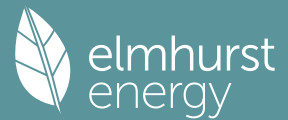


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Property Reference	P22691(1) Mount P				Issued on Date	13/06/2025
Assessment Reference	P22691(1)_As Built		Prop Type Ref			
Property	38, Mount Pleasant, Reading, RG1 2TD					
SAP Rating	88 B	DER	11.98	TER	14.06	
Environmental	90 B	% DER < TER				14.79
CO ₂ Emissions (t/year)	0.79	DFEE	43.97	TFEE	44.15	
Compliance Check	See BREL	% DFEE < TFEE				0.41
% DPER < TPER	7.99	DPER	68.01	TPER	73.92	
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	3.4700 (17)
Infiltration rate	0.3147 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2911 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3712	0.3639	0.3566	0.3202	0.3130	0.2766	0.2766	0.2693	0.2911	0.3130	0.3275	0.3421 (22b)
Effective ac	0.5689	0.5662	0.5636	0.5513	0.5490	0.5382	0.5382	0.5363	0.5424	0.5490	0.5536	0.5585 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows/Doors			24.6900	1.4151	34.9387		(27)
Rooflights			4.0600	1.5918	6.4625		(27a)
Ground Floor			29.5600	0.1300	3.8428	110.0000	3251.6000 (28a)
External Wall	114.8000	24.6900	90.1100	0.1300	11.7143	9.0000	810.9900 (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)			180.8600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.3979		(33)
Main dwelling							
Party Wall 1			54.1200	0.0000	0.0000	70.0000	3788.4000 (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) =	10368.2900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							132.2486 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	13.1000	0.1140	1.4934
E3 Sill	8.6000	0.0480	0.4128
E4 Jamb	47.2000	0.0640	3.0208
E5 Ground floor (normal)	15.8000	0.0210	0.3318
E6 Intermediate floor within a dwelling	28.0000	0.1300	3.6400
E13 Gable (insulation at rafter level)	9.6000	0.0240	0.2304
E15 Flat roof with parapet	7.0000	0.0460	0.3220
E16 Corner (normal)	12.1000	0.0300	0.3630
E18 Party wall between dwellings	2.5000	0.0790	0.1975
E25 Staggered party wall between dwellings	14.6000	0.0100	0.1460
P1 Party wall - Ground floor	7.6000	0.0100	0.0760
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.0100	0.0330
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.4800	2.3040
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)			13.1140 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	75.5119 (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	39.8797	39.6921	39.5083	38.6450	38.4835	37.7316	37.7316	37.5923	38.0212	38.4835	38.8102	39.1519 (38)
Heat transfer coeff	115.3916	115.2041	115.0203	114.1569	113.9954	113.2435	113.2435	113.1042	113.5331	113.9954	114.3222	114.6638 (39)
Average = Sum(39)m / 12 =												114.1562

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.4718	1.4694	1.4671	1.4561	1.4540	1.4444	1.4444	1.4427	1.4481	1.4540	1.4582	1.4625 (40)
HLP (average)												1.4561
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	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)	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)

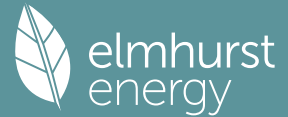
5. Internal gains (see Table 5 and 5a)

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	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		1.0000	0.7700		34.7254 (74)	
East	4.3200				19.6403	0.6300		1.0000	0.7700		37.0429 (76)	
South	12.8900				46.7521	0.6300		1.0000	0.7700		263.1040 (78)	
East	4.0600				26.2379	0.6300		0.7000	1.0000		42.2802 (82)	

Solar gains	377.1525	654.5909	926.2455	1196.1938	1382.1291	1390.2020	1332.8236	1191.6993	1019.5395	731.8782	453.9974	321.2821 (83)
Total gains	844.7146	1134.3070	1385.8395	1642.0690	1805.7231	1796.5983	1724.2407	1582.9548	1422.4337	1150.0939	896.1704	778.6998 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	24.9592	24.9998	25.0398	25.2291	25.2649	25.4326	25.4326	25.4639	25.3678	25.2649	25.1927	25.1176
alpha	2.6639	2.6667	2.6693	2.6819	2.6843	2.6955	2.6955	2.6976	2.6912	2.6843	2.6795	2.6745
util living area	0.9344	0.8747	0.7909	0.6628	0.5196	0.3818	0.2817	0.3175	0.4949	0.7395	0.8930	0.9452 (86)
MIT	18.7332	19.2802	19.8594	20.4140	20.7559	20.9222	20.9747	20.9646	20.8407	20.3294	19.4228	18.6225 (87)
Th 2	19.7087	19.7105	19.7123	19.7206	19.7222	19.7294	19.7294	19.7308	19.7266	19.7222	19.7190	19.7157 (88)
util rest of house	0.9227	0.8546	0.7601	0.6185	0.4626	0.3127	0.2032	0.2342	0.4188	0.6909	0.8720	0.9352 (89)
MIT 2	17.1556	17.8255	18.5186	19.1568	19.5189	19.6804	19.7192	19.7153	19.6158	19.0922	18.0226	17.0225 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	17.7101	18.3369	18.9899	19.5987	19.9537	20.1169	20.1606	20.1545	20.0464	19.5271	18.5148	17.5849 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.7101	18.3369	18.9899	19.5987	19.9537	20.1169	20.1606	20.1545	20.0464	19.5271	18.5148	17.5849 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8984	0.8285	0.7404	0.6140	0.4734	0.3343	0.2303	0.2626	0.4388	0.6826	0.8472	0.9125 (94)
Useful gains	758.8982	939.8199	1026.1010	1008.1948	854.7742	600.6338	397.0320	415.6461	624.1222	785.0944	759.2618	710.5841 (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	1547.4169	1547.9845	1436.5943	1221.3346	940.8889	624.7574	403.2096	424.6457	675.1144	1017.6478	1304.9633	1534.7674 (97)
Space heating kWh	586.6579	408.6866	305.4070	153.4607	64.0694	0.0000	0.0000	0.0000	0.0000	173.0197	392.9050	613.1924 (98a)
Space heating requirement - total per year (kWh/year)												2697.3986
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	586.6579	408.6866	305.4070	153.4607	64.0694	0.0000	0.0000	0.0000	0.0000	173.0197	392.9050	613.1924 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2697.3986
Space heating per m2												(98c) / (4) = 34.4056 (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	586.6579	408.6866	305.4070	153.4607	64.0694	0.0000	0.0000	0.0000	0.0000	173.0197	392.9050	613.1924 (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)	659.1662	459.1985	343.1539	172.4277	71.9880	0.0000	0.0000	0.0000	0.0000	194.4042	441.4663	688.9802 (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	88.6470	88.5762	88.4542	88.2251	87.8747	87.3000	87.3000	87.3000	87.3000	88.2669	88.5586	88.6617 (217)
Fuel for water heating, kWh/month	170.1368	150.3059	160.1615	142.9054	140.0319	128.1583	127.7811	132.5098	133.4956	145.7928	152.6245	168.5657 (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												3030.7850 (211)

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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	1752.4692	(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	4183.4034	(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	3030.7850	0.2100	636.4648 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1752.4692	0.2100	368.0185 (264)
Energy for instantaneous electric shower(s)	592.0494	0.1391	82.3672 (264a)
Space and water heating			1004.4834 (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			939.4991 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.9800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3030.7850	1.1300	3424.7870 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1752.4692	1.1300	1980.2902 (278)
Energy for instantaneous electric shower(s)	592.0494	1.5143	896.5607 (278a)
Space and water heating			5405.0772 (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			5332.0429 (286)
Dwelling Primary energy Rate (DPER)			68.0100 (287)

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

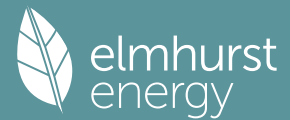
1. Overall dwelling characteristics

	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)
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

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

Blower Door
5.0000 (17)
0.3912 (18)
1 (19)

Shelter factor

Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 0.9250 (20)
(21) = (18) x (20) = 0.3619 (21)

Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4614	0.4524	0.4433	0.3981	0.3890	0.3438	0.3438	0.3347	0.3619	0.3890	0.4071	0.4252 (22b)
Effective ac	0.6064	0.6023	0.5983	0.5792	0.5757	0.5591	0.5591	0.5560	0.5655	0.5757	0.5829	0.5904 (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			16.8400	1.1450	19.2824		(27)
TER Roof Window			2.7700	1.1450	4.1654		(27a)
Ground Floor			29.5600	0.1300	3.8428		(28a)
External Wall	114.8000	16.8400	97.9600	0.1800	17.6328		(29a)
External Roof - Sloping	23.1800	2.7700	20.4100	0.1100	2.2451		(30)
External Roof - Flat Roof	13.3200		13.3200	0.1100	1.4652		(30)
Total net area of external elements Aum(A, m2)			180.8600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 48.6338		(33)
Main dwelling							
Party Wall 1			54.1200	0.0000	0.0000		(32)

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

132.2486 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	13.1000	0.0500	0.6550
E3 Sill	8.6000	0.0500	0.4300
E4 Jamb	47.2000	0.0500	2.3600
E5 Ground floor (normal)	15.8000	0.1600	2.5280
E6 Intermediate floor within a dwelling	28.0000	0.0000	0.0000
E13 Gable (insulation at rafter level)	9.6000	0.0800	0.7680
E15 Flat roof with parapet	7.0000	0.5600	3.9200
E16 Corner (normal)	12.1000	0.0900	1.0890
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	14.6000	0.0600	0.8760
P1 Party wall - Ground floor	7.6000	0.0800	0.6080
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.1200	0.3960
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.0800	0.3840
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)

15.3330 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 63.9668 (37)

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

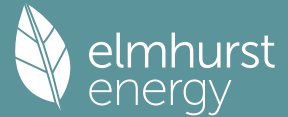
(38)m	Jan 42.5126	Feb 42.2228	Mar 41.9388	Apr 40.6048	May 40.3552	Jun 39.1933	Jul 39.1933	Aug 38.9781	Sep 39.6408	Oct 40.3552	Nov 40.8601	Dec 41.3880 (38)
Heat transfer coeff	106.4793	106.1896	105.9055	104.5715	104.3219	103.1600	103.1600	102.9449	103.6076	104.3219	104.8268	105.3547 (39)
Average = Sum(39)m / 12 =												104.5703

HLP	Jan 1.3582	Feb 1.3545	Mar 1.3508	Apr 1.3338	May 1.3306	Jun 1.3158	Jul 1.3158	Aug 1.3131	Sep 1.3215	Oct 1.3306	Nov 1.3371	Dec 1.3438 (40)
HLP (average)												1.3338
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												Total = Sum(45)m = 2024.5498
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	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
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)
	Total per year (kWh/year) = Sum(64)m =											2348.4775 (64)

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12Total per year (kWh/year)	2348 (64)										
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											
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 W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				5.1000	10.6334		0.6300		0.7000		0.7700		16.5735 (74)
East				2.9500	19.6403		0.6300		0.7000		0.7700		17.7068 (76)
South				8.7900	46.7521		0.6300		0.7000		0.7700		125.5919 (78)
East				2.7700	26.2379		0.6300		0.7000		1.0000		28.8463 (82)
Solar gains	188.7185	329.9011	471.9770	616.3181	716.9228	722.8570	692.3269	615.9549	521.9586	370.3405	227.6235		160.4559 (83)
Total gains	687.2155	839.8951	959.9800	1085.7021	1161.2287	1146.9799	1099.2635	1023.9710	943.1516	810.1919	696.0913		648.1123 (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	27.0483	27.1221	27.1948	27.5417	27.6076	27.9186	27.9186	27.9769	27.7980	27.6076	27.4746	27.3370	
alpha	2.8032	2.8081	2.8130	2.8361	2.8405	2.8612	2.8612	2.8651	2.8532	2.8405	2.8316	2.8225	
util living area	0.9561	0.9259	0.8800	0.7930	0.6700	0.5186	0.3930	0.4337	0.6312	0.8361	0.9315	0.9620 (86)	
MIT	18.6968	19.0835	19.5779	20.1637	20.6023	20.8640	20.9544	20.9388	20.7518	20.1564	19.3290	18.6354 (87)	
Th 2	19.7956	19.7984	19.8012	19.8144	19.8169	19.8285	19.8285	19.8306	19.8240	19.8169	19.8119	19.8067 (88)	
util rest of house	0.9481	0.9129	0.8590	0.7575	0.6146	0.4398	0.2960	0.3340	0.5542	0.7992	0.9172	0.9549 (89)	
MIT 2	17.1635	17.6470	18.2586	18.9681	19.4635	19.7354	19.8079	19.8009	19.6366	18.9829	17.9715	17.0931 (90)	
Living area fraction	17.7025	18.1520	18.7224	19.3884	19.8638	20.1321	20.2110	20.2009	20.0287	fLA = Living area / (4) =			0.3515 (91)
MIT	17.7025	18.1520	18.7224	19.3884	19.8638	20.1321	20.2110	20.2009	20.0287	19.3954	18.4487	17.6353 (92)	
Temperature adjustment												0.0000	
adjusted MIT	17.7025	18.1520	18.7224	19.3884	19.8638	20.1321	20.2110	20.2009	20.0287	19.3954	18.4487	17.6353 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	638.2362	747.4592	802.6626	806.7444	716.4491	528.9643	361.1974	375.5412	536.2998	634.9665	623.4577	607.3063 (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	1427.0913	1407.2223	1294.4165	1096.7855	851.6623	570.6954	372.5068	391.2817	614.2548	917.5557	1189.6500	1415.4724 (97)
Space heating kWh	586.9082	443.3608	365.8649	208.8296	100.5986	0.0000	0.0000	0.0000	0.0000	210.2464	407.6584	601.2756 (98a)
Space heating requirement - total per year (kWh/year)												2924.7425
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	586.9082	443.3608	365.8649	208.8296	100.5986	0.0000	0.0000	0.0000	0.0000	210.2464	407.6584	601.2756 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2924.7425
Space heating per m2										(98c) / (4) =		37.3054 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	586.9082	443.3608	365.8649	208.8296	100.5986	0.0000	0.0000	0.0000	0.0000	210.2464	407.6584	601.2756 (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)	635.1820	479.8277	395.9577	226.0060	108.8730	0.0000	0.0000	0.0000	0.0000	227.5394	441.1888	650.7312 (211)

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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	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	86.2880	85.9926	85.4856	84.5588	83.1125	80.3000	80.3000	80.3000	80.3000	84.5452	85.8139	86.3503	(216)
Fuel for water heating, kWh/month	268.0002	237.8554	254.5363	227.3905	224.9787	210.6584	208.6497	216.5606	218.4918	230.4241	240.1597	265.0567	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	22.6438	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												3165.3058	(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												2802.7621	(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												4775.7392	(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	3165.3058	0.2100	664.7142 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2802.7621	0.2100	588.5800 (264)
Space and water heating			1253.2943 (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			1102.3819 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3165.3058	1.1300	3576.7955 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2802.7621	1.1300	3167.1212 (278)
Space and water heating			6743.9167 (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			5795.6000 (286)
Target Primary Energy Rate (TPER)			73.9200 (287)

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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	3.4700 (17)
Infiltration rate	0.3147 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2911 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3712	0.3639	0.3566	0.3202	0.3130	0.2766	0.2766	0.2693	0.2911	0.3130	0.3275	0.3421 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5689	0.5662	0.5636	0.5513	0.5490	0.5382	0.5382	0.5363	0.5424	0.5490	0.5536	0.5585 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows/Doors			24.6900	1.4151	34.9387		(27)
Rooflights			4.0600	1.5918	6.4625		(27a)
Ground Floor			29.5600	0.1300	3.8428	110.0000	3251.6000 (28a)
External Wall	114.8000	24.6900	90.1100	0.1300	11.7143	9.0000	810.9900 (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)			180.8600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.3979		(33)
Main dwelling							
Party Wall 1			54.1200	0.0000	0.0000	70.0000	3788.4000 (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) =	10368.2900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		132.2486 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	13.1000	0.1140	1.4934
E3 Sill	8.6000	0.0480	0.4128
E4 Jamb	47.2000	0.0640	3.0208
E5 Ground floor (normal)	15.8000	0.0210	0.3318
E6 Intermediate floor within a dwelling	28.0000	0.1300	3.6400
E13 Gable (insulation at rafter level)	9.6000	0.0240	0.2304
E15 Flat roof with parapet	7.0000	0.0460	0.3220
E16 Corner (normal)	12.1000	0.0300	0.3630
E18 Party wall between dwellings	2.5000	0.0790	0.1975
E25 Staggered party wall between dwellings	14.6000	0.0100	0.1460
P1 Party wall - Ground floor	7.6000	0.0100	0.0760
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.0100	0.0330
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.4800	2.3040
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)			13.1140 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	75.5119 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	39.8797	39.6921	39.5083	38.6450	38.4835	37.7316	37.7316	37.5923	38.0212	38.4835	38.8102	39.1519 (38)
Average = Sum(39)m / 12 =	115.3916	115.2041	115.0203	114.1569	113.9954	113.2435	113.2435	113.1042	113.5331	113.9954	114.3222	114.6638 (39)
												114.1562
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.4718	1.4694	1.4671	1.4561	1.4540	1.4444	1.4444	1.4427	1.4481	1.4540	1.4582	1.4625 (40)
												1.4561

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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)		

	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														
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)												875 (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)		
												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														
(66)m	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		Solar flux		g		FF		Access		Gains
				m2		Table 6a		Specific data		Specific data		factor		W
						W/m2		or Table 6b		or Table 6c		Table 6d		
North				7.4800		10.6334		0.6300		1.0000		0.7700		34.7254 (74)
East				4.3200		19.6403		0.6300		1.0000		0.7700		37.0429 (76)
South				12.8900		46.7521		0.6300		1.0000		0.7700		263.1040 (78)
East				4.0600		26.2379		0.6300		0.7000		1.0000		42.2802 (82)

Solar gains	377.1525	654.5909	926.2455	1196.1938	1382.1291	1390.2020	1332.8236	1191.6993	1019.5395	731.8782	453.9974	321.2821	(83)	
Total gains	809.7443	1099.8904	1352.3498	1610.4204	1775.2432	1770.3213	1698.6196	1556.6661	1395.3776	1118.7024	863.0035	743.9506	(84)	

7. Mean internal temperature (heating season)														

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	24.9592	24.9998	25.0398	25.2291	25.2649	25.4326	25.4326	25.4639	25.3678	25.2649	25.1927	25.1176		
alpha	2.6639	2.6667	2.6693	2.6819	2.6843	2.6955	2.6955	2.6976	2.6912	2.6843	2.6795	2.6745		
util living area	0.9399	0.8815	0.7986	0.6704	0.5263	0.3868	0.2857	0.3224	0.5023	0.7494	0.9005	0.9503 (86)		
MIT	18.6770	19.2353	19.8274	20.3965	20.7480	20.9197	20.9738	20.9632	20.8347	20.3049	19.3764	18.5645 (87)		
Th 2	19.7087	19.7105	19.7123	19.7206	19.7222	19.7294	19.7294	19.7308	19.7266	19.7222	19.7190	19.7157 (88)		
util rest of house														
0.9290	0.8623	0.7684	0.6263	0.4690	0.3170	0.2062	0.2380	0.4257	0.7015	0.8806	0.9411 (89)			
MIT 2	17.6650	18.1997	18.7537	19.2671	19.5583	19.6899	19.7212	19.7182	19.6368	19.2114	18.3538	17.5607 (90)		
Living area fraction														
MIT	18.0207	18.5637	19.1311	19.6641	19.9766	20.1222	20.1615	20.1559	20.0579	19.5958	18.7133	17.9136 (92)		
Temperature adjustment												0.0000		
adjusted MIT	18.0207	18.5637	19.1311	19.6641	19.9766	20.1222	20.1615	20.1559	20.0579	19.5958	18.7133	17.9136 (93)		

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9104	0.8416	0.7530	0.6242	0.4809	0.3391	0.2337	0.2669	0.4465	0.6962	0.8612	0.9239	(94)
Useful gains	737.2289	925.7118	1018.3077	1005.2260	853.7305	600.3482	396.9078	415.4316	623.0856	778.7996	743.2192	687.3730	(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	1583.2580	1574.1141	1452.8357	1228.7997	943.4893	625.3565	403.3178	424.8053	676.4179	1025.4757	1327.6568	1572.4522	(97)
Space heating kWh	629.4456	435.7263	323.2889	160.9731	66.7805	0.0000	0.0000	0.0000	0.0000	183.5270	420.7951	658.4989	(98a)
Space heating requirement - total per year (kWh/year)												2879.0355	
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	629.4456	435.7263	323.2889	160.9731	66.7805	0.0000	0.0000	0.0000	0.0000	183.5270	420.7951	658.4989	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2879.0355	
Space heating per m2										(98c) / (4) =		36.7224	(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	1064.4888	838.0018	859.5922	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9033	0.9353	0.9188	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	961.5979	783.7856	789.7858	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1978.7344	1899.6333	1743.2463	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	732.3382	830.1907	709.3746	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	183.0846	207.5477	177.3437	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												567.9759	(107)
Energy for space heating												36.7224	(99)
Energy for space cooling												7.2446	(108)
Total												43.9670	(109)
Fabric Energy Efficiency (DFEE)												44.0	(109)

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

1. Overall dwelling characteristics

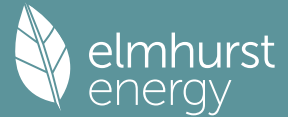
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	29.5600 (1b)	x 2.5000 (2b) =	73.9000 (1b) - (3b)
First floor	31.0800 (1c)	x 2.8000 (2c) =	87.0240 (1c) - (3c)
Second floor	17.7600 (1d)	x 2.9000 (2d) =	51.5040 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4000		(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	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3619 (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	0.4614	0.4524	0.4433	0.3981	0.3890	0.3438	0.3438	0.3347	0.3619	0.3890	0.4071	0.4252	(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	0.6064	0.6023	0.5983	0.5792	0.5757	0.5591	0.5591	0.5560	0.5655	0.5757	0.5829	0.5904	(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			16.8400	1.1450	19.2824			(27)
TER Roof Window			2.7700	1.1450	4.1654			(27a)
Ground Floor			29.5600	0.1300	3.8428			(28a)
External Wall	114.8000	16.8400	97.9600	0.1800	17.6328			(29a)
External Roof - Sloping	23.1800	2.7700	20.4100	0.1100	2.2451			(30)
External Roof - Flat Roof	13.3200		13.3200	0.1100	1.4652			(30)
Total net area of external elements Aum(A, m2)			180.8600					(31)
Fabric heat loss, W/K = Sum (A x U)					48.6338			(33)
Main dwelling								
Party Wall 1			54.1200	0.0000	0.0000			(32)

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

132.2486 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	13.1000	0.0500	0.6550	
E3 Sill	8.6000	0.0500	0.4300	
E4 Jamb	47.2000	0.0500	2.3600	
E5 Ground floor (normal)	15.8000	0.1600	2.5280	
E6 Intermediate floor within a dwelling	28.0000	0.0000	0.0000	
E13 Gable (insulation at rafter level)	9.6000	0.0800	0.7680	
E15 Flat roof with parapet	7.0000	0.5600	3.9200	
E16 Corner (normal)	12.1000	0.0900	1.0890	
E18 Party wall between dwellings	2.5000	0.0600	0.1500	
E25 Staggered party wall between dwellings	14.6000	0.0600	0.8760	
P1 Party wall - Ground floor	7.6000	0.0800	0.6080	
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.1200	0.3960	
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.0800	0.3840	
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)

15.3330 (36)

Point Thermal bridges

0.0000

Total fabric heat loss

(33) + (36) + (36a) = 63.9668 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.5126	42.2228	41.9388	40.6048	40.3552	39.1933	39.1933	38.9781	39.6408	40.3552	40.8601	41.3880	(38)
Heat transfer coeff	106.4793	106.1896	105.9055	104.5715	104.3219	103.1600	103.1600	102.9449	103.6076	104.3219	104.8268	105.3547	(39)
Average = Sum(39)m / 12 =												104.5703	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3582	1.3545	1.3508	1.3338	1.3306	1.3158	1.3158	1.3131	1.3215	1.3306	1.3371	1.3438	(40)
HLP (average)												1.3338	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

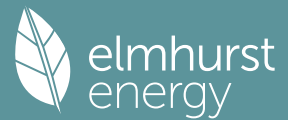
4. Water heating energy requirements (kWh/year)

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	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	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	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)												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	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	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	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	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	89.8507	(64)
Total per year (kWh/year)												874.7764	(64)
Electric shower(s)												875	(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	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	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													

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Appliances gains (calculated in Appendix L, equation L13 or L13a), 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)
Cooking gains (calculated in Appendix L, equation L15 or L15a), 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)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)	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)
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	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)
	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				5.1000	10.6334	0.6300	0.7000	0.7700	16.5735 (74)			
East				2.9500	19.6403	0.6300	0.7000	0.7700	17.7068 (76)			
South				8.7900	46.7521	0.6300	0.7000	0.7700	125.5919 (78)			
East				2.7700	26.2379	0.6300	0.7000	1.0000	28.8463 (82)			
Solar gains	188.7185	329.9011	471.9770	616.3181	716.9228	722.8570	692.3269	615.9549	521.9586	370.3405	227.6235	160.4559 (83)
Total gains	621.3103	775.2007	898.0812	1030.5446	1110.0368	1102.9762	1058.1229	980.9217	897.7967	757.1646	636.6295	583.1244 (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	27.0483	27.1221	27.1948	27.5417	27.6076	27.9186	27.9186	27.9769	27.7980	27.6076	27.4746	27.3370
alpha	2.8032	2.8081	2.8130	2.8361	2.8405	2.8612	2.8612	2.8651	2.8532	2.8405	2.8316	2.8225
util living area	0.9652	0.9376	0.8946	0.8098	0.6880	0.5344	0.4064	0.4498	0.6513	0.8548	0.9436	0.9704 (86)
MIT	18.5789	18.9789	19.4927	20.1090	20.5726	20.8529	20.9503	20.9327	20.7300	20.0939	19.2306	18.5166 (87)
Th 2	19.7956	19.7984	19.8012	19.8144	19.8169	19.8285	19.8285	19.8306	19.8240	19.8169	19.8119	19.8067 (88)
util rest of house	0.9586	0.9263	0.8754	0.7758	0.6331	0.4546	0.3068	0.3474	0.5745	0.8205	0.9315	0.9647 (89)
MIT 2	17.6296	18.0217	18.5199	19.1075	19.5189	19.7495	19.8109	19.8049	19.6636	19.1125	18.2838	17.5758 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.9633	18.3582	18.8619	19.4595	19.8893	20.1374	20.2114	20.2014	20.0385	19.4575	18.6166	17.9065 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.9633	18.3582	18.8619	19.4595	19.8893	20.1374	20.2114	20.2014	20.0385	19.4575	18.6166	17.9065 (93)

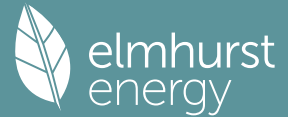
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9451	0.9090	0.8573	0.7643	0.6367	0.4767	0.3404	0.3812	0.5896	0.8082	0.9155	0.9524 (94)
Ext temp.	587.1896	704.6736	769.9538	787.6247	706.8114	525.7355	360.1566	373.9290	529.3690	611.9079	582.8511	555.3666 (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	1454.8594	1429.1218	1309.1905	1104.2259	854.3201	571.2345	372.5548	391.3334	615.2688	924.0313	1207.2499	1444.0425 (97)
Space heating requirement - total per year (kWh/year)	645.5463	486.8292	401.1921	227.9528	109.7465	0.0000	0.0000	0.0000	0.0000	232.2198	449.5672	661.1749 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	645.5463	486.8292	401.1921	227.9528	109.7465	0.0000	0.0000	0.0000	0.0000	232.2198	449.5672	661.1749 (98c)
Space heating per m2	(98c) / (4) =											

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	969.7042	763.3842	782.3809	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8176	0.8723	0.8471	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	792.8677	665.8938	662.7212	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1214.1978	1165.6573	1082.6011	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	303.3577	371.8241	312.3906	0.0000	0.0000	0.0000	0.0000 (104)
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	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	75.8394	92.9560	78.0977	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement	246.8931 (107)											
Energy for space heating	40.9978 (99)											
Energy for space cooling	3.1491 (108)											
Total	44.1470 (109)											
Fabric Energy Efficiency (TFEE)	44.1 (109)											

Full SAP Calculation Printout



CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
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)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1412 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.4700 (17)
Infiltration rate	0.3147 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2911 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3712	0.3639	0.3566	0.3202	0.3130	0.2766	0.2766	0.2693	0.2911	0.3130	0.3275	0.3421 (22b)
Effective ac	0.5689	0.5662	0.5636	0.5513	0.5490	0.5382	0.5382	0.5363	0.5424	0.5490	0.5536	0.5585 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows/Doors			24.6900	1.4151	34.9387		(27)
Rooflights			4.0600	1.5918	6.4625		(27a)
Ground Floor			29.5600	0.1300	3.8428	110.0000	3251.6000 (28a)
External Wall	114.8000	24.6900	90.1100	0.1300	11.7143	9.0000	810.9900 (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)			180.8600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.3979		(33)
Main dwelling							
Party Wall 1			54.1200	0.0000	0.0000	70.0000	3788.4000 (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)

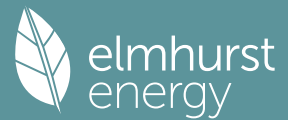
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10368.2900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		132.2486 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	13.1000	0.1140	1.4934
E3 Sill	8.6000	0.0480	0.4128
E4 Jamb	47.2000	0.0640	3.0208
E5 Ground floor (normal)	15.8000	0.0210	0.3318
E6 Intermediate floor within a dwelling	28.0000	0.1300	3.6400
E13 Gable (insulation at rafter level)	9.6000	0.0240	0.2304
E15 Flat roof with parapet	7.0000	0.0460	0.3220
E16 Corner (normal)	12.1000	0.0300	0.3630
E18 Party wall between dwellings	2.5000	0.0790	0.1975
E25 Staggered party wall between dwellings	14.6000	0.0100	0.1460
P1 Party wall - Ground floor	7.6000	0.0100	0.0760
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.0100	0.0330
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.4800	2.3040
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)			13.1140 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 75.5119 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	39.8797	39.6921	39.5083	38.6450	38.4835	37.7316	37.7316	37.5923	38.0212	38.4835	38.8102	39.1519 (38)
Average = Sum(39)m / 12 =	115.3916	115.2041	115.0203	114.1569	113.9954	113.2435	113.2435	113.1042	113.5331	113.9954	114.3222	114.6638 (39)
												114.1562

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.4718	1.4694	1.4671	1.4561	1.4540	1.4444	1.4444	1.4427	1.4481	1.4540	1.4582	1.4625 (40)
HLP (average)												1.4561
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	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)

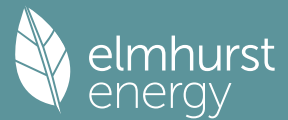
6. Solar gains

[Jan]					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	1.0000			0.7700	34.7254 (74)
East					4.3200	19.6403	0.6300	1.0000			0.7700	37.0429 (76)
South					12.8900	46.7521	0.6300	1.0000			0.7700	263.1040 (78)
East					4.0600	26.2379	0.6300	0.7000			1.0000	42.2802 (82)
Solar gains	377.1525	654.5909	926.2455	1196.1938	1382.1291	1390.2020	1332.8236	1191.6993	1019.5395	731.8782	453.9974	321.2821 (83)
Total gains	908.0622	1184.3179	1440.6429	1682.9766	1839.3710	1818.0107	1745.2775	1605.6518	1448.3820	1189.9380	943.2741	838.0391 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	24.9592	24.9998	25.0398	25.2291	25.2649	25.4326	25.4326	25.4639	25.3678	25.2649	25.1927	25.1176
alpha	2.6639	2.6667	2.6693	2.6819	2.6843	2.6955	2.6955	2.6976	2.6912	2.6843	2.6795	2.6745
util living area	0.9239	0.8646	0.7783	0.6532	0.5123	0.3779	0.2785	0.3134	0.4879	0.7272	0.8823	0.9360 (86)
MIT	18.8322	19.3436	19.9098	20.4357	20.7642	20.9241	20.9754	20.9657	20.8461	20.3590	19.4865	18.7192 (87)
Th 2	19.7087	19.7105	19.7123	19.7206	19.7222	19.7294	19.7294	19.7308	19.7266	19.7222	19.7190	19.7157 (88)
util rest of house												
MIT 2	0.9107	0.8434	0.7466	0.6087	0.4557	0.3093	0.2008	0.2310	0.4124	0.6778	0.8597	0.9246 (89)
Living area fraction	17.2772	17.9009	18.5755	19.1792	19.5262	19.6817	19.7195	19.7158	19.6199	19.1228	18.0983	17.1420 (90)
MIT	17.8238	18.4081	19.0445	19.6209	19.9614	20.1185	20.1610	20.1552	20.0510	19.5574	18.5863	17.6964 (92)
Temperature adjustment												0.0000

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adjusted MIT 17.8238 18.4081 19.0445 19.6209 19.9614 20.1185 20.1610 20.1552 20.0510 19.5574 18.5863 17.6964 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8854	0.8176	0.7280	0.6049	0.4667	0.3308	0.2276	0.2591	0.4325	0.6708	0.8351	0.9007	(94)
Useful gains	804.0195	968.3284	1048.8342	1018.1028	858.4956	601.4188	397.2573	416.0211	626.3783	798.1539	787.7305	754.8018	(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	1560.5359	1556.1831	1442.8726	1223.8613	941.7640	624.9314	403.2597	424.7288	675.6343	1021.1031	1313.1369	1547.5510	(97)
Space heating kWh	562.8482	395.0383	293.1646	148.1461	61.9517	0.0000	0.0000	0.0000	0.0000	165.8742	378.2926	589.8054	(98a)
Space heating requirement - total per year (kWh/year)												2595.1211	
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	562.8482	395.0383	293.1646	148.1461	61.9517	0.0000	0.0000	0.0000	0.0000	165.8742	378.2926	589.8054	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2595.1211	
Space heating per m2										(98c) / (4) =		33.1010	(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	562.8482	395.0383	293.1646	148.1461	61.9517	0.0000	0.0000	0.0000	0.0000	165.8742	378.2926	589.8054	(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)	632.4137	443.8633	329.3984	166.4563	69.6086	0.0000	0.0000	0.0000	0.0000	186.3755	425.0479	662.7027	(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	88.6352	88.5653	88.4389	88.2103	87.8620	87.3000	87.3000	87.3000	87.3000	88.2492	88.5461	88.6510	(216)	
Fuel for water heating, kWh/month	170.1593	150.3244	160.1891	142.9295	140.0521	128.1583	127.7811	132.5098	133.4956	145.8219	152.6461	168.5860	(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												2915.8664	(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												1752.6532	(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)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2915.8664	3.6400	106.1375	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1752.6532	3.6400	63.7966	(247)
Energy for instantaneous electric shower(s)	592.0494	16.4900	97.6290	(247a)

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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			246.3210 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.7186 (257)
SAP value		88.3515
SAP rating (Section 12)		88 (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	2915.8664	0.2100	612.3319 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1752.6532	0.2100	368.0572 (264)
Energy for instantaneous electric shower(s)	592.0494	0.1391	82.3672 (264a)
Space and water heating			980.3891 (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			915.4049 (272)
CO2 emissions per m2			11.6800 (273)
EI value			90.0596
EI rating			90 (274)
EI band			B

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

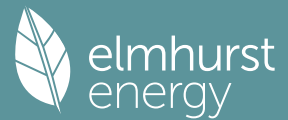
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	29.5600 (1b)	x 2.5000 (2b)	= 73.9000 (1b) - (3b)
First floor	31.0800 (1c)	x 2.8000 (2c)	= 87.0240 (1c) - (3c)
Second floor	17.7600 (1d)	x 2.9000 (2d)	= 51.5040 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4000		(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	3.4700 (17)
Infiltration rate	0.3147 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2911 (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	0.3130	0.2984	0.2984	0.2766	0.2838	0.2475	0.2475	0.2402	0.2475	0.2766	0.2693	0.2911 (22b)
Effective ac	0.5490	0.5445	0.5445	0.5382	0.5403	0.5306	0.5306	0.5288	0.5306	0.5382	0.5363	0.5424 (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								
Windows/Doors			24.6900	1.4151	34.9387			(27)
Rooflights			4.0600	1.5918	6.4625			(27a)
Ground Floor			29.5600	0.1300	3.8428	110.0000	3251.6000	(28a)
External Wall	114.8000	24.6900	90.1100	0.1300	11.7143	9.0000	810.9900	(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)			180.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		62.3979			(33)
Main dwelling								
Party Wall 1			54.1200	0.0000	0.0000	70.0000	3788.4000	(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) = 10368.2900 (34)

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

132.2486 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	13.1000	0.1140	1.4934
E3 Sill	8.6000	0.0480	0.4128
E4 Jamb	47.2000	0.0640	3.0208
E5 Ground floor (normal)	15.8000	0.0210	0.3318
E6 Intermediate floor within a dwelling	28.0000	0.1300	3.6400
E13 Gable (insulation at rafter level)	9.6000	0.0240	0.2304
E15 Flat roof with parapet	7.0000	0.0460	0.3220
E16 Corner (normal)	12.1000	0.0300	0.3630
E18 Party wall between dwellings	2.5000	0.0790	0.1975
E25 Staggered party wall between dwellings	14.6000	0.0100	0.1460
P1 Party wall - Ground floor	7.6000	0.0100	0.0760
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.0100	0.0330
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.4800	2.3040
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)

(36a) = 13.1140 (36)

Point Thermal Bridges

(33) + (36) + (36a) = 75.5119 (37)

Total fabric heat loss

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	38.4835	38.1716	38.1716	37.7316	37.8745	37.1969	37.1969	37.0725	37.1969	37.7316	37.5923	38.0212
Average = Sum(39)m / 12 =	113.9954	113.6835	113.6835	113.2435	113.3864	112.7088	112.7088	112.5844	112.7088	113.2435	113.1042	113.5331

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.4540	1.4500	1.4500	1.4444	1.4463	1.4376	1.4376	1.4360	1.4376	1.4444	1.4427	1.4481
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

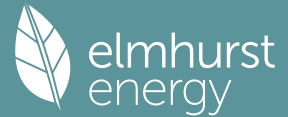
4. Water heating energy requirements (kWh/year)

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	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	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	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	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	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													
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	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	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	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	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	-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	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	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	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	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	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
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(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]					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	1.0000			0.7700	41.6867 (74)	
East					4.3200	23.8018	0.6300	1.0000			0.7700	44.8918 (76)	
South					12.8900	54.2217	0.6300	1.0000			0.7700	305.1405 (78)	
East					4.0600	31.9987	0.6300	0.7000			1.0000	51.5631 (82)	

Solar gains	443.2821	672.8650	948.2541	1250.6052	1414.9770	1508.7319	1430.8848	1306.4192	1115.0484	808.1821	525.7271	379.7766 (83)	
Total gains	974.1918	1202.5920	1462.6515	1737.3880	1872.2189	1936.5406	1843.3387	1720.3717	1543.8908	1266.2419	1015.0038	896.5335 (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	25.2649	25.3342	25.3342	25.4326	25.4006	25.5533	25.5533	25.5815	25.5533	25.4326	25.4639	25.3678	
alpha	2.6843	2.6889	2.6889	2.6955	2.6934	2.7036	2.7036	2.7054	2.7036	2.6955	2.6976	2.6912	
util living area	0.9028	0.8462	0.7488	0.6037	0.4510	0.2942	0.1996	0.2195	0.4103	0.6676	0.8472	0.9172	(86)
MIT	19.1322	19.5536	20.0965	20.5821	20.8515	20.9671	20.9921	20.9897	20.9139	20.5375	19.7744	19.0294	(87)
Th 2	19.7222	19.7252	19.7252	19.7294	19.7280	19.7346	19.7346	19.7358	19.7346	19.7294	19.7308	19.7266	(88)
util rest of house	0.8859	0.8220	0.7131	0.5548	0.3901	0.2257	0.1240	0.1392	0.3326	0.6105	0.8185	0.9024	(89)
MIT 2	17.6575	18.1671	18.8041	19.3451	19.6154	19.7181	19.7328	19.7332	19.6826	19.3203	18.4528	17.5357	(90)
Living area fraction									fLA = Living area /	(4) =		0.3515	(91)
MIT	18.1759	18.6545	19.2585	19.7799	20.0499	20.1572	20.1755	20.1749	20.1155	19.7482	18.9174	18.0607	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1759	18.6545	19.2585	19.7799	20.0499	20.1572	20.1755	20.1749	20.1155	19.7482	18.9174	18.0607	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8602	0.7979	0.6986	0.5568	0.4060	0.2489	0.1506	0.1674	0.3567	0.6114	0.7965	0.8773	(94)
Useful gains	838.0221	959.6060	1021.7542	967.4300	760.1656	482.0609	277.5676	287.9429	550.6907	774.2346	808.4864	786.5430	(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	1490.5893	1472.7131	1348.1108	1118.8360	810.7017	491.0954	279.0059	289.8944	576.5582	934.0541	1234.8002	1471.4742	(97)
Space heating kWh	485.5100	344.8080	242.8093	109.0123	37.5988	0.0000	0.0000	0.0000	0.0000	118.9057	306.9459	509.5889	(98a)
Space heating requirement - total per year (kWh/year)												2155.1789	
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	485.5100	344.8080	242.8093	109.0123	37.5988	0.0000	0.0000	0.0000	0.0000	118.9057	306.9459	509.5889	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2155.1789	
Space heating per m2										(98c) / (4) =		27.4895	(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	485.5100	344.8080	242.8093	109.0123	37.5988	0.0000	0.0000	0.0000	0.0000	118.9057	306.9459	509.5889	(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)	545.5169	387.4247	272.8194	122.4857	42.2459	0.0000	0.0000	0.0000	0.0000	133.6019	344.8830	572.5717	(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	88.5911	88.5198	88.3659	88.0801	87.6920	87.3000	87.3000	87.3000	87.3000	88.1082	88.4733	88.6087	(216)	
Fuel for water heating, kWh/month	170.2441	150.4016	160.3214	143.1406	140.3236	128.1583	127.7811	132.5098	133.4956	146.0553	152.7717	168.6665	(219)	

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Space cooling fuel requirement														
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	21.6424	17.3623	15.6329	11.4533	8.8469	7.2280	8.0704	10.4902	13.6258	17.8777	20.1928	22.2439	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	-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	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	-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													2421.5493	(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													1753.8694	(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													3435.6814	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2421.5493	5.6000	135.6068	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1753.8694	5.6000	98.2167	(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			314.1365	(255)

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

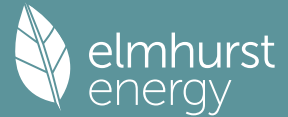
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2421.5493	0.2100	508.5254	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1753.8694	0.2100	368.3126	(264)
Energy for instantaneous electric shower(s)	592.0494	0.1391	82.3672	(264a)
Space and water heating			876.8379	(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			794.1650	(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	2421.5493	1.1300	2736.3507	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1753.8694	1.1300	1981.8724	(278)
Energy for instantaneous electric shower(s)	592.0494	1.5143	896.5607	(278a)
Space and water heating			4718.2231	(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			4535.7547	(286)

SAP 10 EPC IMPROVEMENTS

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P22691(1)_As Built

Current energy efficiency rating: B 88
Current environmental impact rating: B 90

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 (16.8%)

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

Potential energy efficiency rating: B 88
Potential environmental impact rating: B 90

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	£333	£333	£0
Space heating	£257	£257	£0
Water heating	£253	£253	£0
Lighting	£46	£46	£0
Generated (PV)	-£241	-£241	£0
Total cost of fuels	£314	£314	£0
Total cost of uses	£315	£315	£0
Delivered energy	44 kWh/m²	44 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	10 kg/m²	10 kg/m²	0 kg/m²
Primary energy	58 kWh/m²	58 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

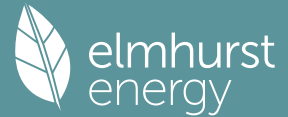
	Area (m²)	Storey height (m)	Volume (m³)
Main dwelling			
Ground floor	29.5600 (1b)	x 2.5000 (2b)	= 73.9000 (1b) - (3b)
First floor	31.0800 (1c)	x 2.8000 (2c)	= 87.0240 (1c) - (3c)
Second floor	17.7600 (1d)	x 2.9000 (2d)	= 51.5040 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.4000		(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)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1412 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.4700 (17)
Infiltration rate	0.3147 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2911 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3712	0.3639	0.3566	0.3202	0.3130	0.2766	0.2766	0.2693	0.2911	0.3130	0.3275	0.3421 (22b)
Effective ac	0.5689	0.5662	0.5636	0.5513	0.5490	0.5382	0.5382	0.5363	0.5424	0.5490	0.5536	0.5585 (25)

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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								
Windows/Doors			24.6900	1.4151	34.9387			(27)
Rooflights			4.0600	1.5918	6.4625			(27a)
Ground Floor			29.5600	0.1300	3.8428	110.0000	3251.6000	(28a)
External Wall	114.8000	24.6900	90.1100	0.1300	11.7143	9.0000	810.9900	(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)			180.8600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	62.3979			(33)
Main dwelling								
Party Wall 1			54.1200	0.0000	0.0000	70.0000	3788.4000	(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) = 10368.2900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								132.2486 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	13.1000	0.1140	1.4934
E3 Sill	8.6000	0.0480	0.4128
E4 Jamb	47.2000	0.0640	3.0208
E5 Ground floor (normal)	15.8000	0.0210	0.3318
E6 Intermediate floor within a dwelling	28.0000	0.1300	3.6400
E13 Gable (insulation at rafter level)	9.6000	0.0240	0.2304
E15 Flat roof with parapet	7.0000	0.0460	0.3220
E16 Corner (normal)	12.1000	0.0300	0.3630
E18 Party wall between dwellings	2.5000	0.0790	0.1975
E25 Staggered party wall between dwellings	14.6000	0.0100	0.1460
P1 Party wall - Ground floor	7.6000	0.0100	0.0760
P2 Party wall - Intermediate floor within a dwelling	13.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	3.3000	0.0100	0.0330
P5 Party wall - Roof (insulation at rafter level)	4.8000	0.4800	2.3040
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)			13.1140 (36)
Point Thermal Bridges			0.0000 (36a) =
Total fabric heat loss			(33) + (36) + (36a) = 75.5119 (37)

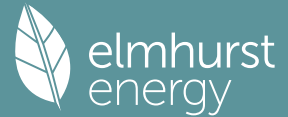
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.8797	39.6921	39.5083	38.6450	38.4835	37.7316	37.7316	37.5923	38.0212	38.4835	38.8102	39.1519 (38)
Heat transfer coeff	115.3916	115.2041	115.0203	114.1569	113.9954	113.2435	113.2435	113.1042	113.5331	113.9954	114.3222	114.6638 (39)
Average = Sum(39)m / 12 =												114.1562
HLP	1.4718	1.4694	1.4671	1.4561	1.4540	1.4444	1.4444	1.4427	1.4481	1.4540	1.4582	1.4625 (40)
HLP (average)												1.4561
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 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												
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)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	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]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	7.4800		10.6334		0.6300		1.0000		0.7700		34.7254 (74)	
East	4.3200		19.6403		0.6300		1.0000		0.7700		37.0429 (76)	
South	12.8900		46.7521		0.6300		1.0000		0.7700		263.1040 (78)	
East	4.0600		26.2379		0.6300		0.7000		1.0000		42.2802 (82)	
Solar gains	377.1525	654.5909	926.2455	1196.1938	1382.1291	1390.2020	1332.8236	1191.6993	1019.5395	731.8782	453.9974	321.2821 (83)
Total gains	908.0622	1184.3179	1440.6429	1682.9766	1839.3710	1818.0107	1745.2775	1605.6518	1448.3820	1189.9380	943.2741	838.0391 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	24.9592	24.9998	25.0398	25.2291	25.2649	25.4326	25.4326	25.4639	25.3678	25.2649	25.1927	25.1176
alpha	2.6639	2.6667	2.6693	2.6819	2.6843	2.6955	2.6955	2.6976	2.6912	2.6843	2.6795	2.6745
util living area	0.9239	0.8646	0.7783	0.6532	0.5123	0.3779	0.2785	0.3134	0.4879	0.7272	0.8823	0.9360 (86)
MIT	18.8322	19.3436	19.9098	20.4357	20.7642	20.9241	20.9754	20.9657	20.8461	20.3590	19.4865	18.7192 (87)
Th 2	19.7087	19.7105	19.7123	19.7206	19.7222	19.7294	19.7294	19.7308	19.7266	19.7222	19.7190	19.7157 (88)
util rest of house	0.9107	0.8434	0.7466	0.6087	0.4557	0.3093	0.2008	0.2310	0.4124	0.6778	0.8597	0.9246 (89)
MIT 2	17.2772	17.9009	18.5755	19.1792	19.5262	19.6817	19.7195	19.7158	19.6199	19.1228	18.0983	17.1420 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.8238	18.4081	19.0445	19.6209	19.9614	20.1185	20.1610	20.1552	20.0510	19.5574	18.5863	17.6964 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.8238	18.4081	19.0445	19.6209	19.9614	20.1185	20.1610	20.1552	20.0510	19.5574	18.5863	17.6964 (93)

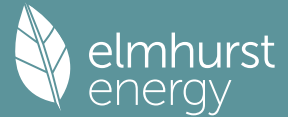
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8854	0.8176	0.7280	0.6049	0.4667	0.3308	0.2276	0.2591	0.4325	0.6708	0.8351	0.9007 (94)
Useful gains	804.0195	968.3284	1048.8342	1018.1028	858.4956	601.4188	397.2573	416.0211	626.3783	798.1539	787.7305	754.8018 (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	1560.5359	1556.1831	1442.8726	1223.8613	941.7640	624.9314	403.2597	424.7288	675.6343	1021.1031	1313.1369	1547.5510 (97)
Space heating kWh	562.8482	395.0383	293.1646	148.1461	61.9517	0.0000	0.0000	0.0000	0.0000	165.8742	378.2926	589.8054 (98a)
Space heating requirement - total per year (kWh/year)												2595.1211
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	562.8482	395.0383	293.1646	148.1461	61.9517	0.0000	0.0000	0.0000	0.0000	165.8742	378.2926	589.8054 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2595.1211
Space heating per m ²												(98c) / (4) = 33.1010 (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	562.8482	395.0383	293.1646	148.1461	61.9517	0.0000	0.0000	0.0000	0.0000	165.8742	378.2926	589.8054 (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)	632.4137	443.8633	329.3984	166.4563	69.6086	0.0000	0.0000	0.0000	0.0000	186.3755	425.0479	662.7027 (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)

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Efficiency of water heater (217)m	88.6352	88.5653	88.4389	88.2103	87.8620	87.3000	87.3000	87.3000	87.3000	88.2492	88.5461	87.3000 (216)
Fuel for water heating, kWh/month	170.1593	150.3244	160.1891	142.9295	140.0521	128.1583	127.7811	132.5098	133.4956	145.8219	152.6461	88.6510 (217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	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												2915.8664 (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												1752.6532 (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												4068.6688 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2915.8664	3.6400	106.1375	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1752.6532	3.6400	63.7966	(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			246.3210	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.7186	(257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	88.3515	
SAP rating (Section 12)		88	(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	2915.8664	0.2100	612.3319	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1752.6532	0.2100	368.0572	(264)
Energy for instantaneous electric shower(s)	592.0494	0.1391	82.3672	(264a)
Space and water heating			980.3891	(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			915.4049	(272)
CO2 emissions per m2			11.6800	(273)
EI value			90.0596	
EI rating			90	(274)
EI band			B	

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

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)

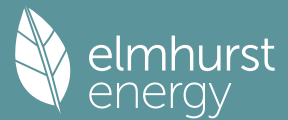
2. Ventilation rate

	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	3.4700 (17)
Infiltration rate	0.3147 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2911 (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	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	0.3130 0.2984 0.2984 0.2766 0.2838 0.2475 0.2475 0.2402 0.2475 0.2766 0.2693 0.2911 (22b)
Effective ac	0.5490 0.5445 0.5445 0.5382 0.5403 0.5306 0.5306 0.5288 0.5306 0.5382 0.5363 0.5424 (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			24.6900	1.4151	34.9387		(27)
Rooflights			4.0600	1.5918	6.4625		(27a)
Ground Floor			29.5600	0.1300	3.8428	110.0000	3251.6000 (28a)
External Wall	114.8000	24.6900	90.1100	0.1300	11.7143	9.0000	810.9900 (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)			180.8600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.3979		(33)
Main dwelling							
Party Wall 1			54.1200	0.0000	0.0000	70.0000	3788.4000 (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) = 10368.2900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							132.2486 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				13.1000	0.1140	1.4934	
E3 Sill				8.6000	0.0480	0.4128	
E4 Jamb				47.2000	0.0640	3.0208	
E5 Ground floor (normal)				15.8000	0.0210	0.3318	
E6 Intermediate floor within a dwelling				28.0000	0.1300	3.6400	
E13 Gable (insulation at rafter level)				9.6000	0.0240	0.2304	
E15 Flat roof with parapet				7.0000	0.0460	0.3220	
E16 Corner (normal)				12.1000	0.0300	0.3630	
E18 Party wall between dwellings				2.5000	0.0790	0.1975	
E25 Staggered party wall between dwellings				14.6000	0.0100	0.1460	
P1 Party wall - Ground floor				7.6000	0.0100	0.0760	
P2 Party wall - Intermediate floor within a dwelling				13.2000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				3.3000	0.0100	0.0330	
P5 Party wall - Roof (insulation at rafter level)				4.8000	0.4800	2.3040	
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)							13.1140 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	75.5119 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 38.4835	Feb 38.1716	Mar 38.1716	Apr 37.7316	May 37.8745	Jun 37.1969	Jul 37.1969
Heat transfer coeff						Aug 37.0725	Sep 37.1969
						Oct 37.7316	Nov 37.5923
							Dec 38.0212 (38)

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Average = Sum(39)m / 12 =	113.9954	113.6835	113.6835	113.2435	113.3864	112.7088	112.7088	112.5844	112.7088	113.2435	113.1042	113.5331 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.4540	1.4500	1.4500	1.4444	1.4463	1.4376	1.4376	1.4360	1.4376	1.4444	1.4427	1.4481 (40)
HLP (average)												1.4441
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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	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												
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	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)

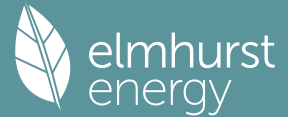
6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			W
North					7.4800	12.7650	0.6300	1.0000	0.7700			41.6867 (74)
East					4.3200	23.8018	0.6300	1.0000	0.7700			44.8918 (76)
South					12.8900	54.2217	0.6300	1.0000	0.7700			305.1405 (78)
East					4.0600	31.9987	0.6300	0.7000	1.0000			51.5631 (82)
Solar gains	443.2821	672.8650	948.2541	1250.6052	1414.9770	1508.7319	1430.8848	1306.4192	1115.0484	808.1821	525.7271	379.7766 (83)
Total gains	974.1918	1202.5920	1462.6515	1737.3880	1872.2189	1936.5406	1843.3387	1720.3717	1543.8908	1266.2419	1015.0038	896.5335 (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	25.2649	25.3342	25.3342	25.4326	25.4006	25.5533	25.5533	25.5815	25.5533	25.4326	25.4639	25.3678
alpha	2.6843	2.6889	2.6889	2.6955	2.6934	2.7036	2.7036	2.7054	2.7036	2.6955	2.6976	2.6912
util living area	0.9028	0.8462	0.7488	0.6037	0.4510	0.2942	0.1996	0.2195	0.4103	0.6676	0.8472	0.9172 (86)
MIT	19.1322	19.5536	20.0965	20.5821	20.8515	20.9671	20.9921	20.9897	20.9139	20.5375	19.7744	19.0294 (87)
Th 2	19.7222	19.7252	19.7252	19.7294	19.7280	19.7346	19.7346	19.7346	19.7346	19.7294	19.7308	19.7266 (88)
util rest of house	0.8859	0.8220	0.7131	0.5548	0.3901	0.2257	0.1240	0.1392	0.3326	0.6105	0.8185	0.9024 (89)
MIT 2	17.6575	18.1671	18.8041	19.3451	19.6154	19.7181	19.7328	19.7332	19.6826	19.3203	18.4528	17.5357 (90)
Living area fraction												0.3515 (91)
fLA = Living area / (4) =												

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MIT	18.1759	18.6545	19.2585	19.7799	20.0499	20.1572	20.1755	20.1749	20.1155	19.7482	18.9174	18.0607 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1759	18.6545	19.2585	19.7799	20.0499	20.1572	20.1755	20.1749	20.1155	19.7482	18.9174	18.0607 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8602	0.7979	0.6986	0.5568	0.4060	0.2489	0.1506	0.1674	0.3567	0.6114	0.7965	0.8773	(94)
Useful gains	838.0221	959.6060	1021.7542	967.4300	760.1656	482.0609	277.5676	287.9429	550.6907	774.2346	808.4864	786.5430	(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	1490.5893	1472.7131	1348.1108	1118.8360	810.7017	491.0954	279.0059	289.8944	576.5582	934.0541	1234.8002	1471.4742	(97)
Space heating kWh	485.5100	344.8080	242.8093	109.0123	37.5988	0.0000	0.0000	0.0000	0.0000	118.9057	306.9459	509.5889	(98a)
Space heating requirement - total per year (kWh/year)												2155.1789	
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	485.5100	344.8080	242.8093	109.0123	37.5988	0.0000	0.0000	0.0000	0.0000	118.9057	306.9459	509.5889	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2155.1789	
Space heating per m2										(98c) / (4) =		27.4895	(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	485.5100	344.8080	242.8093	109.0123	37.5988	0.0000	0.0000	0.0000	0.0000	118.9057	306.9459	509.5889	(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)	545.5169	387.4247	272.8194	122.4857	42.2459	0.0000	0.0000	0.0000	0.0000	133.6019	344.8830	572.5717	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	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	88.5911	88.5198	88.3659	88.0801	87.6920	87.3000	87.3000	87.3000	87.3000	88.1082	88.4733	88.6087	(216)	
Fuel for water heating, kWh/month	170.2441	150.4016	160.3214	143.1406	140.3236	128.1583	127.7811	132.5098	133.4956	146.0553	152.7717	168.6665	(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													2421.5493	(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													1753.8694	(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)

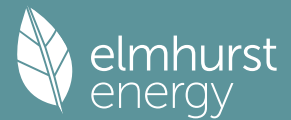
Energy saving/generation technologies (Appendices M ,N and Q)

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													3435.6814	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2421.5493	5.6000	135.6068	(240)
Total CO2 associated with community systems			0.0000	(473)

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Water heating (other fuel)	1753.8694	5.6000	98.2167 (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			314.1365 (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	2421.5493	0.2100	508.5254 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1753.8694	0.2100	368.3126 (264)
Energy for instantaneous electric shower(s)	592.0494	0.1391	82.3672 (264a)
Space and water heating			876.8379 (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			794.1650 (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	2421.5493	1.1300	2736.3507 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1753.8694	1.1300	1981.8724 (278)
Energy for instantaneous electric shower(s)	592.0494	1.5143	896.5607 (278a)
Space and water heating			4718.2231 (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			4535.7547 (286)