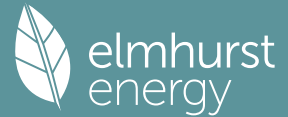


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Property Reference	P22691(4) Mount P				Issued on Date	13/06/2025
Assessment Reference	As Built	Prop Type Ref				
Property	44, Mount Pleasant, Reading, RG1 2TD					
SAP Rating	90 B	DER	9.81	TER	12.26	
Environmental	92 A	% DER < TER				19.98
CO ₂ Emissions (t/year)	0.64	DFEE	33.80	TFEE	35.73	
Compliance Check	See BREL	% DFEE < TFEE				5.38
% DPER < TPER	12.31	DPER	56.32	TPER	64.23	
Assessor Details	Mr. Malcolm Lisle				Assessor ID	P736-0001
Client	JZ, Jay Zaman					

SAP 10 WORKSHEET FOR New Build (As Built) (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	29.5600 (1b)	x 2.5000 (2b)	= 73.9000 (1b) - (3b)
First floor	31.0800 (1c)	x 2.8000 (2c)	= 87.0240 (1c) - (3c)
Second floor	17.7600 (1d)	x 2.9000 (2d)	= 51.5040 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	212.4280 (5)

2. Ventilation rate

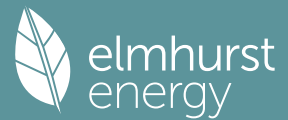
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1412 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.4200 (17)
Infiltration rate	0.3122 (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) = 0.2654 (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	0.3384	0.3317	0.3251	0.2919	0.2853	0.2521	0.2521	0.2455	0.2654	0.2853	0.2986	0.3118 (22b)
Effective ac	0.5572	0.5550	0.5528	0.5426	0.5407	0.5318	0.5318	0.5301	0.5352	0.5407	0.5446	0.5486 (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							
Windows/Doors			20.3700	1.4151	28.8255		(27)
Rooflights			4.0600	1.5918	6.4625		(27a)
Ground Floor			29.5600	0.1300	3.8428	110.0000	3251.6000 (28a)
External Wall	62.6800	20.3700	42.3100	0.1300	5.5003	9.0000	380.7900 (29a)
External Roof - Sloping	23.1800	4.0600	19.1200	0.1800	3.4416	9.0000	172.0800 (30)
External Roof - Flat Roof	13.3200		13.3200	0.1500	1.9980	9.0000	119.8800 (30)
Total net area of external elements Aum(A, m ²)			128.7400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.0707		(33)
Main dwelling							
Party Wall 1			108.2400	0.0000	0.0000	70.0000	7576.8000 (32)
Internal Walls - Timber			105.3000			9.0000	947.7000 (32c)
Internal Floor - 1st Floor			29.5600			18.0000	532.0800 (32d)
Internal Floor - 2nd Floor			17.7600			18.0000	319.6800 (32d)
Internal Ceiling - G Floor			29.5600			9.0000	266.0400 (32e)
Internal Ceiling - 1st Floor			17.7600			9.0000	159.8400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13726.4900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							175.0828 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	10.4000	0.1440	1.4976
E3 Sill	5.9000	0.0480	0.2832
E4 Jamb	37.6000	0.0640	2.4064
E5 Ground floor (normal)	8.2000	0.0210	0.1722
E6 Intermediate floor within a dwelling	14.8000	0.0800	1.1840
E13 Gable (insulation at rafter level)	9.6000	0.0240	0.2304
E15 Flat roof with parapet	3.7000	0.0460	0.1702
E16 Corner (normal)	2.5000	0.0300	0.0750
E18 Party wall between dwellings	2.5000	0.0370	0.0925
E25 Staggered party wall between dwellings	29.2000	0.0370	1.0804
P1 Party wall - Ground floor	15.2000	0.0490	0.7448
P2 Party wall - Intermediate floor within a dwelling	26.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.6000	0.0770	0.5082
P5 Party wall - Roof (insulation at rafter level)	9.6000	0.0710	0.6816
R1 Head of roof window	3.1000	0.0240	0.0744
R2 Sill of roof window	3.1000	0.0240	0.0744
R3 Jamb of roof window	4.8000	0.0240	0.1152
R4 Ridge (vaulted ceiling)	4.8000	0.0120	0.0576
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0150	-0.0375
E11 Eaves (insulation at rafter level)	4.8000	0.0540	0.2592

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.6698 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 59.7405 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.0638	38.9080	38.7552	38.0377	37.9035	37.2786	37.2786	37.1629	37.5193	37.9035	38.1751	38.4590 (38)

 Heat transfer coeff 98.8043
 Average = Sum(39)m / 12 = 98.1995 (39)
97.7776

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2603	1.2583	1.2563	1.2472	1.2455	1.2375	1.2375	1.2360	1.2406	1.2455	1.2489	1.2525 (40)
HLP (average)												1.2472
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4318 (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	0.0000 (42a)
Hot water usage for baths												
28.0723	27.6554	27.0683	25.9858	25.1752	24.2765	23.7910	24.3740	25.0087	25.9705	27.0753	27.9774	(42b)
Hot water usage for other uses												
39.5341	38.0965	36.6589	35.2213	33.7837	32.3461	32.3461	33.7837	35.2213	36.6589	38.0965	39.5341	(42c)
Average daily hot water use (litres/day)												61.9676 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	67.6064	65.7519	63.7272	61.2071	58.9589	56.6225	56.1370	58.1576	60.2300	62.6294	65.1718	67.5115 (44)
Energy conte	107.0720	93.6298	97.9463	83.7894	79.3700	69.6240	67.8929	72.0113	74.2696	84.9874	92.8491	105.7067 (45)
Energy content (annual)										Total = Sum(45)m =		1029.1487
Distribution loss (46)m = 0.15 x (45)m												
16.0608	14.0445	14.6920	12.5684	11.9055	10.4436	10.1839	10.8017	11.1404	12.7481	13.9274	15.8560	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	43.7491	39.5054	43.7232	42.2890	43.6826	42.2582	43.6600	43.6698	42.2720	43.6993	42.3130	43.7464 (61)
Total heat required for water heating calculated for each month												
150.8211	133.1352	141.6695	126.0785	123.0526	111.8822	111.5529	115.6811	116.5416	128.6867	135.1621	149.4532	(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	150.8211	133.1352	141.6695	126.0785	123.0526	111.8822	111.5529	115.6811	116.5416	128.6867	135.1621	149.4532 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1543.7167 (64)
Electric shower(s)												1544 (64)
52.0486	46.3757	50.6405	48.3256	49.2324	46.9629	48.5284	49.2324	48.3256	50.6405	49.6883	52.0486	(64a)
Heat gains from water heating, kWh/month	59.5509	52.6022	56.1581	50.5137	49.6193	45.4553	45.6215	47.1693	47.3441	51.8433	53.8727	59.0962 (65)

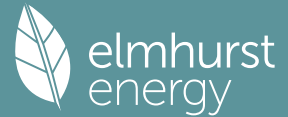
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
108.9795	120.6559	108.9795	112.6122	108.9795	112.6122	108.9795	108.9795	112.6122	108.9795	112.6122	108.9795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
216.0641	218.3061	212.6562	200.6281	185.4449	171.1748	161.6414	159.3994	165.0493	177.0774	192.2606	206.5308	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	(71)
Water heating gains (Table 5)												
80.0415	78.2771	75.4813	70.1578	66.6926	63.1323	61.3192	63.3996	65.7556	69.6818	74.8231	79.4304	(72)
Total internal gains	467.5621	479.7161	459.5940	445.8752	423.5940	406.3962	391.4171	391.2555	402.8941	418.2157	442.1729	457.4177 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2				Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		factor Table 6d	W	
North	7.4800				10.6334	0.6300		0.0000		0.7700	38.5838 (74)	
South	12.8900				46.7521	0.6300		0.0000		0.7700	292.3378 (78)	
East	4.0600				26.2379	0.6300		0.7000		1.0000	42.2802 (82)	

Solar gains	373.2018	637.3781	880.4248	1111.2017	1267.7676	1269.9988	1219.5803	1100.2219	959.5181	706.3114	447.2211	319.2971 (83)
Total gains	840.7639	1117.0942	1340.0188	1557.0769	1691.3616	1676.3951	1610.9975	1491.4774	1362.4122	1124.5271	889.3941	776.7148 (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	38.5906	38.6515	38.7115	38.9955	39.0491	39.3006	39.3006	39.3476	39.2034	39.0491	38.9408	38.8283
alpha	3.5727	3.5768	3.5808	3.5997	3.6033	3.6200	3.6200	3.6232	3.6136	3.6033	3.5961	3.5886
util living area	0.9538	0.8947	0.8059	0.6652	0.5089	0.3639	0.2634	0.2962	0.4725	0.7412	0.9126	0.9634 (86)
MIT	19.5193	19.9716	20.3914	20.7419	20.9169	20.9810	20.9955	20.9931	20.9519	20.6812	20.0384	19.4234 (87)
Th 2	19.8721	19.8737	19.8752	19.8824	19.8838	19.8901	19.8901	19.8913	19.8877	19.8838	19.8811	19.8782 (88)
util rest of house	0.9441	0.8756	0.7750	0.6211	0.4552	0.3032	0.1977	0.2260	0.4031	0.6919	0.8930	0.9555 (89)
MIT 2	18.2035	18.7554	19.2498	19.6424	19.8181	19.8790	19.8885	19.8886	19.8567	19.5950	18.8541	18.0886 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.6661	19.1829	19.6511	20.0289	20.2044	20.2664	20.2776	20.2768	20.2417	19.9768	19.2704	18.5578 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6661	19.1829	19.6511	20.0289	20.2044	20.2664	20.2776	20.2768	20.2417	19.9768	19.2704	18.5578 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9309	0.8620	0.7683	0.6271	0.4710	0.3240	0.2207	0.2506	0.4256	0.6963	0.8802	0.9435 (94)
Useful gains	782.6951	962.9358	1029.4702	976.4504	796.5532	543.1840	355.6142	373.7731	579.9049	783.0074	782.8433	732.8085 (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	1419.4304	1408.9884	1295.3309	1088.1665	830.4033	549.7489	356.8005	375.6784	597.3404	915.5900	1191.6696	1409.9295 (97)
Space heating kWh	473.7311	299.7473	197.8004	80.4356	25.1845	0.0000	0.0000	0.0000	0.0000	98.6415	294.3549	503.7780 (98a)
Space heating requirement - total per year (kWh/year)												1973.6733
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	473.7311	299.7473	197.8004	80.4356	25.1845	0.0000	0.0000	0.0000	0.0000	98.6415	294.3549	503.7780 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1973.6733
Space heating per m2												(98c) / (4) = 25.1744 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	473.7311	299.7473	197.8004	80.4356	25.1845	0.0000	0.0000	0.0000	0.0000	98.6415	294.3549	503.7780 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	532.2821	336.7948	222.2476	90.3771	28.2972	0.0000	0.0000	0.0000	0.0000	110.8331	330.7359	566.0427 (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	150.8211	133.1352	141.6695	126.0785	123.0526	111.8822	111.5529	115.6811	116.5416	128.6867	135.1621	149.4532 (64)
Efficiency of water heater (217)m	88.5834	88.4701	88.2826	87.9544	87.5842	87.3000	87.3000	87.3000	87.3000	88.0296	88.4579	87.3000 (216)
Fuel for water heating, kWh/month	170.2589	150.4860	160.4728	143.3454	140.4963	128.1583	127.7811	132.5098	133.4956	146.1857	152.7982	168.6730 (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	21.6424	17.3623	15.6329	11.4533	8.8469	7.2280	8.0704	10.4902	13.6258	17.8777	20.1928	22.2439 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-23.3201	-37.2820	-61.3196	-77.0905	-88.9048	-85.2412	-84.0406	-76.2299	-62.6192	-45.8512	-26.9199	-19.5064 (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	-8.3532	-20.5552	-49.3236	-87.0012	-126.2170	-131.0156	-127.3716	-100.4626	-64.4880	-31.4918	-11.6585	-6.3031 (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												2217.6104 (211)
Space heating fuel - main system 2												0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	87.3000
Water heating fuel used	1754.6610 (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)	174.6666 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1452.5668 (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	3372.4207 (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	2217.6104	0.2100	465.6982 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1754.6610	0.2100	368.4788 (264)
Energy for instantaneous electric shower(s)	592.0494	0.1391	82.3672 (264a)
Space and water heating			834.1770 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	174.6666	0.1443	25.2098 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-688.3254	0.1324	-91.1225
PV Unit electricity exported	-764.2414	0.1222	-93.3679
Total			-184.4905 (269)
Total CO2, kg/year			769.1928 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.8100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2217.6104	1.1300	2505.8998 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1754.6610	1.1300	1982.7670 (278)
Energy for instantaneous electric shower(s)	592.0494	1.5143	896.5607 (278a)
Space and water heating			4488.6667 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	174.6666	1.5338	267.9094 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-688.3254	1.4891	-1025.0156
PV Unit electricity exported	-764.2414	0.4483	-342.5896
Total			-1367.6052 (283)
Total Primary energy kWh/year			4415.6325 (286)
Dwelling Primary energy Rate (DPER)			56.3200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	29.5600 (1b)	x 2.5000 (2b)	= 73.9000 (1b) - (3b)
First floor	31.0800 (1c)	x 2.8000 (2c)	= 87.0240 (1c) - (3c)
Second floor	17.7600 (1d)	x 2.9000 (2d)	= 51.5040 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.4280 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1412 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3912 (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) = 0.3325 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4240	0.4157	0.4074	0.3658	0.3575	0.3159	0.3159	0.3076	0.3325	0.3575	0.3741	0.3907 (22b)
	0.5899	0.5864	0.5830	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5700	0.5763 (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 Opening Type			16.3500	1.1450	18.7214		(27)
TER Roof Window			3.2600	1.1450	4.9023		(27a)
Ground Floor			29.5600	0.1300	3.8428		(28a)
External Wall	62.6800	16.3500	46.3300	0.1800	8.3394		(29a)
External Roof - Sloping	23.1800	3.2600	19.9200	0.1100	2.1912		(30)
External Roof - Flat Roof	13.3200		13.3200	0.1100	1.4652		(30)
Total net area of external elements Aum(A, m2)			128.7400				(31)
Fabric heat loss, W/K = Sum (A x U)					39.4622		(33)
Main dwelling							
Party Wall 1			108.2400	0.0000	0.0000		(32)

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

175.0828 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	10.4000	0.0500	0.5200
E3 Sill	5.9000	0.0500	0.2950
E4 Jamb	37.6000	0.0500	1.8800
E5 Ground floor (normal)	8.2000	0.1600	1.3120
E6 Intermediate floor within a dwelling	14.8000	0.0000	0.0000
E13 Gable (insulation at rafter level)	9.6000	0.0800	0.7680
E15 Flat roof with parapet	3.7000	0.5600	2.0720
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	29.2000	0.0600	1.7520
P1 Party wall - Ground floor	15.2000	0.0800	1.2160
P2 Party wall - Intermediate floor within a dwelling	26.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.6000	0.1200	0.7920
P5 Party wall - Roof (insulation at rafter level)	9.6000	0.0800	0.7680
R1 Head of roof window	3.1000	0.0800	0.2480
R2 Sill of roof window	3.1000	0.0600	0.1860
R3 Jamb of roof window	4.8000	0.0800	0.3840
R4 Ridge (vaulted ceiling)	4.8000	0.0800	0.3840
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E11 Eaves (insulation at rafter level)	4.8000	0.0400	0.1920

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

Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 52.3812 (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	41.3516	41.1069	40.8671	39.7406	39.5298	38.5487	38.5487	38.3670	38.9266	39.5298	39.9562	40.4019 (38)
Heat transfer coeff	93.7328	93.4881	93.2483	92.1218	91.9111	90.9300	90.9300	90.7483	91.3079	91.9111	92.3374	92.7832 (39)
Average = Sum(39)m / 12 =												92.1208

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1956	1.1925	1.1894	1.1750	1.1723	1.1598	1.1598	1.1575	1.1646	1.1723	1.1778	1.1835 (40)
HLP (average)												1.1750
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4318 (42)
Hot water usage for mixer showers												
64.9930	64.0163	62.5930	59.8699	57.8602	55.6191	54.3452	55.7577	57.3061	59.7124	62.4940	64.7440 (42a)	
Hot water usage for baths												
28.0723	27.6554	27.0683	25.9858	25.1752	24.2765	23.7910	24.3740	25.0087	25.9705	27.0753	27.9774 (42b)	
Hot water usage for other uses												
39.5341	38.0965	36.6589	35.2213	33.7837	32.3461	32.3461	33.7837	35.2213	36.6589	38.0965	39.5341 (42c)	
Average daily hot water use (litres/day)												121.8889 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
132.5994	129.7682	126.3202	121.0769	116.8191	112.2416	110.4823	113.9154	117.5361	122.3417	127.6658	132.2555 (44)	
Energy content (annual)	210.0051	184.7882	194.1495	165.7483	157.2610	138.0142	133.6187	141.0510	144.9338	166.0166	181.8833	207.0802 (45)
Distribution loss (46)m = 0.15 x (45)m												
31.5008	27.7182	29.1224	24.8622	23.5892	20.7021	20.0428	21.1577	21.7401	24.9025	27.2825	31.0620 (46)	
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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												
260.9640	230.8156	245.1084	215.0633	208.2199	187.3292	184.5776	192.0099	194.2488	216.9755	231.1984	258.0391 (62)	
WWHRS	-29.7121	-26.2776	-27.5164	-22.7847	-21.2345	-18.1705	-17.0320	-18.1118	-18.7999	-22.1630	-25.1080	-29.1619 (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												
231.2519	204.5380	217.5920	192.2787	186.9854	169.1587	167.5457	173.8981	175.4489	194.8125	206.0904	228.8772 (64)	

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Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	82.5664	72.9489	77.2944	67.4401	65.0290	58.2185	57.1680	59.6392	60.5192	67.9402	72.8050	81.5939 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9795	120.6559	108.9795	112.6122	108.9795	112.6122	108.9795	108.9795	112.6122	108.9795	112.6122	108.9795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.0641	218.3061	212.6562	200.6281	185.4449	171.1748	161.6414	159.3994	165.0493	177.0774	192.2606	206.5308	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	(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)	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	(71)
Water heating gains (Table 5)	110.9764	108.5549	103.8904	93.6668	87.4046	80.8590	76.8386	80.1602	84.0545	91.3175	101.1180	109.6692	(72)
Total internal gains	498.4970	509.9940	488.0031	469.3841	444.3060	424.1229	406.9366	408.0161	421.1930	439.8514	468.4678	487.6565	(73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North			6.0100	10.6334		0.6300		0.7000		0.7700		19.5307 (74)	
South			10.3400	46.7521		0.6300		0.7000		0.7700		147.7383 (78)	
East			3.2600	26.2379		0.6300		0.7000		1.0000		33.9491 (82)	
Solar gains	201.2182	347.4272	488.2685	627.3964	723.7537	727.9155	697.8671	624.4441	536.1560	387.4140	241.8534	171.6633	(83)
Total gains	699.7151	857.4211	976.2716	1096.7805	1168.0597	1152.0384	1104.8037	1032.4602	957.3490	827.2654	710.3212	659.3198	(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	40.6785	40.7850	40.8899	41.3899	41.4848	41.9324	41.9324	42.0164	41.7589	41.4848	41.2933	41.0949	
alpha	3.7119	3.7190	3.7260	3.7593	3.7657	3.7955	3.7955	3.8011	3.7839	3.7657	3.7529	3.7397	
util living area	0.9715	0.9429	0.8948	0.7962	0.6536	0.4857	0.3572	0.3965	0.6047	0.8431	0.9484	0.9765	(86)
MIT	19.4304	19.7642	20.1506	20.5701	20.8372	20.9599	20.9903	20.9856	20.9087	20.5395	19.9145	19.3736	(87)
Th 2	19.9235	19.9260	19.9285	19.9400	19.9422	19.9523	19.9523	19.9541	19.9484	19.9422	19.9378	19.9333	(88)
util rest of house	0.9653	0.9312	0.8740	0.7591	0.5974	0.4130	0.2744	0.3098	0.5289	0.8046	0.9357	0.9713	(89)
MIT 2	18.1289	18.5459	19.0198	19.5184	19.8056	19.9274	19.9485	19.9480	19.8851	19.5008	18.7484	18.0642	(90)
Living area fraction	18.5864	18.9742	19.4173	19.8881	20.1682	20.2904	20.3147	20.3128	20.2449	19.8659	19.1583	18.5245	(91)
MIT	18.5864	18.9742	19.4173	19.8881	20.1682	20.2904	20.3147	20.3128	20.2449	19.8659	19.1583	18.5245	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5864	18.9742	19.4173	19.8881	20.1682	20.2904	20.3147	20.3128	20.2449	19.8659	19.1583	18.5245	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	668.2086	787.3921	841.9340	830.3807	712.5086	503.4621	335.1561	351.0216	527.7383	663.0375	656.3468	634.2667	(94)
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	1339.1062	1315.7692	1204.5158	1012.2439	778.3247	517.4242	337.7759	355.0754	561.0799	851.6393	1113.4361	1329.0739	(97)
Space heating kWh	499.1478	355.0694	269.7609	130.9416	48.9672	0.0000	0.0000	0.0000	0.0000	140.3198	329.1043	516.9366	(98a)
Space heating requirement - total per year (kWh/year)												2290.2474	
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	499.1478	355.0694	269.7609	130.9416	48.9672	0.0000	0.0000	0.0000	0.0000	140.3198	329.1043	516.9366	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2290.2474	
Space heating per m ²												29.2123	(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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
499.1478	355.0694	269.7609	130.9416	48.9672	0.0000	0.0000	0.0000	0.0000	0.0000	140.3198	329.1043	516.9366	(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)	540.2032	384.2742	291.9490	141.7116	52.9948	0.0000	0.0000	0.0000	0.0000	151.8612	356.1735	559.4552	(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)

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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	231.2519	204.5380	217.5920	192.2787	186.9854	169.1587	167.5457	173.8981	175.4489	194.8125	206.0904	228.8772	(64)
Efficiency of water heater	85.9844	85.5511	84.8431	83.5753	81.9451	80.3000	80.3000	80.3000	80.3000	83.6898	85.3789	80.3000	(216)
Fuel for water heating, kWh/month	268.9463	239.0827	256.4641	230.0663	228.1837	210.6584	208.6497	216.5606	218.4918	232.7793	241.3833	265.9163	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	22.6438	18.1657	16.3562	11.9832	9.2562	7.5624	8.4438	10.9756	14.2562	18.7049	21.1272	23.2731	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-29.2919	-42.1745	-61.9000	-71.1161	-77.9866	-73.2590	-72.3497	-67.6551	-59.5939	-48.8966	-32.5103	-25.2222	(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)	-13.9897	-29.6872	-59.4849	-90.0459	-119.7504	-120.5758	-119.1663	-100.5940	-73.3252	-42.7003	-18.7572	-11.0443	(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												2478.6227	(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												2817.1826	(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)												182.7484	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1461.0771	(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												4103.4766	(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	2478.6227	0.2100	520.5108 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2817.1826	0.2100	591.6083 (264)
Space and water heating			1112.1191 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	182.7484	0.1443	26.3762 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-661.9558	0.1341	-88.7970
PV Unit electricity exported	-799.1212	0.1257	-100.4209
Total			-189.2179 (269)
Total CO2, kg/year			961.2067 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2600 (273)

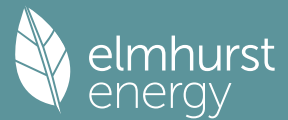
13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2478.6227	1.1300	2800.8437 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.1826	1.1300	3183.4163 (278)
Space and water heating			5984.2600 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	182.7484	1.5338	280.3055 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-661.9558	1.4957	-990.1179
PV Unit electricity exported	-799.1212	0.4613	-368.6051
Total			-1358.7230 (283)
Total Primary energy kWh/year			5035.9434 (286)
Target Primary Energy Rate (TPER)			64.2300 (287)

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

1. Overall dwelling characteristics

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	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	29.5600 (1b)	x 2.5000 (2b)	= 73.9000 (1b) - (3b)
First floor	31.0800 (1c)	x 2.8000 (2c)	= 87.0240 (1c) - (3c)
Second floor	17.7600 (1d)	x 2.9000 (2d)	= 51.5040 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	212.4280 (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) = 0.1412 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.4200 (17)
Infiltration rate	0.3122 (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) = 0.2654 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3384	0.3317	0.3251	0.2919	0.2853	0.2521	0.2521	0.2455	0.2654	0.2853	0.2986	0.3118	(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	0.5572	0.5550	0.5528	0.5426	0.5407	0.5318	0.5318	0.5301	0.5352	0.5407	0.5446	0.5486	(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							
Windows/Doors			20.3700	1.4151	28.8255		(27)
Rooflights			4.0600	1.5918	6.4625		(27a)
Ground Floor			29.5600	0.1300	3.8428	110.0000	3251.6000 (28a)
External Wall	62.6800	20.3700	42.3100	0.1300	5.5003	9.0000	380.7900 (29a)
External Roof - Sloping	23.1800	4.0600	19.1200	0.1800	3.4416	9.0000	172.0800 (30)
External Roof - Flat Roof	13.3200		13.3200	0.1500	1.9980	9.0000	119.8800 (30)
Total net area of external elements Aum(A, m ²)			128.7400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.0707		(33)
Main dwelling							
Party Wall 1			108.2400	0.0000	0.0000	70.0000	7576.8000 (32)
Internal Walls - Timber			105.3000			9.0000	947.7000 (32c)
Internal Floor - 1st Floor			29.5600			18.0000	532.0800 (32d)
Internal Floor - 2nd Floor			17.7600			18.0000	319.6800 (32d)
Internal Ceiling - G Floor			29.5600			9.0000	266.0400 (32e)
Internal Ceiling - 1st Floor			17.7600			9.0000	159.8400 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13726.4900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		175.0828 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	10.4000	0.1440	1.4976
E3 Sill	5.9000	0.0480	0.2832
E4 Jamb	37.6000	0.0640	2.4064
E5 Ground floor (normal)	8.2000	0.0210	0.1722
E6 Intermediate floor within a dwelling	14.8000	0.0800	1.1840
E13 Gable (insulation at rafter level)	9.6000	0.0240	0.2304
E15 Flat roof with parapet	3.7000	0.0460	0.1702
E16 Corner (normal)	2.5000	0.0300	0.0750
E18 Party wall between dwellings	2.5000	0.0370	0.0925
E25 Staggered party wall between dwellings	29.2000	0.0370	1.0804
P1 Party wall - Ground floor	15.2000	0.0490	0.7448
P2 Party wall - Intermediate floor within a dwelling	26.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.6000	0.0770	0.5082
P5 Party wall - Roof (insulation at rafter level)	9.6000	0.0710	0.6816
R1 Head of roof window	3.1000	0.0240	0.0744
R2 Sill of roof window	3.1000	0.0240	0.0744
R3 Jamb of roof window	4.8000	0.0240	0.1152
R4 Ridge (vaulted ceiling)	4.8000	0.0120	0.0576
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0150	-0.0375
E11 Eaves (insulation at rafter level)	4.8000	0.0540	0.2592

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.6698 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	59.7405 (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	
	39.0638	38.9080	38.7552	38.0377	37.9035	37.2786	37.2786	37.1629	37.5193	37.9035	38.1751	38.4590	(38)
Heat transfer coeff	98.8043	98.6485	98.4957	97.7783	97.6440	97.0191	97.0191	96.9034	97.2598	97.6440	97.9156	98.1995	(39)
Average = Sum(39)m / 12 =												97.7776	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.2603	1.2583	1.2563	1.2472	1.2455	1.2375	1.2375	1.2360	1.2406	1.2455	1.2489	1.2525	(40)
HLP (average)												1.2472	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4318 (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	28.0723	27.6554	27.0683	25.9858	25.1752	24.2765	23.7910	24.3740	25.0087	25.9705	27.0753	27.9774 (42b)
Hot water usage for other uses	39.5341	38.0965	36.6589	35.2213	33.7837	32.3461	32.3461	33.7837	35.2213	36.6589	38.0965	39.5341 (42c)
Average daily hot water use (litres/day)												61.9676 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	67.6064	65.7519	63.7272	61.2071	58.9589	56.6225	56.1370	58.1576	60.2300	62.6294	65.1718	67.5115 (44)
Energy content (annual)	107.0720	93.6298	97.9463	83.7894	79.3700	69.6240	67.8929	72.0113	74.2696	84.9874	92.8491	105.7067 (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:												
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	91.0112	79.5854	83.2544	71.2210	67.4645	59.1804	57.7089	61.2096	63.1292	72.2393	78.9217	89.8507 (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	91.0112	79.5854	83.2544	71.2210	67.4645	59.1804	57.7089	61.2096	63.1292	72.2393	78.9217	89.8507 (64)
12Total per year (kWh/year)												874.7764 (64)
Electric shower(s)	52.0486	46.3757	50.6405	48.3256	49.2324	46.9629	48.5284	49.2324	48.3256	50.6405	49.6883	52.0486 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											592.0494 (64a)
Heat gains from water heating, kWh/month	35.7650	31.4903	33.4737	29.8867	29.1742	26.5358	26.5593	27.6105	27.8637	30.7200	32.1525	35.4748 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9795	120.6559	108.9795	112.6122	108.9795	112.6122	108.9795	108.9795	112.6122	108.9795	112.6122	108.9795 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.0641	218.3061	212.6562	200.6281	185.4449	171.1748	161.6414	159.3994	165.0493	177.0774	192.2606	206.5308 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720 (71)
Water heating gains (Table 5)	48.0712	46.8605	44.9916	41.5092	39.2127	36.8553	35.6980	37.1109	38.6996	41.2903	44.6563	47.6812 (72)
Total internal gains	432.5918	445.2996	426.1043	414.2266	393.1141	380.1193	365.7960	364.9668	375.8381	386.8242	409.0061	422.6685 (73)

6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North						7.4800	10.6334	0.6300	0.0000	0.7700	38.5838 (74)	
South						12.8900	46.7521	0.6300	0.0000	0.7700	292.3378 (78)	
East						4.0600	26.2379	0.6300	0.7000	1.0000	42.2802 (82)	
Solar gains	373.2018	637.3781	880.4248	1111.2017	1267.7676	1269.9988	1219.5803	1100.2219	959.5181	706.3114	447.2211	319.2971 (83)
Total gains	805.7936	1082.6777	1306.5291	1525.4283	1660.8817	1650.1181	1585.3763	1465.1887	1335.3561	1093.1355	856.2272	741.9656 (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	38.5906	38.6515	38.7115	38.9955	39.0491	39.3006	39.3006	39.3476	39.2034	39.0491	38.9408	38.8283
alpha	3.5727	3.5768	3.5808	3.5997	3.6033	3.6200	3.6200	3.6232	3.6136	3.6033	3.5961	3.5886
util living area	0.9589	0.9022	0.8151	0.6744	0.5167	0.3694	0.2676	0.3014	0.4808	0.7531	0.9205	0.9679 (86)
MIT	19.4683	19.9321	20.3652	20.7298	20.9127	20.9800	20.9953	20.9927	20.9491	20.6631	19.9972	19.3707 (87)
Th 2	19.8721	19.8737	19.8752	19.8824	19.8838	19.8901	19.8901	19.8913	19.8877	19.8838	19.8811	19.8782 (88)
util rest of house	0.9502	0.8841	0.7849	0.6304	0.4626	0.3079	0.2009	0.2300	0.4106	0.7044	0.9022	0.9609 (89)
MIT 2	18.5227	18.9656	19.3652	19.6860	19.8299	19.8810	19.8888	19.8890	19.8620	19.6447	19.0427	18.4324 (90)
Living area fraction	18.8551	19.3054	19.7167	20.0529	20.2105	20.2674	20.2777	20.2770	20.2442	20.0027	19.3782	18.7622 (91)
MIT	18.8551	19.3054	19.7167	20.0529	20.2105	20.2674	20.2777	20.2770	20.2442	20.0027	19.3782	18.7622 (92)
Temperature adjustment	18.8551	19.3054	19.7167	20.0529	20.2105	20.2674	20.2777	20.2770	20.2442	20.0027	19.3782	18.7622 (93)
adjusted MIT	18.8551	19.3054	19.7167	20.0529	20.2105	20.2674	20.2777	20.2770	20.2442	20.0027	19.3782	18.7622 (93)

8. Space heating requirement

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9403	0.8736	0.7803	0.6375	0.4788	0.3290	0.2243	0.2550	0.4336	0.7100	0.8925	0.9520	(94)
Useful gains	757.6595	945.7917	1019.4501	972.4038	795.2812	542.9373	355.5590	373.6738	579.0627	776.1297	764.1638	706.3183	(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	1438.1049	1421.0664	1301.7907	1090.5151	831.0043	549.8425	356.8106	375.6943	597.5827	918.1170	1202.2316	1430.0041	(97)
Space heating kWh	506.2514	319.3846	210.0614	85.0401	26.5780	0.0000	0.0000	0.0000	0.0000	105.6386	315.4088	538.4222	(98a)
Space heating requirement - total per year (kWh/year)												2106.7851	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	506.2514	319.3846	210.0614	85.0401	26.5780	0.0000	0.0000	0.0000	0.0000	105.6386	315.4088	538.4222	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2106.7851	
Space heating per m2										(98c) / (4) =		26.8723	(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	911.9799	717.9416	736.4659	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9585	0.9769	0.9687	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	874.1622	701.3340	713.4401	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1838.2371	1767.2710	1636.3247	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	694.1339	793.0571	686.6261	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	173.5335	198.2643	171.6565	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												543.4543	(107)
Energy for space heating												26.8723	(99)
Energy for space cooling												6.9318	(108)
Total												33.8041	(109)
Fabric Energy Efficiency (DFEE)												33.8	(109)

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

1. Overall dwelling characteristics

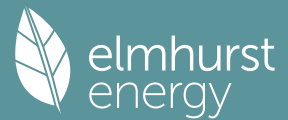
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	29.5600 (1b)	x 2.5000 (2b)	= 73.9000 (1b) - (3b)
First floor	31.0800 (1c)	x 2.8000 (2c)	= 87.0240 (1c) - (3c)
Second floor	17.7600 (1d)	x 2.9000 (2d)	= 51.5040 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	212.4280 (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) = 0.1412 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3912 (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) = 0.3325 (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	0.4240	0.4157	0.4074	0.3658	0.3575	0.3159	0.3159	0.3076	0.3325	0.3575	0.3741	0.3907	(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	0.5899	0.5864	0.5830	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5700	0.5763	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opening Type			16.3500	1.1450	18.7214			(27)
TER Roof Window			3.2600	1.1450	4.9023			(27a)
Ground Floor			29.5600	0.1300	3.8428			(28a)
External Wall	62.6800	16.3500	46.3300	0.1800	8.3394			(29a)
External Roof - Sloping	23.1800	3.2600	19.9200	0.1100	2.1912			(30)
External Roof - Flat Roof	13.3200		13.3200	0.1100	1.4652			(30)
Total net area of external elements Aum(A, m2)			128.7400					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)... (30) + (32) =	39.4622		(33)
Main dwelling								
Party Wall 1			108.2400	0.0000	0.0000			(32)

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

175.0828 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	10.4000	0.0500	0.5200	
E3 Sill	5.9000	0.0500	0.2950	
E4 Jamb	37.6000	0.0500	1.8800	
E5 Ground floor (normal)	8.2000	0.1600	1.3120	
E6 Intermediate floor within a dwelling	14.8000	0.0000	0.0000	
E13 Gable (insulation at rafter level)	9.6000	0.0800	0.7680	
E15 Flat roof with parapet	3.7000	0.5600	2.0720	
E16 Corner (normal)	2.5000	0.0900	0.2250	
E18 Party wall between dwellings	2.5000	0.0600	0.1500	
E25 Staggered party wall between dwellings	29.2000	0.0600	1.7520	
P1 Party wall - Ground floor	15.2000	0.0800	1.2160	
P2 Party wall - Intermediate floor within a dwelling	26.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	6.6000	0.1200	0.7920	
P5 Party wall - Roof (insulation at rafter level)	9.6000	0.0800	0.7680	
R1 Head of roof window	3.1000	0.0800	0.2480	
R2 Sill of roof window	3.1000	0.0600	0.1860	
R3 Jamb of roof window	4.8000	0.0800	0.3840	
R4 Ridge (vaulted ceiling)	4.8000	0.0800	0.3840	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250	
E11 Eaves (insulation at rafter level)	4.8000	0.0400	0.1920	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				12.9190 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	52.3812 (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	41.3516	41.1069	40.8671	39.7406	39.5298	38.5487	38.5487	38.3670	38.9266	39.5298	39.9562	40.4019	(38)
Heat transfer coeff	93.7328	93.4881	93.2483	92.1218	91.9111	90.9300	90.9300	90.7483	91.3079	91.9111	92.3374	92.7832	(39)
Average = Sum(39)m / 12 =												92.1208	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1956	1.1925	1.1894	1.1750	1.1723	1.1598	1.1598	1.1575	1.1646	1.1723	1.1778	1.1835	(40)
HLP (average)												1.1750	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4318 (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	28.0723	27.6554	27.0683	25.9858	25.1752	24.2765	23.7910	24.3740	25.0087	25.9705	27.0753	27.9774	(42b)
Hot water usage for other uses	39.5341	38.0965	36.6589	35.2213	33.7837	32.3461	32.3461	33.7837	35.2213	36.6589	38.0965	39.5341	(42c)
Average daily hot water use (litres/day)													61.9676 (43)
Daily hot water use	67.6064	65.7519	63.7272	61.2071	58.9589	56.6225	56.1370	58.1576	60.2300	62.6294	65.1718	67.5115	(44)
Energy conte	107.0720	93.6298	97.9463	83.7894	79.3700	69.6240	67.8929	72.0113	74.2696	84.9874	92.8491	105.7067	(45)
Energy content (annual)										Total = Sum(45)m =		1029.1487	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.0112	79.5854	83.2544	71.2210	67.4645	59.1804	57.7089	61.2096	63.1292	72.2393	78.9217	89.8507	(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	91.0112	79.5854	83.2544	71.2210	67.4645	59.1804	57.7089	61.2096	63.1292	72.2393	78.9217	89.8507	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		874.7764	(64)
Electric shower(s)	52.0486	46.3757	50.6405	48.3256	49.2324	46.9629	48.5284	49.2324	48.3256	50.6405	49.6883	52.0486	(64a)
Heat gains from water heating, kWh/month	35.7650	31.4903	33.4737	29.8867	29.1742	26.5358	26.5593	27.6105	27.8637	30.7200	32.1525	35.4748	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	121.5901	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9795	120.6559	108.9795	112.6122	108.9795	112.6122	108.9795	108.9795	112.6122	108.9795	112.6122	108.9795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.0641	218.3061	212.6562	200.6281	185.4449	171.1748	161.6414	159.3994	165.0493	177.0774	192.2606	206.5308	(68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590	35.1590 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)											
	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720 (71)
Water heating gains (Table 5)											
	48.0712	46.8605	44.9916	41.5092	39.2127	36.8553	35.6980	37.1109	38.6996	41.2903	44.6563 (72)
Total internal gains											
	432.5918	445.2996	426.1043	414.2266	393.1141	380.1193	365.7960	364.9668	375.8381	386.8242	409.0061 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					6.0100	10.6334	0.6300	0.7000	0.7700		19.5307 (74)	
South					10.3400	46.7521	0.6300	0.7000	0.7700		147.7383 (78)	
East					3.2600	26.2379	0.6300	0.7000	1.0000		33.9491 (82)	
Solar gains	201.2182	347.4272	488.2685	627.3964	723.7537	727.9155	697.8671	624.4441	536.1560	387.4140	241.8534	171.6633 (83)
Total gains	633.8099	792.7267	914.3728	1041.6229	1116.8678	1108.0347	1063.6631	989.4109	911.9941	774.2382	650.8594	594.3318 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, nil,m (see Table 9a)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
tau	40.6785	40.7850	40.8899	41.3899	41.4848	41.9324	41.9324	42.0164	41.7589	41.4848	41.2933
alpha	3.7119	3.7190	3.7260	3.7593	3.7657	3.7955	3.7955	3.8011	3.7839	3.7657	3.7529
util living area	0.9789	0.9542	0.9105	0.8158	0.6743	0.5025	0.3704	0.4126	0.6273	0.8644	0.9599
MIT	19.3252	19.6718	20.0778	20.5281	20.8187	20.9551	20.9890	20.9835	20.8966	20.4892	19.8274
Th 2	19.9235	19.9260	19.9285	19.9400	19.9422	19.9523	19.9523	19.9541	19.9484	19.9422	19.9378
util rest of house	0.9742	0.9444	0.8919	0.7803	0.6183	0.4282	0.2848	0.3229	0.5508	0.8290	0.9496
MIT 2	18.4222	18.7622	19.1535	19.5763	19.8227	19.9304	19.9489	19.9486	19.8919	19.5557	18.9279
Living area fraction	FLA = Living area / (4) =										
MIT	18.7397	19.0820	19.4784	19.9109	20.1728	20.2906	20.3145	20.3124	20.2451	19.8839	19.2441
Temperature adjustment	0.0000										
adjusted MIT	18.7397	19.0820	19.4784	19.9109	20.1728	20.2906	20.3145	20.3124	20.2451	19.8839	19.2441

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9673	0.9349	0.8828	0.7793	0.6311	0.4528	0.3147	0.3541	0.5735	0.8267	0.9411	0.9731
Useful gains	613.0633	741.0984	807.2339	811.7160	704.8589	501.7090	334.7850	350.3833	523.0095	640.1013	612.5167	578.3262
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	1353.4696	1325.8450	1210.2128	1014.3448	778.7485	517.4447	337.7605	355.0455	561.0920	853.2905	1121.3551	1344.1849
Space heating kWh	550.8623	392.9497	299.8163	145.8928	54.9739	0.0000	0.0000	0.0000	0.0000	158.6128	366.3636	569.7989
Space heating requirement - total per year (kWh/year)	2539.2702											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
Solar heating contribution - total per year (kWh/year)	0.0000											98b
Space heating kWh	550.8623	392.9497	299.8163	145.8928	54.9739	0.0000	0.0000	0.0000	0.0000	158.6128	366.3636	569.7989
Space heating requirement after solar contribution - total per year (kWh/year)	2539.2702											98c
Space heating per m2	(98c) / (4) =											32.3887 (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
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	854.7415	672.8816	689.6868	0.0000	0.0000	0.0000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9041	0.9435	0.9271	0.0000	0.0000	0.0000
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	772.7523	634.8922	639.3946	0.0000	0.0000	0.0000
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1214.2314	1166.5656	1087.8504	0.0000	0.0000	0.0000
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	317.8650	395.5650	333.6511	0.0000	0.0000	0.0000
Cooled fraction	fc = cooled area / (4) =										
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
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	79.4662	98.8913	83.4128	0.0000	0.0000	0.0000
Space cooling requirement	261.7703 (107)										
Energy for space heating	32.3887 (99)										
Energy for space cooling	3.3389 (108)										
Total	35.7276 (109)										
Fabric Energy Efficiency (TFEE)	35.7 (109)										

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)	
Main dwelling				
Ground floor	29.5600 (1b)	x 2.5000 (2b)	= 73.9000 (1b)	- (3b)
First floor	31.0800 (1c)	x 2.8000 (2c)	= 87.0240 (1c)	- (3c)
Second floor	17.7600 (1d)	x 2.9000 (2d)	= 51.5040 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.4280	(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) =	0.1412 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		3.4200 (17)
Infiltration rate		0.3122 (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) =	0.2654 (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	0.3384	0.3317	0.3251	0.2919	0.2853	0.2521	0.2521	0.2455	0.2654	0.2853	0.2986	0.3118	(22b)
Effective ac	0.5572	0.5550	0.5528	0.5426	0.5407	0.5318	0.5318	0.5301	0.5352	0.5407	0.5446	0.5486	(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								
Windows/Doors			20.3700	1.4151	28.8255			(27)
Rooflights			4.0600	1.5918	6.4625			(27a)
Ground Floor			29.5600	0.1300	3.8428	110.0000	3251.6000	(28a)
External Wall	62.6800	20.3700	42.3100	0.1300	5.5003	9.0000	380.7900	(29a)
External Roof - Sloping	23.1800	4.0600	19.1200	0.1800	3.4416	9.0000	172.0800	(30)
External Roof - Flat Roof	13.3200		13.3200	0.1500	1.9980	9.0000	119.8800	(30)
Total net area of external elements Aum(A, m ²)			128.7400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.0707			(33)
Main dwelling								
Party Wall 1			108.2400	0.0000	0.0000	70.0000	7576.8000	(32)
Internal Walls - Timber			105.3000			9.0000	947.7000	(32c)
Internal Floor - 1st Floor			29.5600			18.0000	532.0800	(32d)
Internal Floor - 2nd Floor			17.7600			18.0000	319.6800	(32d)
Internal Ceiling - G Floor			29.5600			9.0000	266.0400	(32e)
Internal Ceiling - 1st Floor			17.7600			9.0000	159.8400	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13726.4900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		175.0828 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	10.4000	0.1440	1.4976	
E3 Sill	5.9000	0.0480	0.2832	
E4 Jamb	37.6000	0.0640	2.4064	
E5 Ground floor (normal)	8.2000	0.0210	0.1722	
E6 Intermediate floor within a dwelling	14.8000	0.0800	1.1840	
E13 Gable (insulation at rafter level)	9.6000	0.0240	0.2304	
E15 Flat roof with parapet	3.7000	0.0460	0.1702	
E16 Corner (normal)	2.5000	0.0300	0.0750	
E18 Party wall between dwellings	2.5000	0.0370	0.0925	
E25 Staggered party wall between dwellings	29.2000	0.0370	1.0804	
P1 Party wall - Ground floor	15.2000	0.0490	0.7448	
P2 Party wall - Intermediate floor within a dwelling	26.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	6.6000	0.0770	0.5082	
P5 Party wall - Roof (insulation at rafter level)	9.6000	0.0710	0.6816	
R1 Head of roof window	3.1000	0.0240	0.0744	
R2 Sill of roof window	3.1000	0.0240	0.0744	
R3 Jamb of roof window	4.8000	0.0240	0.1152	
R4 Ridge (vaulted ceiling)	4.8000	0.0120	0.0576	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0150	-0.0375	
E11 Eaves (insulation at rafter level)	4.8000	0.0540	0.2592	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.6698 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	59.7405 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.0638	38.9080	38.7552	38.0377	37.9035	37.2786	37.2786	37.1629	37.5193	37.9035	38.1751	38.4590	(38)
Heat transfer coeff	98.8043	98.6485	98.4957	97.7783	97.6440	97.0191	97.0191	96.9034	97.2598	97.6440	97.9156	98.1995	(39)
Average = Sum(39)m / 12 =												97.7776	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2603	1.2583	1.2563	1.2472	1.2455	1.2375	1.2375	1.2360	1.2406	1.2455	1.2489	1.2525	(40)
HLP (average)												1.2472	

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9184	0.8499	0.7533	0.6159	0.4630	0.3201	0.2179	0.2469	0.4185	0.6818	0.8671	0.9326	(94)
Useful gains	830.3799	991.8734	1050.6619	984.1333	798.7104	543.4925	355.6752	373.8849	581.0196	793.8393	812.0042	779.7091	(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	1429.5981	1415.0716	1299.5907	1089.5966	830.7812	549.8016	356.8113	375.6981	597.5335	917.6669	1197.7912	1419.8732	(97)
Space heating kWh	445.8184	284.3892	185.2031	75.9336	23.8607	0.0000	0.0000	0.0000	0.0000	92.1278	277.7667	476.2821	(98a)
Space heating requirement - total per year (kWh/year)												1861.3814	
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	445.8184	284.3892	185.2031	75.9336	23.8607	0.0000	0.0000	0.0000	0.0000	92.1278	277.7667	476.2821	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1861.3814	
Space heating per m2										(98c) / (4) =		23.7421	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													89.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	445.8184	284.3892	185.2031	75.9336	23.8607	0.0000	0.0000	0.0000	0.0000	92.1278	277.7667	476.2821	(98)	
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)	
Space heating fuel (main heating system)	500.9195	319.5384	208.0933	85.3186	26.8097	0.0000	0.0000	0.0000	0.0000	103.5143	312.0974	535.1484	(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	150.8211	133.1352	141.6695	126.0785	123.0526	111.8822	111.5529	115.6811	116.5416	128.6867	135.1621	149.4532	(64)	
Efficiency of water heater (217)m	88.5640	88.4508	88.2551	87.9313	87.5717	87.3000	87.3000	87.3000	87.3000	88.0013	88.4363	88.5880	(216)	
Fuel for water heating, kWh/month	170.2961	150.5190	160.5227	143.3829	140.5164	128.1583	127.7811	132.5098	133.4956	146.2327	152.8356	168.7059	(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	21.6424	17.3623	15.6329	11.4533	8.8469	7.2280	8.0704	10.4902	13.6258	17.8777	20.1928	22.2439	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-23.3201	-37.2820	-61.3196	-77.0905	-88.9048	-85.2412	-84.0406	-76.2299	-62.6192	-45.8512	-26.9199	-19.5064	(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	-8.3532	-20.5552	-49.3236	-87.0012	-126.2170	-131.0156	-127.3716	-100.4626	-64.4880	-31.4918	-11.6585	-6.3031	(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													2091.4397	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													87.3000	
Water heating fuel used													1754.9561	(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)													174.6666	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-1452.5668	(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													3246.5450	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2091.4397	3.6400	76.1284	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1754.9561	3.6400	63.8804	(247)
Energy for instantaneous electric shower(s)	592.0494	16.4900	97.6290	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	174.6666	16.4900	28.8025	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				

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PV Unit electricity used in dwelling	-688.3254	16.4900	-113.5049
PV Unit electricity exported	-764.2414	5.5900	-42.7211
Total			-156.2259 (252)
Total energy cost			216.3957 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.6313 (257)
SAP value		89.7666
SAP rating (Section 12)		90 (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	2091.4397	0.2100	439.2023 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1754.9561	0.2100	368.5408 (264)
Energy for instantaneous electric shower(s)	592.0494	0.1391	82.3672 (264a)
Space and water heating			807.7431 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	174.6666	0.1443	25.2098 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-688.3254	0.1324	-91.1225
PV Unit electricity exported	-764.2414	0.1222	-93.3679
Total			-184.4905 (269)
Total CO2, kg/year			742.7589 (272)
CO2 emissions per m2			9.4700 (273)
EI value			91.9344
EI rating			92 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Built) (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	29.5600 (1b)	x 2.5000 (2b)	= 73.9000 (1b) - (3b)
First floor	31.0800 (1c)	x 2.8000 (2c)	= 87.0240 (1c) - (3c)
Second floor	17.7600 (1d)	x 2.9000 (2d)	= 51.5040 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	212.4280 (5)

2. Ventilation rate

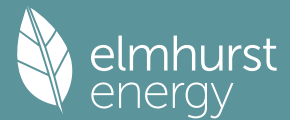
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1412 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.4200 (17)
Infiltration rate	0.3122 (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) = 0.2654 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate	0.2853	0.2720	0.2720	0.2521	0.2588	0.2256	0.2256	0.2189	0.2256	0.2521	0.2455	0.2654 (22b)
Effective ac	0.5407	0.5370	0.5370	0.5318	0.5335	0.5254	0.5254	0.5240	0.5254	0.5318	0.5301	0.5352 (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							

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Windows/Doors			20.3700	1.4151	28.8255			(27)
Rooflights			4.0600	1.5918	6.4625			(27a)
Ground Floor			29.5600	0.1300	3.8428	110.0000	3251.6000	(28a)
External Wall	62.6800	20.3700	42.3100	0.1300	5.5003	9.0000	380.7900	(29a)
External Roof - Sloping	23.1800	4.0600	19.1200	0.1800	3.4416	9.0000	172.0800	(30)
External Roof - Flat Roof	13.3200		13.3200	0.1500	1.9980	9.0000	119.8800	(30)
Total net area of external elements Aum(A, m2)			128.7400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.0707			(33)
Main dwelling								
Party Wall 1			108.2400	0.0000	0.0000	70.0000	7576.8000	(32)
Internal Walls - Timber			105.3000			9.0000	947.7000	(32c)
Internal Floor - 1st Floor			29.5600			18.0000	532.0800	(32d)
Internal Floor - 2nd Floor			17.7600			18.0000	319.6800	(32d)
Internal Ceiling - G Floor			29.5600			9.0000	266.0400	(32e)
Internal Ceiling - 1st Floor			17.7600			9.0000	159.8400	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13726.4900 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.0828 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	10.4000	0.1440	1.4976
E3 Sill	5.9000	0.0480	0.2832
E4 Jamb	37.6000	0.0640	2.4064
E5 Ground floor (normal)	8.2000	0.0210	0.1722
E6 Intermediate floor within a dwelling	14.8000	0.0800	1.1840
E13 Gable (insulation at rafter level)	9.6000	0.0240	0.2304
E15 Flat roof with parapet	3.7000	0.0460	0.1702
E16 Corner (normal)	2.5000	0.0300	0.0750
E18 Party wall between dwellings	2.5000	0.0370	0.0925
E25 Staggered party wall between dwellings	29.2000	0.0370	1.0804
P1 Party wall - Ground floor	15.2000	0.0490	0.7448
P2 Party wall - Intermediate floor within a dwelling	26.4000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.6000	0.0770	0.5082
P5 Party wall - Roof (insulation at rafter level)	9.6000	0.0710	0.6816
R1 Head of roof window	3.1000	0.0240	0.0744
R2 Sill of roof window	3.1000	0.0240	0.0744
R3 Jamb of roof window	4.8000	0.0240	0.1152
R4 Ridge (vaulted ceiling)	4.8000	0.0120	0.0576
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0150	-0.0375
E11 Eaves (insulation at rafter level)	4.8000	0.0540	0.2592

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.6698 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 59.7405 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.9035	37.6443	37.6443	37.2786	37.3974	36.8343	36.8343	36.7309	36.8343	37.2786	37.1629	37.5193	(38)
Heat transfer coeff													
Average = Sum(39)m / 12 =	97.6440	97.3848	97.3848	97.0191	97.1379	96.5748	96.5748	96.4714	96.5748	97.0191	96.9034	97.2598	(39)
												96.9957	
HLP	1.2455	1.2422	1.2422	1.2375	1.2390	1.2318	1.2318	1.2305	1.2318	1.2375	1.2360	1.2406	(40)
HLP (average)												1.2372	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

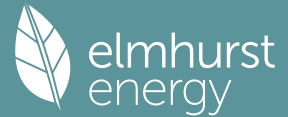
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4318	(42)
Hot water usage for mixer showers														(42a)
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		
Hot water usage for baths	28.0723	27.6554	27.0683	25.9858	25.1752	24.2765	23.7910	24.3740	25.0087	25.9705	27.0753	27.9774	(42b)	
Hot water usage for other uses	39.5341	38.0965	36.6589	35.2213	33.7837	32.3461	32.3461	33.7837	35.2213	36.6589	38.0965	39.5341	(42c)	
Average daily hot water use (litres/day)													61.9676	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	67.6064	65.7519	63.7272	61.2071	58.9589	56.6225	56.1370	58.1576	60.2300	62.6294	65.1718	67.5115	(44)	
Energy conte	107.0720	93.6298	97.9463	83.7894	79.3700	69.6240	67.8929	72.0113	74.2696	84.9874	92.8491	105.7067	(45)	
Energy content (annual)										Total = Sum(45)m =		1029.1487		
Distribution loss (46)m = 0.15 x (45)m	16.0608	14.0445	14.6920	12.5684	11.9055	10.4436	10.1839	10.8017	11.1404	12.7481	13.9274	15.8560	(46)	
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	43.7491	39.5054	43.7232	42.2890	43.6826	42.2582	43.6600	43.6698	42.2720	43.6993	42.3130	43.7464	(61)	
Total heat required for water heating calculated for each month														
150.8211	133.1352	141.6695	126.0785	123.0526	111.8822	111.5529	115.6811	116.5416	128.6867	135.1621	149.4532	(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	150.8211	133.1352	141.6695	126.0785	123.0526	111.8822	111.5529	115.6811	116.5416	128.6867	135.1621	149.4532	(64)	
Electric shower(s)														
52.0486	46.3757	50.6405	48.3256	49.2324	46.9629	48.5284	49.2324	48.3256	50.6405	49.6883	52.0486	(64a)		
Heat gains from water heating, kWh/month	59.5509	52.6022	56.1581	50.5137	49.6193	45.4553	45.6215	47.1693	47.3441	51.8433	53.8727	59.0962	(65)	

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

Metabolic gains (Table 5), Watts														
(66)m	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7259	21.9613	17.8601	13.5213	10.1073	8.5330	9.2202	11.9848	16.0860	20.4248	23.8388	25.4131	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.4837	325.8301	317.3973	299.4450	276.7834	255.4847	241.2559	237.9095	246.3423	264.2946	286.9562	308.2549	(68)	

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	(71)
Water heating gains (Table 5)	80.0415	78.2771	75.4813	70.1578	66.6926	63.1323	61.3192	63.3996	65.7556	69.6818	74.8231	(72)
Total internal gains	530.9097	529.7271	514.3973	486.7827	457.2419	427.8087	412.4539	413.9525	428.8425	458.0598	489.2767	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d			Gains W
North					7.4800	12.7650	0.6300	0.0000				0.7700			46.3186 (74)
South					12.8900	54.2217	0.6300	0.0000				0.7700			339.0450 (78)
East					4.0600	31.9987	0.6300	0.7000				1.0000			51.5631 (82)
Solar gains	436.9267	652.3499	897.4759	1157.9369	1295.2411	1376.2530	1307.0599	1202.8035	1045.2048	776.5181	515.7862			376.0146 (83)	
Total gains	967.8364	1182.0769	1411.8732	1644.7196	1752.4830	1804.0617	1719.5138	1616.7560	1474.0472	1234.5779	1005.0629			892.7716 (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	39.0491	39.1531	39.1531	39.3006	39.2526	39.4815	39.4815	39.5238	39.4815	39.3006	39.3476	39.2034		
alpha	3.6033	3.6102	3.6102	3.6200	3.6168	3.6321	3.6321	3.6349	3.6321	3.6200	3.6232	3.6136		
util living area	0.9226	0.8634	0.7574	0.5979	0.4350	0.2764	0.1850	0.2024	0.3850	0.6579	0.8624	0.9369	(86)	
MIT	19.8445	20.1771	20.5528	20.8359	20.9569	20.9939	20.9990	20.9986	20.9789	20.8079	20.3100	19.7548	(87)	
Th 2	19.8838	19.8864	19.8864	19.8901	19.8889	19.8946	19.8946	19.8957	19.8946	19.8901	19.8913	19.8877	(88)	
util rest of house	0.9072	0.8396	0.7212	0.5502	0.3796	0.2185	0.1232	0.1369	0.3172	0.6011	0.8338	0.9239	(89)	
MIT 2	18.6126	19.0112	19.4417	19.7454	19.8582	19.8918	19.8944	19.8954	19.8829	19.7282	19.1832	18.5071	(90)	
Living area fraction									FLA = Living area / (4) =			0.3515	(91)	
MIT	19.0456	19.4210	19.8323	20.1287	20.2444	20.2792	20.2827	20.2832	20.2682	20.1078	19.5793	18.9457	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.0456	19.4210	19.8323	20.1287	20.2444	20.2792	20.2827	20.2832	20.2682	20.1078	19.5793	18.9457	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.8933	0.8283	0.7194	0.5608	0.3976	0.2388	0.1449	0.1599	0.3404	0.6128	0.8246	0.9102	(94)	
Useful gains	864.5895	979.1478	1015.6389	922.3927	696.7682	430.7387	249.2327	258.5718	501.7310	756.5804	828.8061	812.6027	(95)	
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)	
Heat loss rate W	1361.7079	1336.2207	1210.7141	992.3832	713.4240	432.5795	249.4248	258.8507	508.7754	835.1181	1122.0752	1346.6314	(97)	
Space heating kWh	369.8561	239.9530	145.1360	50.3931	12.3919	0.0000	0.0000	0.0000	0.0000	58.4321	211.1538	397.3173	(98a)	
Space heating requirement - total per year (kWh/year)												1484.6333		
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	369.8561	239.9530	145.1360	50.3931	12.3919	0.0000	0.0000	0.0000	0.0000	58.4321	211.1538	397.3173	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1484.6333		
Space heating per m2										(98c) / (4) =		18.9366	(99)	

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													89.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	369.8561	239.9530	145.1360	50.3931	12.3919	0.0000	0.0000	0.0000	0.0000	58.4321	211.1538	397.3173	(98)	
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)	
Space heating fuel (main heating system)	415.5687	269.6101	163.0741	56.6215	13.9235	0.0000	0.0000	0.0000	0.0000	65.6540	237.2514	446.4239	(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	150.8211	133.1352	141.6695	126.0785	123.0526	111.8822	111.5529	115.6811	116.5416	128.6867	135.1621	149.4532	(64)	
Efficiency of water heater (217)m	88.5008	88.3858	88.1521	87.7788	87.4528	87.3000	87.3000	87.3000	87.3000	87.8238	88.3287	88.5288	(216)	
Fuel for water heating, kWh/month	170.4178	150.6296	160.7104	143.6321	140.7074	128.1583	127.7811	132.5098	133.4956	146.5282	153.0218	168.8187	(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	21.6424	17.3623	15.6329	11.4533	8.8469	7.2280	8.0704	10.4902	13.6258	17.8777	20.1928	22.2439	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-27.5672	-39.2153	-63.7739	-80.3588	-90.8321	-89.4622	-87.8229	-81.1593	-67.4811	-50.5851	-31.2662	-23.2323	(233a)	

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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	-11.1306	-22.5372	-53.3063	-95.3474	-132.9418	-148.1761	-142.3337	-116.5376	-75.7261	-38.0110	-15.1723	-8.4767		(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													1668.1273	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													87.3000	
Water heating fuel used													1756.4107	(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)													174.6666	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-1592.4533	(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													2684.8007	(238)

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1668.1273	5.6000	93.4151	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1756.4107	5.6000	98.3590	(247)
Energy for instantaneous electric shower(s)	592.0494	26.0600	154.2881	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116	(249)
Energy for lighting	174.6666	26.0600	45.5181	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-732.7564	26.0600	-190.9563	
PV Unit electricity exported	-859.6969	5.8100	-49.9484	
Total			-240.9047	(252)
Total energy cost			272.0872	(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	1668.1273	0.2100	350.3067	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1756.4107	0.2100	368.8462	(264)
Energy for instantaneous electric shower(s)	592.0494	0.1391	82.3672	(264a)
Space and water heating			719.1530	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	174.6666	0.1443	25.2098	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-732.7564	0.1327	-97.2004	
PV Unit electricity exported	-859.6969	0.1221	-104.9787	
Total			-202.1791	(269)
Total CO2, kg/year			636.4801	(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	1668.1273	1.1300	1884.9838	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1756.4107	1.1300	1984.7441	(278)
Energy for instantaneous electric shower(s)	592.0494	1.5143	896.5607	(278a)
Space and water heating			3869.7279	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	174.6666	1.5338	267.9094	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-732.7564	1.4901	-1091.9072	
PV Unit electricity exported	-859.6969	0.4480	-385.1322	
Total			-1477.0394	(283)
Total Primary energy kWh/year			3687.2594	(286)

SAP 10 EPC IMPROVEMENTS

As Built

Current energy efficiency rating:

B 90

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Current environmental impact rating:

A 92

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

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

Measures omitted - SAP change or cost saving too small:
 N Solar water heating + 0.5 -£ 19 -133 kg (21.0%)

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

Potential energy efficiency rating: B 90
 Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 572 TEST (30 May 2025)
 Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£222	£222	£0
Mains gas	£291	£291	£0
Space heating	£215	£215	£0
Water heating	£253	£253	£0
Lighting	£46	£46	£0
Generated (PV)	-£241	-£241	£0
Total cost of fuels	£272	£272	£0
Total cost of uses	£273	£273	£0
Delivered energy	34 kWh/m²	34 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	47 kWh/m²	47 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Built) (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	29.5600 (1b)	x 2.5000 (2b)	= 73.9000 (1b) - (3b)
First floor	31.0800 (1c)	x 2.8000 (2c)	= 87.0240 (1c) - (3c)
Second floor	17.7600 (1d)	x 2.9000 (2d)	= 51.5040 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	212.4280 (5)

2. Ventilation rate

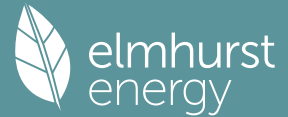
	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) =	0.1412 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		3.4200 (17)
Infiltration rate		0.3122 (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) =	0.2654 (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	0.3384	0.3317	0.3251	0.2919	0.2853	0.2521	0.2521	0.2455	0.2654	0.2853	0.2986	0.3118 (22b)
Effective ac	0.5572	0.5550	0.5528	0.5426	0.5407	0.5318	0.5318	0.5301	0.5352	0.5407	0.5446	0.5486 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Windows/Doors			20.3700	1.4151	28.8255			(27)
Rooflights			4.0600	1.5918	6.4625			(27a)
Ground Floor			29.5600	0.1300	3.8428	110.0000	3251.6000	(28a)
External Wall	62.6800	20.3700	42.3100	0.1300	5.5003	9.0000	380.7900	(29a)
External Roof - Sloping	23.1800	4.0600	19.1200	0.1800	3.4416	9.0000	172.0800	(30)
External Roof - Flat Roof	13.3200		13.3200	0.1500	1.9980	9.0000	119.8800	(30)
Total net area of external elements Aum(A, m2)			128.7400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.0707			(33)
Main dwelling								
Party Wall 1			108.2400	0.0000	0.0000	70.0000	7576.8000	(32)
Internal Walls - Timber			105.3000			9.0000	947.7000	(32c)
Internal Floor - 1st Floor			29.5600			18.0000	532.0800	(32d)
Internal Floor - 2nd Floor			17.7600			18.0000	319.6800	(32d)
Internal Ceiling - G Floor			29.5600			9.0000	266.0400	(32e)
Internal Ceiling - 1st Floor			17.7600			9.0000	159.8400	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13726.4900 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.0828 (35)

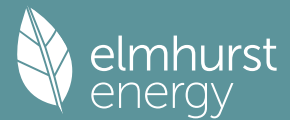
List of Thermal Bridges	Length	Psi-value	Total	
K1 Element				
E1 Steel lintel with perforated steel base plate	10.4000	0.1440	1.4976	
E3 Sill	5.9000	0.0480	0.2832	
E4 Jamb	37.6000	0.0640	2.4064	
E5 Ground floor (normal)	8.2000	0.0210	0.1722	
E6 Intermediate floor within a dwelling	14.8000	0.0800	1.1840	
E13 Gable (insulation at rafter level)	9.6000	0.0240	0.2304	
E15 Flat roof with parapet	3.7000	0.0460	0.1702	
E16 Corner (normal)	2.5000	0.0300	0.0750	
E18 Party wall between dwellings	2.5000	0.0370	0.0925	
E25 Staggered party wall between dwellings	29.2000	0.0370	1.0804	
P1 Party wall - Ground floor	15.2000	0.0490	0.7448	
P2 Party wall - Intermediate floor within a dwelling	26.4000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	6.6000	0.0770	0.5082	
P5 Party wall - Roof (insulation at rafter level)	9.6000	0.0710	0.6816	
R1 Head of roof window	3.1000	0.0240	0.0744	
R2 Sill of roof window	3.1000	0.0240	0.0744	
R3 Jamb of roof window	4.8000	0.0240	0.1152	
R4 Ridge (vaulted ceiling)	4.8000	0.0120	0.0576	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0150	-0.0375	
E11 Eaves (insulation at rafter level)	4.8000	0.0540	0.2592	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.6698 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 59.7405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.0638	38.9080	38.7552	38.0377	37.9035	37.2786	37.2786	37.1629	37.5193	37.9035	38.1751	38.4590	(38)
Heat transfer coeff	98.8043	98.6485	98.4957	97.7783	97.6440	97.0191	97.0191	96.9034	97.2598	97.6440	97.9156	98.1995	(39)
Average = Sum(39)m / 12 =												97.7776	
HLP	1.2603	1.2583	1.2563	1.2472	1.2455	1.2375	1.2375	1.2360	1.2406	1.2455	1.2489	1.2525	(40)
HLP (average)												1.2472	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													
Assumed occupancy													2.4318 (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	28.0723	27.6554	27.0683	25.9858	25.1752	24.2765	23.7910	24.3740	25.0087	25.9705	27.0753	27.9774	(42b)
Hot water usage for other uses	39.5341	38.0965	36.6589	35.2213	33.7837	32.3461	32.3461	33.7837	35.2213	36.6589	38.0965	39.5341	(42c)
Average daily hot water use (litres/day)												61.9676	(43)
Daily hot water use	67.6064	65.7519	63.7272	61.2071	58.9589	56.6225	56.1370	58.1576	60.2300	62.6294	65.1718	67.5115	(44)
Energy conte	107.0720	93.6298	97.9463	83.7894	79.3700	69.6240	67.8929	72.0113	74.2696	84.9874	92.8491	105.7067	(45)
Energy content (annual)										Total = Sum(45)m =		1029.1487	
Distribution loss (46)m = 0.15 x (45)m	16.0608	14.0445	14.6920	12.5684	11.9055	10.4436	10.1839	10.8017	11.1404	12.7481	13.9274	15.8560	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
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	43.7491	39.5054	43.7232	42.2890	43.6826	42.2582	43.6600	43.6698	42.2720	43.6993	42.3130	43.7464	(61)
Total heat required for water heating calculated for each month	150.8211	133.1352	141.6695	126.0785	123.0526	111.8822	111.5529	115.6811	116.5416	128.6867	135.1621	149.4532	(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	150.8211	133.1352	141.6695	126.0785	123.0526	111.8822	111.5529	115.6811	116.5416	128.6867	135.1621	149.4532	(64)
Electric shower(s)	52.0486	46.3757	50.6405	48.3256	49.2324	46.9629	48.5284	49.2324	48.3256	50.6405	49.6883	52.0486	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												592.0494	(64a)
Heat gains from water heating, kWh/month	59.5509	52.6022	56.1581	50.5137	49.6193	45.4553	45.6215	47.1693	47.3441	51.8433	53.8727	59.0962	(65)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	24.7259	21.9613	17.8601	13.5213	10.1073	8.5330	9.2202	11.9848	16.0860	20.4248	23.8388	25.4131 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	322.4837	325.8301	317.3973	299.4450	276.7834	255.4847	241.2559	237.9095	246.3423	264.2946	286.9562	308.2549 (68)
Pumps, fans	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226 (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)	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720 (71)
Total internal gains	80.0415	78.2771	75.4813	70.1578	66.6926	63.1323	61.3192	63.3996	65.7556	69.6818	74.8231	79.4304 (72)
	530.9097	529.7271	514.3973	486.7827	457.2419	427.8087	412.4539	413.9525	428.8425	458.0598	489.2767	516.7570 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
North					7.4800	10.6334		0.6300	0.0000	0.7700		38.5838 (74)
South					12.8900	46.7521		0.6300	0.0000	0.7700		292.3378 (78)
East					4.0600	26.2379		0.6300	0.7000	1.0000		42.2802 (82)
Solar gains	373.2018	637.3781	880.4248	1111.2017	1267.7676	1269.9988	1219.5803	1100.2219	959.5181	706.3114	447.2211	319.2971 (83)
Total gains	904.1115	1167.1051	1394.8222	1597.9844	1725.0095	1697.8075	1632.0342	1514.1744	1388.3605	1164.3712	936.4978	836.0541 (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	38.5906	38.6515	38.7115	38.9955	39.0491	39.3006	39.3006	39.3476	39.2034	39.0491	38.9408	38.8283
alpha	3.5727	3.5768	3.5808	3.5997	3.6033	3.6200	3.6200	3.6232	3.6136	3.6033	3.5961	3.5886
util living area	0.9437	0.8835	0.7908	0.6534	0.5004	0.3596	0.2601	0.2919	0.4647	0.7264	0.9009	0.9550 (86)
MIT	19.6089	20.0269	20.4319	20.7566	20.9213	20.9817	20.9957	20.9934	20.9544	20.7027	20.0944	19.5110 (87)
Th 2	19.8721	19.8737	19.8752	19.8824	19.8838	19.8901	19.8901	19.8913	19.8877	19.8838	19.8811	19.8782 (88)
util rest of house	0.9323	0.8630	0.7589	0.6092	0.4472	0.2995	0.1952	0.2227	0.3961	0.6763	0.8795	0.9456 (89)
MIT 2	18.3137	18.8205	19.2946	19.6570	19.8218	19.8795	19.8886	19.8887	19.8584	19.6161	18.9201	18.1972 (90)
Living area fraction	18.7690	19.2446	19.6944	20.0435	20.2083	20.2669	20.2777	20.2770	fLA = Living area / (4) =	18.6591 (92)	18.6591 (92)	0.3515 (91)
MIT	18.7690	19.2446	19.6944	20.0435	20.2083	20.2669	20.2777	20.2770	20.2437	19.9981	19.3329	18.6591 (93)
Temperature adjustment												0.0000
adjusted MIT	18.7690	19.2446	19.6944	20.0435	20.2083	20.2669	20.2777	20.2770	20.2437	19.9981	19.3329	18.6591 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9184	0.8499	0.7533	0.6159	0.4630	0.3201	0.2179	0.2469	0.4185	0.6818	0.8671	0.9326 (94)
Ext temp.	830.3799	991.8734	1050.6619	984.1333	798.7104	543.4925	355.6752	373.8849	581.0196	793.8393	812.0042	779.7091 (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	1429.5981	1415.0716	1299.5907	1089.5966	830.7812	549.8016	356.8113	375.6981	597.5335	917.6669	1197.7912	1419.8732 (97)
Space heating requirement - total per year (kWh/year)	445.8184	284.3892	185.2031	75.9336	23.8607	0.0000	0.0000	0.0000	0.0000	92.1278	277.7667	476.2821 (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)	445.8184	284.3892	185.2031	75.9336	23.8607	0.0000	0.0000	0.0000	0.0000	92.1278	277.7667	476.2821 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1861.3814
Space heating per m2										(98c) / (4) =		23.7421 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	89.0000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
445.8184	284.3892	185.2031	75.9336	23.8607	0.0000	0.0000	0.0000	0.0000	0.0000	92.1278	277.7667	476.2821 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	500.9195	319.5384	208.0933	85.3186	26.8097	0.0000	0.0000	0.0000	0.0000	103.5143	312.0974	535.1484 (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	150.8211	133.1352	141.6695	126.0785	123.0526	111.8822	111.5529	115.6811	116.5416	128.6867	135.1621	149.4532 (64)
Water heating requirement	88.5640	88.4508	88.2551	87.9313	87.5717	87.3000	87.3000	87.3000	87.3000	88.0013	88.4363	87.3000 (216)
Efficiency of water heater (217)m	170.2961	150.5190	160.5227	143.3829	140.5164	128.1583	127.7811	132.5098	133.4956	146.2327	152.8356	168.7059 (219)
Fuel for water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Space cooling fuel requirement (221)m	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)
Pumps and Fa												

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Lighting	21.6424	17.3623	15.6329	11.4533	8.8469	7.2280	8.0704	10.4902	13.6258	17.8777	20.1928	22.2439	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.3201	-37.2820	-61.3196	-77.0905	-88.9048	-85.2412	-84.0406	-76.2299	-62.6192	-45.8512	-26.9199	-19.5064	(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	-8.3532	-20.5552	-49.3236	-87.0012	-126.2170	-131.0156	-127.3716	-100.4626	-64.4880	-31.4918	-11.6585	-6.3031	(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												2091.4397	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												1754.9561	(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)												174.6666	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1452.5668	(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												3246.5450	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2091.4397	3.6400	76.1284	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1754.9561	3.6400	63.8804	(247)
Energy for instantaneous electric shower(s)	592.0494	16.4900	97.6290	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	174.6666	16.4900	28.8025	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-688.3254	16.4900	-113.5049	
PV Unit electricity exported	-764.2414	5.5900	-42.7211	
Total			-156.2259	(252)
Total energy cost			216.3957	(255)

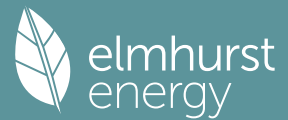
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6313	(257)
SAP value		89.7666	
SAP rating (Section 12)		90	(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	2091.4397	0.2100	439.2023	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1754.9561	0.2100	368.5408	(264)
Energy for instantaneous electric shower(s)	592.0494	0.1391	82.3672	(264a)
Space and water heating			807.7431	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	174.6666	0.1443	25.2098	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-688.3254	0.1324	-91.1225	
PV Unit electricity exported	-764.2414	0.1222	-93.3679	
Total			-184.4905	(269)
Total CO2, kg/year			742.7589	(272)
CO2 emissions per m2			9.4700	(273)
EI value			91.9344	
EI rating			92	(274)
EI band			A	

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	29.5600 (1b)	x 2.5000 (2b)	= 73.9000 (1b) - (3b)
First floor	31.0800 (1c)	x 2.8000 (2c)	= 87.0240 (1c) - (3c)
Second floor	17.7600 (1d)	x 2.9000 (2d)	= 51.5040 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.4280 (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) = 0.1412 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.4200 (17)
Infiltration rate	0.3122 (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) = 0.2654 (21)
Wind speed	Jan 4.3000 Feb 4.1000 Mar 4.1000 Apr 3.8000 May 3.9000 Jun 3.4000 Jul 3.4000 Aug 3.3000 Sep 3.4000 Oct 3.8000 Nov 3.7000 Dec 4.0000 (22)
Wind factor	Jan 1.0750 Feb 1.0250 Mar 1.0250 Apr 0.9500 May 0.9750 Jun 0.8500 Jul 0.8500 Aug 0.8250 Sep 0.8500 Oct 0.9500 Nov 0.9250 Dec 1.0000 (22a)
Adj infilt rate	Jan 0.2853 Feb 0.2720 Mar 0.2720 Apr 0.2521 May 0.2588 Jun 0.2256 Jul 0.2256 Aug 0.2189 Sep 0.2256 Oct 0.2521 Nov 0.2455 Dec 0.2654 (22b)
Effective ac	Jan 0.5407 Feb 0.5370 Mar 0.5370 Apr 0.5318 May 0.5335 Jun 0.5254 Jul 0.5254 Aug 0.5240 Sep 0.5254 Oct 0.5318 Nov 0.5301 Dec 0.5352 (25)

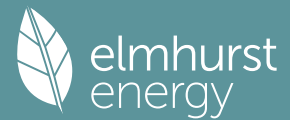
3. Heat losses and heat loss parameter

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							
Windows/Doors			20.3700	1.4151	28.8255		(27)
Rooflights			4.0600	1.5918	6.4625		(27a)
Ground Floor			29.5600	0.1300	3.8428	110.0000	3251.6000 (28a)
External Wall	62.6800	20.3700	42.3100	0.1300	5.5003	9.0000	380.7900 (29a)
External Roof - Sloping	23.1800	4.0600	19.1200	0.1800	3.4416	9.0000	172.0800 (30)
External Roof - Flat Roof	13.3200		13.3200	0.1500	1.9980	9.0000	119.8800 (30)
Total net area of external elements Aum(A, m ²)			128.7400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.0707		(33)
Main dwelling							
Party Wall 1			108.2400	0.0000	0.0000	70.0000	7576.8000 (32)
Internal Walls - Timber			105.3000			9.0000	947.7000 (32c)
Internal Floor - 1st Floor			29.5600			18.0000	532.0800 (32d)
Internal Floor - 2nd Floor			17.7600			18.0000	319.6800 (32d)
Internal Ceiling - G Floor			29.5600			9.0000	266.0400 (32e)
Internal Ceiling - 1st Floor			17.7600			9.0000	159.8400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13726.4900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							175.0828 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	10.4000	0.1440	1.4976
E1 Steel lintel with perforated steel base plate	5.9000	0.0480	0.2832
E3 Sill	37.6000	0.0640	2.4064
E4 Jamb	8.2000	0.0210	0.1722
E5 Ground floor (normal)	14.8000	0.0800	1.1840
E6 Intermediate floor within a dwelling	9.6000	0.0240	0.2304
E13 Gable (insulation at rafter level)	3.7000	0.0460	0.1702
E15 Flat roof with parapet	2.5000	0.0300	0.0750
E16 Corner (normal)	2.5000	0.0370	0.0925
E18 Party wall between dwellings	29.2000	0.0370	1.0804
E25 Staggered party wall between dwellings	15.2000	0.0490	0.7448
P1 Party wall - Ground floor	26.4000	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	6.6000	0.0770	0.5082
P4 Party wall - Roof (insulation at ceiling level)	9.6000	0.0710	0.6816
P5 Party wall - Roof (insulation at rafter level)	3.1000	0.0240	0.0744
R1 Head of roof window	3.1000	0.0240	0.0744
R2 Sill of roof window	4.8000	0.0240	0.1152
R3 Jamb of roof window	4.8000	0.0120	0.0576
R4 Ridge (vaulted ceiling)	2.5000	-0.0150	-0.0375
E17 Corner (inverted - internal area greater than external area)	4.8000	0.0540	0.2592
E11 Eaves (insulation at rafter level)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.6698 (36)
Point Thermal bridges			0.0000
Total fabric heat loss	(33) + (36) + (36a) =		59.7405 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 37.9035	Feb 37.6443	Mar 37.6443	Apr 37.2786	May 37.3974	Jun 36.8343	Jul 36.8343	Aug 36.7309	Sep 36.8343	Oct 37.2786	Nov 37.1629	Dec 37.5193 (38)
Heat transfer coeff	97.6440	97.3848	97.3848	97.0191	97.1379	96.5748	96.5748	96.4714	96.5748	97.0191	96.9034	97.2598 (39)
Average = Sum(39)m / 12 =												96.9957
HLP	Jan 1.2455	Feb 1.2422	Mar 1.2422	Apr 1.2375	May 1.2390	Jun 1.2318	Jul 1.2318	Aug 1.2305	Sep 1.2318	Oct 1.2375	Nov 1.2360	Dec 1.2406 (40)
HLP (average)												1.2372
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4318 (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	28.0723	27.6554	27.0683	25.9858	25.1752	24.2765	23.7910	24.3740	25.0087	25.9705	27.0753	27.9774 (42b)
Hot water usage for other uses	39.5341	38.0965	36.6589	35.2213	33.7837	32.3461	32.3461	33.7837	35.2213	36.6589	38.0965	39.5341 (42c)
Average daily hot water use (litres/day)												61.9676 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	67.6064	65.7519	63.7272	61.2071	58.9589	56.6225	56.1370	58.1576	60.2300	62.6294	65.1718	67.5115 (44)
Energy content (annual)	107.0720	93.6298	97.9463	83.7894	79.3700	69.6240	67.8929	72.0113	74.2696	84.9874	92.8491	105.7067 (45)
Distribution loss (46)m = 0.15 x (45)m	16.0608	14.0445	14.6920	12.5684	11.9055	10.4436	10.1839	10.8017	11.1404	12.7481	13.9274	15.8560 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	43.7491	39.5054	43.7232	42.2890	43.6826	42.2582	43.6600	43.6698	42.2720	43.6993	42.3130	43.7464 (61)
Total heat required for water heating calculated for each month	150.8211	133.1352	141.6695	126.0785	123.0526	111.8822	111.5529	115.6811	116.5416	128.6867	135.1621	149.4532 (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	150.8211	133.1352	141.6695	126.0785	123.0526	111.8822	111.5529	115.6811	116.5416	128.6867	135.1621	149.4532 (64)
	Total per year (kWh/year) = Sum(64a)m =											1543.7167 (64)
Electric shower(s)	52.0486	46.3757	50.6405	48.3256	49.2324	46.9629	48.5284	49.2324	48.3256	50.6405	49.6883	52.0486 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											592.0494 (64a)
Heat gains from water heating, kWh/month	59.5509	52.6022	56.1581	50.5137	49.6193	45.4553	45.6215	47.1693	47.3441	51.8433	53.8727	59.0962 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081	145.9081 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.7259	21.9613	17.8601	13.5213	10.1073	8.5330	9.2202	11.9848	16.0860	20.4248	23.8388	25.4131 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.4837	325.8301	317.3973	299.4450	276.7834	255.4847	241.2559	237.9095	246.3423	264.2946	286.9562	308.2549 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226	52.0226 (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)	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720	-97.2720 (71)
Water heating gains (Table 5)	80.0415	78.2771	75.4813	70.1578	66.6926	63.1323	61.3192	63.3996	65.7556	69.6818	74.8231	79.4304 (72)
Total internal gains	530.9097	529.7271	514.3973	486.7827	457.2419	427.8087	412.4539	413.9525	428.8425	458.0598	489.2767	516.7570 (73)

6. Solar gains

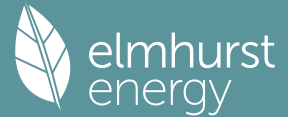
[Jan]												Gains
				Area	Solar flux		g		FF	Access		W
				m2	Table 6a		Specific data		Specific data	factor		
					W/m2		or Table 6b		or Table 6c	Table 6d		
North				7.4800	12.7650		0.6300		0.0000	0.7700		46.3186 (74)
South				12.8900	54.2217		0.6300		0.0000	0.7700		339.0450 (78)
East				4.0600	31.9987		0.6300		0.7000	1.0000		51.5631 (82)
Solar gains	436.9267	652.3499	897.4759	1157.9369	1295.2411	1376.2530	1307.0599	1202.8035	1045.2048	776.5181	515.7862	376.0146 (83)
Total gains	967.8364	1182.0769	1411.8732	1644.7196	1752.4830	1804.0617	1719.5138	1616.7560	1474.0472	1234.5779	1005.0629	892.7716 (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	39.0491	39.1531	39.1531	39.3006	39.2526	39.4815	39.4815	39.5238	39.4815	39.3006	39.3476	39.2034
alpha	3.6033	3.6102	3.6102	3.6200	3.6168	3.6321	3.6321	3.6349	3.6321	3.6200	3.6232	3.6136
util living area	0.9226	0.8634	0.7574	0.5979	0.4350	0.2764	0.1850	0.2024	0.3850	0.6579	0.8624	0.9369 (86)
MIT	19.8445	20.1771	20.5528	20.8359	20.9569	20.9939	20.9990	20.9986	20.9789	20.8079	20.3100	19.7548 (87)
Th 2	19.8838	19.8864	19.8864	19.8901	19.8889	19.8946	19.8946	19.8957	19.8946	19.8901	19.8913	19.8877 (88)
util rest of house	0.9072	0.8396	0.7212	0.5502	0.3796	0.2185	0.1232	0.1369	0.3172	0.6011	0.8338	0.9239 (89)
MIT 2	18.6126	19.0112	19.4417	19.7454	19.8582	19.8918	19.8944	19.8954	19.8829	19.7282	19.1832	18.5071 (90)
Living area fraction	19.0456	19.4210	19.8323	20.1287	20.2444	20.2792	20.2827	20.2832	20.2682	FLA = Living area / (4) =		0.3515 (91)
MIT	19.0456	19.4210	19.8323	20.1287	20.2444	20.2792	20.2827	20.2832	20.2682	20.1078	19.5793	18.9457 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0456	19.4210	19.8323	20.1287	20.2444	20.2792	20.2827	20.2832	20.2682	20.1078	19.5793	18.9457 (93)

8. Space heating requirement

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8933	0.8283	0.7194	0.5608	0.3976	0.2388	0.1449	0.1599	0.3404	0.6128	0.8246	0.9102	(94)
Useful gains	864.5895	979.1478	1015.6389	922.3927	696.7682	430.7387	249.2327	258.5718	501.7310	756.5804	828.8061	812.6027	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	1361.7079	1336.2207	1210.7141	992.3832	713.4240	432.5795	249.4248	258.8507	508.7754	835.1181	1122.0752	1346.6314	(97)
Space heating kWh	369.8561	239.9530	145.1360	50.3931	12.3919	0.0000	0.0000	0.0000	0.0000	58.4321	211.1538	397.3173	(98a)
Space heating requirement - total per year (kWh/year)												1484.6333	
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	369.8561	239.9530	145.1360	50.3931	12.3919	0.0000	0.0000	0.0000	0.0000	58.4321	211.1538	397.3173	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1484.6333	
Space heating per m2										(98c) / (4) =		18.9366	(99)

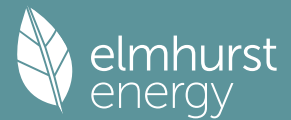
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													89.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	369.8561	239.9530	145.1360	50.3931	12.3919	0.0000	0.0000	0.0000	0.0000	58.4321	211.1538	397.3173	(98)	
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)	
Space heating fuel (main heating system)	415.5687	269.6101	163.0741	56.6215	13.9235	0.0000	0.0000	0.0000	0.0000	65.6540	237.2514	446.4239	(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	150.8211	133.1352	141.6695	126.0785	123.0526	111.8822	111.5529	115.6811	116.5416	128.6867	135.1621	149.4532	(64)	
Efficiency of water heater (217)m	88.5008	88.3858	88.1521	87.7788	87.4528	87.3000	87.3000	87.3000	87.3000	87.8238	88.3287	88.5288	(216)	
Fuel for water heating, kWh/month	170.4178	150.6296	160.7104	143.6321	140.7074	128.1583	127.7811	132.5098	133.4956	146.5282	153.0218	168.8187	(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	21.6424	17.3623	15.6329	11.4533	8.8469	7.2280	8.0704	10.4902	13.6258	17.8777	20.1928	22.2439	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-27.5672	-39.2153	-63.7739	-80.3588	-90.8321	-89.4622	-87.8229	-81.1593	-67.4811	-50.5851	-31.2662	-23.2323	(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	-11.1306	-22.5372	-53.3063	-95.3474	-132.9418	-148.1761	-142.3337	-116.5376	-75.7261	-38.0110	-15.1723	-8.4767	(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												1668.1273	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												87.3000		
Water heating fuel used												1756.4107	(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)												174.6666	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												-1592.4533	(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												2684.8007	(238)	

10a. Fuel costs - using BEDF prices (572)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1668.1273	5.6000	93.4151	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1756.4107	5.6000	98.3590	(247)
Energy for instantaneous electric shower(s)	592.0494	26.0600	154.2881	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116	(249)
Energy for lighting	174.6666	26.0600	45.5181	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-732.7564	26.0600	-190.9563	

Full SAP Calculation Printout



PV Unit electricity exported	-859.6969	5.8100	-49.9484
Total			-240.9047 (252)
Total energy cost			272.0872 (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	1668.1273	0.2100	350.3067 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1756.4107	0.2100	368.8462 (264)
Energy for instantaneous electric shower(s)	592.0494	0.1391	82.3672 (264a)
Space and water heating			719.1530 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	174.6666	0.1443	25.2098 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-732.7564	0.1327	-97.2004
PV Unit electricity exported	-859.6969	0.1221	-104.9787
Total			-202.1791 (269)
Total CO2, kg/year			636.4801 (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	1668.1273	1.1300	1884.9838 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1756.4107	1.1300	1984.7441 (278)
Energy for instantaneous electric shower(s)	592.0494	1.5143	896.5607 (278a)
Space and water heating			3869.7279 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	174.6666	1.5338	267.9094 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-732.7564	1.4901	-1091.9072
PV Unit electricity exported	-859.6969	0.4480	-385.1322
Total			-1477.0394 (283)
Total Primary energy kWh/year			3687.2594 (286)