)
Total energy cost			187.5357	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.5292	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	91.4220	
SAP rating (Section 12)		91	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2022.4002	0.2100	424.7041	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2209.1562	0.2100	463.9228	(264)
Space and water heating			888.6269	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	180.8062	0.1443	26.0959	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-478.2991	0.1322	-63.2254	
PV Unit electricity exported	-422.5005	0.1222	-51.6223	
Total			-114.8477	(269)
Total CO2, kg/year			811.8043	(272)
CO2 emissions per m2			9.8300	(273)
EI value			91.4734	
EI rating			91	(274)
EI band			B	

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	41.2900 (1b)	x 2.4000 (2b)	= 99.0960 (1b) - (3b)
First floor	41.2900 (1c)	x 2.7000 (2c)	= 111.4830 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 210.5790 (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) = 0.1900 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3900 (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) = 0.3315 (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 (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	0.3480	0.3232	0.3315	0.3149	0.3149	0.3066	0.2983	0.2900	0.2817	0.3066	0.2900	0.3066 (22b)
Effective ac	0.5606	0.5522	0.5549	0.5496	0.5496	0.5470	0.5445	0.5421	0.5397	0.5470	0.5421	0.5470 (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			14.7900	1.1450	16.9351		(27)
Heatloss Floor 1			41.2900	0.1200	4.9548	75.0000	3096.7500 (28a)
External Wall 1	43.4900	16.9100	26.5800	0.1800	4.7844	60.0000	1594.8000 (29a)
External Roof 1	41.2900		41.2900	0.0900	3.7161	9.0000	371.6100 (30)
Total net area of external elements Aum(A, m ²)			126.0700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 32.7224		(33)
Main dwelling							
Party Wall 1			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			41.2900			18.0000	743.2200 (32d)
Internal Ceiling 1			41.2900			9.0000	371.6100 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12285.3000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 148.7685 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.4900	0.0300	0.3447
E3 Sill	6.9700	0.0200	0.1394
E4 Jamb	23.4600	0.0200	0.4692
E5 Ground floor (normal)	18.3700	0.0400	0.7348
E6 Intermediate floor within a dwelling	18.3700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	9.8200	0.0500	0.4910
E12 Gable (insulation at ceiling level)	8.5400	0.0300	0.2562
E16 Corner (normal)	15.3000	0.0400	0.6120
E17 Corner (inverted - internal area greater than external area)	5.1000	-0.0700	-0.3570
E18 Party wall between dwellings	10.2000	0.0500	0.5100
P1 Party wall - Ground floor	8.5400	0.0400	0.3416
P2 Party wall - Intermediate floor within a dwelling	8.5400	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.5400	0.0300	0.2562

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.7981 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 36.5205 (37)

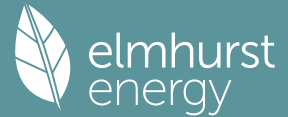
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	38.9541	38.3744	38.5629	38.1907	38.1907	38.0117	37.8376	37.6682	37.5036	38.0117	37.6682	38.0117 (38)
Heat transfer coeff	75.4747	74.8949	75.0834	74.7112	74.7112	74.5323	74.3581	74.1887	74.0241	74.5323	74.1887	74.5323 (39)
Average = Sum(39)m / 12 =												74.6026

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9140	0.9069	0.9092	0.9047	0.9047	0.9025	0.9004	0.8984	0.8964	0.9025	0.8984	0.9025 (40)
HLP (average)												0.9034
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.5100 (42)
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Hot water usage for mixer showers	66.3041	65.3076	63.8557	61.0776	59.0274	56.7411	55.4415	56.8825	58.4621	60.9169	63.7547	66.0500 (42a)
Hot water usage for baths	28.6361	28.2109	27.6120	26.5077	25.6809	24.7640	24.2688	24.8635	25.5110	26.4921	27.6191	28.5393 (42b)
Hot water usage for other uses	40.3348	38.8681	37.4014	35.9347	34.4680	33.0012	33.0012	34.4680	35.9347	37.4014	38.8681	40.3348 (42c)
Average daily hot water use (litres/day)												124.3484 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	135.2750	132.3866	128.8690	123.5199	119.1762	114.5063	112.7115	116.2139	119.9078	124.8104	130.2419	134.9242 (44)
Distribution loss (46)m = 0.15 x (45)m	214.2426	188.5168	198.0669	169.0926	160.4341	140.7989	136.3148	143.8971	147.8583	169.3665	185.5534	211.2587 (45)
Water storage loss (or HIU loss):	32.1364	28.2775	29.7100	25.3639	24.0651	21.1198	20.4472	21.5846	22.1787	25.4050	27.8330	31.6888 (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	0.6635	0.6056	0.6642	0.6032	0.6002	0.5530	0.5452	0.5554	0.5488	0.5954	0.6120	0.6572 (61)
Total heat required for water heating calculated for each month	214.9061	189.1224	198.7311	169.6958	161.0343	141.3519	136.8600	144.4525	148.4071	169.9619	186.1654	211.9159 (62)
WWHRS	-31.0154	-27.4303	-28.7234	-23.7841	-22.1660	-18.9676	-17.7791	-18.9063	-19.6246	-23.1352	-26.2094	-30.4411 (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	183.8907	161.6921	170.0076	145.9117	138.8683	122.3843	119.0809	125.5462	128.7825	146.8267	159.9560	181.4749 (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	71.4015	62.8332	66.0233	56.3741	53.4944	46.9539	45.4610	47.9846	49.3001	56.4632	61.8495	70.4078 (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	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996	150.5996 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.5950	22.7332	18.4879	13.9965	10.4626	8.8329	9.5443	12.4061	16.6514	21.1428	24.6767	26.3063 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	335.4449	338.9257	330.1541	311.4802	287.9078	265.7531	250.9524	247.4715	256.2432	274.9170	298.4894	320.6442 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700	52.5700 (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)	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997	-100.3997 (71)
Water heating gains (Table 5)	95.9698	93.5018	88.7410	78.2974	71.9010	65.2137	61.1035	64.4955	68.4723	75.8914	85.9021	94.6342 (72)
Total internal gains	562.7795	560.9306	543.1528	509.5439	476.0413	442.5696	424.3700	427.1429	444.1367	477.7211	514.8381	547.3545 (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				3.7000	25.1925		0.6300		0.7000		0.7700		28.4869 (76)
South				0.8400	56.7559		0.6300		0.7000		0.7700		14.5701 (78)
West				10.2500	25.1925		0.6300		0.7000		0.7700		78.9165 (80)
Solar gains	121.9735	198.9562	321.8243	461.9561	531.5943	588.6534	556.9893	494.5806	391.4984	252.1392	150.6748		99.2079 (83)
Total gains	684.7530	759.8869	864.9771	971.5001	1007.6356	1031.2230	981.3593	921.7235	835.6351	729.8603	665.5129		646.5624 (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	45.2150	45.5650	45.4506	45.6770	45.6770	45.7867	45.8939	45.9987	46.1010	45.7867	45.9987	45.7867
alpha	4.0143	4.0377	4.0300	4.0451	4.0451	4.0524	4.0596	4.0666	4.0734	4.0524	4.0666	4.0524
util living area	0.9537	0.9317	0.8708	0.7497	0.5903	0.4052	0.2940	0.3120	0.5339	0.7940	0.9208	0.9599 (86)
MIT	19.8544	20.0446	20.3919	20.7327	20.9179	20.9858	20.9970	20.9963	20.9586	20.7220	20.2649	19.8306 (87)
Th 2	20.1557	20.1616	20.1597	20.1635	20.1635	20.1653	20.1671	20.1689	20.1706	20.1653	20.1689	20.1653 (88)
util rest of house	0.9457	0.9204	0.8506	0.7155	0.5418	0.3483	0.2319	0.2464	0.4712	0.7553	0.9054	0.9527 (89)
MIT 2	19.1287	19.3168	19.6448	19.9559	20.1090	20.1583	20.1662	20.1677	20.1476	19.9567	19.5390	19.1136 (90)
Living area fraction	19.2905	19.4791	19.8113	20.1291	20.2893	20.3428	20.3514	20.3524	20.3284	20.1273	19.7008	19.2734 (92)
MIT	19.2905	19.4791	19.8113	20.1291	20.2893	20.3428	20.3514	20.3524	20.3284	20.1273	19.7008	19.2734 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9356	0.9096	0.8413	0.7140	0.5493	0.3606	0.2457	0.2610	0.4835	0.7534	0.8953	0.9433 (94)
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	1086.1167	1061.9406	961.9183	794.1092	581.9504	375.8520	241.7678	241.2926	416.6391	650.4675	875.4876	1063.8316 (97)

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Space heating kWh	331.4074	249.1332	174.2408	72.3452	21.1800	0.0000	0.0000	0.0000	0.0000	74.8321	201.3694	337.7330 (98a)
Space heating requirement - total per year (kWh/year)												1462.2411
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	331.4074	249.1332	174.2408	72.3452	21.1800	0.0000	0.0000	0.0000	0.0000	74.8321	201.3694	337.7330 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1462.2411
Space heating per m2										(98c) / (4) =		17.7070 (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	331.4074	249.1332	174.2408	72.3452	21.1800	0.0000	0.0000	0.0000	0.0000	74.8321	201.3694	337.7330 (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)	373.6273	280.8717	196.4384	81.5616	23.8783	0.0000	0.0000	0.0000	0.0000	84.3654	227.0230	380.7587 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	183.8907	161.6921	170.0076	145.9117	138.8683	122.3843	119.0809	125.5462	128.7825	146.8267	159.9560	181.4749 (64)
Efficiency of water heater	83.8808	83.4145	82.1671	80.0809	77.8282	76.4000	76.4000	76.4000	76.4000	80.1523	82.7988	76.4000 (216)
Fuel for water heating, kWh/month	219.2286	193.8417	206.9047	182.2054	178.4292	160.1889	155.8651	164.3275	168.5635	183.1846	193.1864	83.9746 (217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	216.1067 (219)
(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	22.4031	17.9726	16.1824	11.8559	9.1578	7.4820	8.3541	10.8589	14.1047	18.5061	20.9026	23.0258 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-19.5364	-27.3805	-45.4697	-57.6249	-64.6088	-64.9239	-63.5190	-58.3066	-48.0127	-35.5939	-22.4158	-16.1158 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-6.7744	-13.0889	-31.3018	-54.8876	-73.8100	-85.4276	-82.6445	-68.1304	-44.4539	-22.4499	-9.4355	-5.0176 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1648.5244 (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												2222.0324 (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)												180.8062 (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												3116.4328 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1648.5244	6.5500	107.9783 (240)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	2222.0324	6.5500	145.5431 (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	180.8062	28.4300	51.4032 (250)	
Additional standing charges			104.0000 (251)	
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-523.5081	28.4300	-148.8333	
PV Unit electricity exported	-497.4221	5.8100	-28.9002	
Total			-177.7336 (252)	
Total energy cost			255.6409 (255)	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1648.5244	0.2100	346.1901 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2222.0324	0.2100	466.6268 (264)
Space and water heating			812.8169 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	180.8062	0.1443	26.0959 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.5081	0.1325	-69.3727
PV Unit electricity exported	-497.4221	0.1222	-60.7776
Total			-130.1503 (269)
Total CO2, kg/year			720.6918 (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	1648.5244	1.1300	1862.8326 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2222.0324	1.1300	2510.8966 (278)
Space and water heating			4373.7292 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	180.8062	1.5338	277.3265 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-523.5081	1.4896	-779.8320
PV Unit electricity exported	-497.4221	0.4482	-222.9562
Total			-1002.7881 (283)
Total Primary energy kWh/year			3778.3684 (286)