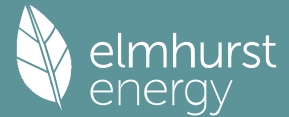


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	36.3862	32.0169	33.6388	28.7179	27.2474	23.9126	23.1511	24.4389	25.1117	28.7646	31.5137	35.8794 (46)
Water storage loss (or HIU loss):												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0208 (55)
Total storage loss												
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (56)
If cylinder contains dedicated solar storage												
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	297.4814	263.0394	279.1655	244.5886	236.5560	212.5530	209.2476	217.8330	220.5471	246.6709	263.2271	294.1030 (62)
VVHRS	-34.3188	-30.3518	-31.7826	-26.3173	-24.5268	-20.9877	-19.6726	-20.9199	-21.7147	-25.5992	-29.0008	-33.6832 (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												
	263.1627	232.6876	247.3828	218.2713	212.0292	191.5653	189.5749	196.9131	198.8324	221.0716	234.2263	260.4198 (64)
12Total per year (kWh/year)												2666.1371 (64)
Electric shower(s)												2666 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	124.5815	110.6454	118.4914	106.1666	104.3238	95.5148	95.2437	98.0984	98.1728	107.6870	112.3639	123.4582 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	151.6394	151.6394	151.6394	151.6394	151.6394	151.6394	151.6394	151.6394	151.6394	151.6394	151.6394	151.6394 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	208.4453	230.7787	208.4453	215.3935	208.4453	215.3935	208.4453	208.4453	215.3935	208.4453	215.3935	208.4453 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	393.0811	397.1601	386.8813	364.9989	337.3762	311.4149	294.0711	289.9922	300.2710	322.1534	349.7760	375.7374 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	38.1639	38.1639	38.1639	38.1639	38.1639	38.1639	38.1639	38.1639	38.1639	38.1639	38.1639	38.1639 (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)												
	-121.3115	-121.3115	-121.3115	-121.3115	-121.3115	-121.3115	-121.3115	-121.3115	-121.3115	-121.3115	-121.3115	-121.3115 (71)
Water heating gains (Table 5)												
	167.4483	164.6509	159.2627	147.4536	140.2202	132.6594	128.0158	131.8527	136.3511	144.7406	156.0610	165.9384 (72)
Total internal gains												
	840.4665	864.0816	826.0811	799.3378	757.5335	727.9596	699.0240	698.7820	720.5074	746.8311	792.7223	821.6129 (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				7.2490	10.6334		0.6300		0.7000		0.7700		23.5571 (74)	
East				0.9690	19.6403		0.6300		0.7000		0.7700		5.8162 (76)	
South				26.2360	46.7521		0.6300		0.7000		0.7700		374.8610 (78)	
Solar gains	404.2343	670.3223	877.2681	1034.0695	1120.0590	1097.8619	1064.1239	1030.3418	930.6932	729.2662	480.6510	348.3358	(83)	
Total gains	1244.7009	1534.4039	1703.3491	1833.4073	1877.5925	1825.8215	1763.1479	1699.1238	1651.2006	1476.0973	1273.3733	1169.9487	(84)	

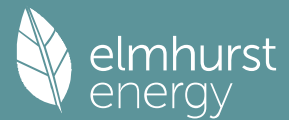
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	42.7009	42.7987	42.8949	43.3529	43.4396	43.8481	43.8481	43.9246	43.6899	43.4396	43.2645	43.0828
alpha	3.8467	3.8532	3.8597	3.8902	3.8960	3.9232	3.9232	3.9283	3.9127	3.8960	3.8843	3.8722
util living area	0.9932	0.9844	0.9695	0.9348	0.8639	0.7267	0.5678	0.6053	0.8023	0.9457	0.9862	0.9946 (86)
MIT	19.1191	19.3973	19.7490	20.1912	20.5786	20.8557	20.9586	20.9462	20.7720	20.2577	19.6050	19.0754 (87)
Th 2	19.9921	19.9942	19.9962	20.0058	20.0076	20.0159	20.0159	20.0174	20.0127	20.0076	20.0039	20.0002 (88)
util rest of house	0.9915	0.9807	0.9621	0.9176	0.8254	0.6492	0.4558	0.4953	0.7375	0.9280	0.9824	0.9933 (89)
MIT 2	17.7843	18.1397	18.5864	19.1442	19.6086	19.9114	19.9967	19.9904	19.8307	19.2351	18.4129	17.7338 (90)
Living area fraction									fLA = Living area / (4) =			0.1023 (91)
MIT	17.9209	18.2683	18.7054	19.2513	19.7078	20.0080	20.0951	20.0882	19.9270	19.3397	18.5349	17.8711 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9209	18.2683	18.7054	19.2513	19.7078	20.0080	20.0951	20.0882	19.9270	19.3397	18.5349	17.8711 (93)

8. Space heating requirement

ULilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9864	0.9717	0.9490	0.9012	0.8117	0.6486	0.4653	0.5038	0.7310	0.9123	0.9740	0.9890 (94)
Useful gains	1227.7910	1490.9869	1616.4729	1652.1787	1524.0586	1184.1600	820.4488	855.9525	1206.9658	1346.6659	1240.3003	1157.1362 (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												
	3384.7097	3314.3580	3019.2444	2533.5634	1956.0549	1308.7061	845.7841	890.9621	1415.2012	2134.8416	2804.4890	3367.0633 (97)
Space heating kWh												
	1604.7475	1225.3053	1043.6620	634.5969	321.4053	0.0000	0.0000	0.0000	0.0000	586.4027	1126.2159	1644.1858 (98a)
Space heating requirement - total per year (kWh/year)												8186.5215
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												
	1604.7475	1225.3053	1043.6620	634.5969	321.4053	0.0000	0.0000	0.0000	0.0000	586.4027	1126.2159	1644.1858 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8186.5215

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Space heating per m2

(98c) / (4) = 36.5899 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1604.7475	1225.3053	1043.6620	634.5969	321.4053	0.0000	0.0000	0.0000	0.0000	586.4027	1126.2159	1644.1858	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1738.6214	1327.5248	1130.7281	687.5373	348.2181	0.0000	0.0000	0.0000	0.0000	635.3226	1220.1689	1781.3497	(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	263.1627	232.6876	247.3828	218.2713	212.0292	191.5653	189.5749	196.9131	198.8324	221.0716	234.2263	260.4198	(64)
Efficiency of water heater (217)m	87.4111	87.2299	86.9216	86.3088	84.9900	79.8000	79.8000	79.8000	79.8000	86.1402	87.1086	79.8000	(216)
Fuel for water heating, kWh/month	301.0633	266.7521	284.6047	252.8958	249.4754	240.0567	237.5626	246.7583	249.1634	256.6417	268.8901	297.7880	(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	43.3108	34.7455	31.2845	22.9204	17.7044	14.4646	16.1505	20.9930	27.2679	35.7769	40.4100	44.5146	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-57.3546	-81.7397	-118.6947	-134.7598	-146.2638	-136.6823	-134.8333	-126.7502	-112.7623	-93.9079	-63.3064	-49.4707	(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	-29.7651	-62.9075	-125.6356	-189.6360	-251.7522	-253.4790	-250.6605	-211.9108	-154.7845	-90.4634	-39.8878	-23.5286	(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													8869.4707 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													79.8000
Water heating fuel used													3151.6519 (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)													349.5431 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation													-2940.9366 (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													9515.7291 (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	8869.4707	0.2100	1862.5888 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3151.6519	0.2100	661.8469 (264)
Space and water heating			2524.4357 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	349.5431	0.1443	50.4499 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1256.5256	0.1344	-168.8808
PV Unit electricity exported	-1684.4110	0.1257	-211.7866
Total			-380.6674 (269)
Total CO2, kg/year			2206.1475 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8600 (273)

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

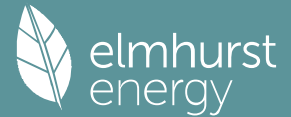
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	8869.4707	1.1300	10022.5019 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3151.6519	1.1300	3561.3666 (278)
Space and water heating			13583.8685 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	349.5431	1.5338	536.1409 (282)
Energy saving/generation technologies			

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PV Unit electricity used in dwelling	-1256.5256	1.4967	-1880.6679
PV Unit electricity exported	-1684.4110	0.4615	-777.3871
Total			-2658.0550 (283)
Total Primary energy kWh/year			11592.0552 (286)
Target Primary Energy Rate (TPER)			51.8100 (287)

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Plot Reference	002 2				Issued on Date	16/07/2026
Assessment Reference	002 2 Be Lean	Plot Type Ref	002 2			
Plot Address	002 2, 002 2, 0				SAP Version	10.2
SAP Rating	89 B	DER	10.04	TER	8.78	
Environmental	89 B	% DER < TER				-14.35
CO ₂ Emissions (t/year)	1.95	DFEE	31.41	TFEE	35.24	
Compliance Check	See BREL	% DFEE < TFEE				10.87
% DPER < TPER	-20.01	DPER	55.25	TPER	46.04	
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Basement floor	58.5560 (1a)	x 2.6250 (2a)	= 153.7095 (1a) - (3a)
Ground floor	58.5560 (1b)	x 3.1330 (2b)	= 183.4559 (1b) - (3b)
First floor	58.5560 (1c)	x 3.0560 (2c)	= 178.9471 (1c) - (3c)
Second floor	48.2610 (1d)	x 3.0000 (2d)	= 144.7830 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	223.9290		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 660.8956 (5)

2. Ventilation rate

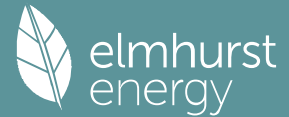
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	5 * 10 =	50.0000 (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) =	
Pressure test	50.0000 / (5) =	
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate	4.0100 (17)	
Number of sides sheltered	0.2762 (18)	
Shelter factor	2 (19)	
Infiltration rate adjusted to include shelter factor	(20) = 1 - [0.075 x (19)] =	
	(21) = (18) x (20) =	
	0.8500 (20)	
	0.2347 (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	0.2993	0.2934	0.2875	0.2582	0.2523	0.2230	0.2230	0.2171	0.2347	0.2523	0.2641	0.2758 (22b)
Effective ac	0.5448	0.5430	0.5413	0.5333	0.5318	0.5249	0.5249	0.5236	0.5275	0.5318	0.5349	0.5380 (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							
Solid Door			1.9890	1.2000	2.3880		(26)
Windows			33.4850	1.1450	38.3473		(27)
Flr - Basement			58.5560	0.1100	6.4412	75.0000	4391.7000 (28a)
Ext Wall	99.1320	30.9590	68.1730	0.1600	10.9077	60.0000	4090.3802 (29a)
Top floor	38.1330	3.3790	34.7540	0.1400	4.8656	9.0000	312.7860 (29a)
Below Ground	15.4070		15.4070	0.1600	2.4651	60.0000	924.4200 (29a)
Wl - Dormer	2.5010	1.1360	1.3650	0.1400	0.1911	9.0000	12.2850 (29a)
Rf - Flat Roof	55.3870		55.3870	0.1100	6.0926	9.0000	498.4830 (30)
Total net area of external elements Aum(A, m ²)			269.1220				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		71.6985		(33)
Main dwelling							
Party Wall			223.1420	0.0000	0.0000	150.0000	33471.2997 (32)
Stud			26.9272			9.0000	242.3452 (32c)
Stud			119.2670			9.0000	1073.4034 (32c)
Stud			204.6909			9.0000	1842.2180 (32c)
Internal Floor 1			106.8170			9.0000	961.3530 (32d)
Internal Ceiling 1			106.8170			9.0000	961.3530 (32e)

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Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	15.4270	0.2680	4.1344
E2 Other lintels (including other steel lintels)	9.9530	0.0220	0.2190
E3 Sill	43.2120	0.0170	0.7346
E4 Jamb	12.9960	0.0760	0.9877
E5 Ground floor (normal)	25.0210	0.0010	0.0250
E6 Intermediate floor within a dwelling	1.4240	0.0370	0.0527
E7 Party floor between dwellings (in blocks of flats)	11.9710	0.1600	1.9154
E14 Flat roof	12.7020	0.0800	1.0162
E15 Flat roof with parapet	20.3590	0.0460	0.9365
E16 Corner (normal)	4.0900	-0.0880	-0.3599
E17 Corner (inverted - internal area greater than external area)	23.7700	0.0400	0.9508
E18 Party wall between dwellings	11.4580	0.0750	0.8593
E24 Eaves (insulation at ceiling level - inverted)	23.6280	0.0290	0.6852
E25 Staggered party wall between dwellings	20.0540	0.1030	2.0656
P1 Party wall - Ground floor	56.2260	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	17.1100	0.0800	1.3688
P4 Party wall - Roof (insulation at ceiling level)	1.0320	0.2400	0.2477
R1 Head of roof window	1.0320	0.2400	0.2477
R2 Sill of roof window	4.4000	0.2400	1.0560
R3 Jamb of roof window	2.3270	0.1600	0.3723
R9 Roof to wall (flat ceiling)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m
Heat transfer coeff
Average = Sum(39)m / 12 =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9290	0.9273	0.9256	0.9178	0.9164	0.9096	0.9096	0.9083	0.9122	0.9164	0.9193	0.9224
HLP (average)												0.9178
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

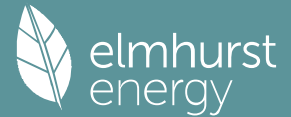
Assumed occupancy													3.0330 (42)
Hot water usage for mixer showers	75.0739	73.9457	72.3017	69.1561	66.8348	64.2461	62.7746	64.4062	66.1947	68.9742	72.1874	74.7863	(42a)
Hot water usage for baths	32.4075	31.9262	31.2484	29.9987	29.0630	28.0254	27.4649	28.1380	28.8708	29.9810	31.2564	32.2979	(42b)
Hot water usage for other uses	45.6913	44.0298	42.3683	40.7068	39.0453	37.3838	37.3838	39.0453	40.7068	42.3683	44.0298	45.6913	(42c)
Average daily hot water use (litres/day)													140.8001 (43)
Daily hot water use	153.1727	149.9017	145.9184	139.8617	134.9431	129.6553	127.6234	131.5895	135.7723	141.3236	147.4736	152.7755	(44)
Energy content (annual)	242.5882	213.4581	224.2712	191.4637	181.6593	159.4263	154.3494	162.9353	167.4208	191.7748	210.1032	239.2096	(45)
Distribution loss (46)m = 0.15 x (45)m	36.3882	32.0187	33.6407	28.7195	27.2489	23.9139	23.1524	24.4403	25.1131	28.7662	31.5155	35.8814	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	293.5471	259.4855	275.2301	240.7787	232.6183	208.7413	205.3083	213.8942	216.7359	242.7337	259.4183	290.1685	(62)
VWHRs	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	293.5471	259.4855	275.2301	240.7787	232.6183	208.7413	205.3083	213.8942	216.7359	242.7337	259.4183	290.1685	(64)
12Total per year (kWh/year)													2939 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	93.4003	82.4817	87.3099	75.9904	73.1415	65.3380	64.0609	66.9157	67.9962	76.5048	82.1881	92.2769	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	208.5897	230.9386	208.5897	215.5427	208.5897	215.5427	208.5897	208.5897	215.5427	208.5897	215.5427	208.5897	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	393.2554	397.3361	387.0527	365.1606	337.5258	311.5529	294.2015	290.1207	300.4041	322.2962	349.9310	375.9039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	(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)	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	(71)
Water heating gains (Table 5)	125.5380	122.7406	117.3520	105.5423	98.3084	90.7472	86.1034	89.9405	94.4392	102.8291	114.1501	124.0281	(72)
Total internal gains	798.8787	822.5109	784.4900	757.7412	715.9195	686.3384	657.3901	657.1464	678.8815	705.2105	751.1194	780.0173	(73)

6. Solar gains

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[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		Specific data or Table 6c	FF	Access factor Table 6d		Gains W
South				26.2360	46.7521	0.6300			0.7200	0.7700		385.5713 (78)
Northwest				7.2490	11.2829	0.6300			0.7200	0.7700		25.7103 (81)

Solar gains	411.2816	683.8004	898.6655	1063.9698	1155.5078	1133.6128	1098.3814	1030.5749	955.1588	745.0521	489.3837	354.1654 (83)
Total gains	1210.1603	1506.3113	1683.1555	1821.7109	1871.4273	1819.9512	1755.7715	1687.7213	1634.0403	1450.2626	1240.5031	1134.1827 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.1380	65.2569	65.3740	65.9294	66.0344	66.5274	66.5274	66.6196	66.3366	66.0344	65.8224	65.6022
alpha	5.3425	5.3505	5.3583	5.3953	5.4023	5.4352	5.4352	5.4413	5.4224	5.4023	5.3882	5.3735
util living area	0.9977	0.9922	0.9798	0.9422	0.8519	0.6788	0.5039	0.5442	0.7758	0.9566	0.9937	0.9983 (86)
MIT	19.7354	19.9683	20.2428	20.5691	20.8243	20.9617	20.9936	20.9904	20.9206	20.5822	20.0894	19.6939 (87)
Th 2	20.1429	20.1444	20.1458	20.1524	20.1536	20.1594	20.1594	20.1604	20.1571	20.1536	20.1511	20.1485 (88)
util rest of house	0.9970	0.9901	0.9740	0.9251	0.8101	0.6035	0.4109	0.4498	0.7083	0.9403	0.9916	0.9979 (89)
MIT 2	18.9773	19.2100	19.4819	19.8015	20.0313	20.1403	20.1574	20.1572	20.1124	19.8197	19.3367	18.9404 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.0609	19.2936	19.5658	19.8862	20.1187	20.2309	20.2496	20.2491	20.2015	19.9038	19.4197	19.0235 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.9109	19.1436	19.4158	19.7362	19.9687	20.0809	20.0996	20.0991	20.0515	19.7538	19.2697	18.8735 (93)

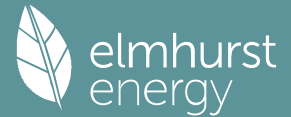
8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9956	0.9865	0.9674	0.9149	0.7997	0.5960	0.4042	0.4427	0.6989	0.9304	0.9884	0.9968 (94)
Useful gains	1204.8293	1486.0400	1628.3008	1666.6774	1496.5923	1084.7006	709.6488	747.2380	1142.0820	1349.2627	1226.1536	1130.5680 (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	3039.4940	2957.6841	2677.1510	2227.1741	1696.7833	1116.3630	712.8130	752.4073	1215.7192	1878.4071	2505.3296	3030.8986 (97)
Space heating kWh	1364.9906	988.9449	780.3445	403.5577	148.9421	0.0000	0.0000	0.0000	0.0000	393.6834	921.0067	1413.8459 (98a)
Space heating requirement - total per year (kWh/year)	6415.3158											
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	1364.9906	988.9449	780.3445	403.5577	148.9421	0.0000	0.0000	0.0000	0.0000	393.6834	921.0067	1413.8459 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	6415.3158											
Space heating per m2	(98c) / (4) = 28.6489 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.5000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1364.9906	988.9449	780.3445	403.5577	148.9421	0.0000	0.0000	0.0000	0.0000	393.6834	921.0067	1413.8459 (98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)
Space heating fuel (main heating system)	1525.1292	1104.9663	871.8933	450.9024	166.4157	0.0000	0.0000	0.0000	0.0000	439.8698	1029.0578	1579.7161 (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	293.5471	259.4855	275.2301	240.7787	232.6183	208.7413	205.3083	213.8942	216.7359	242.7337	259.4183	290.1685 (64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (216)
Fuel for water heating, kWh/month	327.9856	289.9279	307.5197	269.0265	259.9087	233.2305	229.3948	238.9879	242.1630	271.2108	289.8528	324.2106 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	40.4344	32.4380	29.2068	21.3982	16.5286	13.5040	15.0779	19.5988	25.4569	33.4009	37.7262	41.5582 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												

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Space heating fuel - main system 1	7167.9506 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.5000
Water heating fuel used	3283.4188 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
Total electricity for the above, kWh/year	41.0000 (231)
Electricity for lighting (calculated in Appendix L)	326.3289 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generator (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	10818.6982 (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	7167.9506	0.2100	1505.2696 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3283.4188	0.2100	689.5179 (264)
Space and water heating			2194.7876 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	326.3289	0.1443	47.0993 (268)
Total CO2, kg/year			2247.5741 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.0400 (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	7167.9506	1.1300	8099.7842 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3283.4188	1.1300	3710.2632 (278)
Space and water heating			11810.0474 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	326.3289	1.5338	500.5341 (282)
Total Primary energy kWh/year			12372.6063 (286)
Dwelling Primary energy Rate (DPER)			55.2500 (287)

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

1. Overall dwelling characteristics

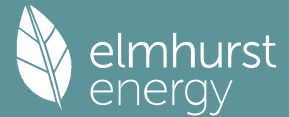
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Basement floor	58.5560 (1a)	x 2.6250 (2a)	= 153.7095 (1a) - (3a)
Ground floor	58.5560 (1b)	x 3.1330 (2b)	= 183.4559 (1b) - (3b)
First floor	58.5560 (1c)	x 3.0560 (2c)	= 178.9471 (1c) - (3c)
Second floor	48.2610 (1d)	x 3.0000 (2d)	= 144.7830 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	223.9290		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 660.8956 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.0605 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3105 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2639 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)

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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	0.3365	0.3299	0.3233	0.2903	0.2837	0.2507	0.2507	0.2441	0.2639	0.2837	0.2969	0.3101 (22b)
Effective ac	0.5566	0.5544	0.5523	0.5421	0.5403	0.5314	0.5314	0.5298	0.5348	0.5403	0.5441	0.5481 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.9890	1.0000	1.9900		(26)
TER Opening Type			33.4850	1.1450	38.3473		(27)
Flr - Basement			58.5560	0.1300	7.6123		(28a)
Ext Wall	99.1320	30.9590	68.1730	0.1800	12.2711		(29a)
Top floor	38.1330	3.3790	34.7540	0.1800	6.2557		(29a)
Below Ground	15.4070		15.4070	0.1800	2.7733		(29a)
Wl - Dormer	2.5010	1.1360	1.3650	0.1800	0.2457		(29a)
Rf - Flat Roof	55.3870		55.3870	0.1100	6.0926		(30)
Total net area of external elements Aum(A, m2)			269.1220				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	75.5880	(33)
Main dwelling							
Party Wall			223.1420	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							217.8460 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	15.4270	0.0500	0.7713
E3 Sill	9.9530	0.0500	0.4976
E4 Jamb	43.2120	0.0500	2.1606
E5 Ground floor (normal)	12.9960	0.1600	2.0794
E6 Intermediate floor within a dwelling	25.0210	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	1.4240	0.0700	0.0997
E14 Flat roof	11.9710	0.0800	0.9577
E15 Flat roof with parapet	12.7020	0.5600	7.1131
E16 Corner (normal)	20.3590	0.0900	1.8323
E17 Corner (inverted - internal area greater than external area)	4.0900	-0.0900	-0.3681
E18 Party wall between dwellings	23.7700	0.0600	1.4262
E24 Eaves (insulation at ceiling level - inverted)	11.4580	0.2400	2.7499
E25 Staggered party wall between dwellings	23.6280	0.0600	1.4177
P1 Party wall - Ground floor	20.0540	0.0800	1.6043
P2 Party wall - Intermediate floor within a dwelling	56.2260	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	17.1100	0.1200	2.0532
R1 Head of roof window	1.0320	0.0800	0.0826
R2 Sill of roof window	1.0320	0.0600	0.0619
R3 Jamb of roof window	4.4000	0.0800	0.3520
R9 Roof to wall (flat ceiling)	2.3270	0.0400	0.0931
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			24.9845 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	100.5725 (37)

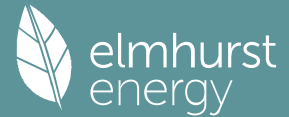
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	121.3977	120.9182	120.4481	118.2402	117.8271	115.9041	115.9041	115.5480	116.6448	117.8271	118.6628	119.5364 (38)
Heat transfer coeff	221.9702	221.4907	221.0206	218.8127	218.3996	216.4766	216.4766	216.1205	217.2173	218.3996	219.2353	220.1090 (39)
Average = Sum(39)m / 12 =												218.8107
HLP	0.9913	0.9891	0.9870	0.9772	0.9753	0.9667	0.9667	0.9651	0.9700	0.9753	0.9790	0.9829 (40)
HLP (average)												0.9771
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0330 (42)
Hot water usage for mixer showers	75.0739	73.9457	72.3017	69.1561	66.8348	64.2461	62.7746	64.4062	66.1947	68.9742	72.1874	74.7863 (42a)
Hot water usage for baths	32.4075	31.9262	31.2484	29.9987	29.0630	28.0254	27.4649	28.1380	28.8708	29.9810	31.2564	32.2979 (42b)
Hot water usage for other uses	45.6913	44.0298	42.3683	40.7068	39.0453	37.3838	37.3838	39.0453	40.7068	42.3683	44.0298	45.6913 (42c)
Average daily hot water use (litres/day)												140.8001 (43)
Daily hot water use	153.1727	149.9017	145.9184	139.8617	134.9431	129.6553	127.6234	131.5895	135.7723	141.3236	147.4736	152.7755 (44)
Energy conte	242.5882	213.4581	224.2712	191.4637	181.6593	159.4263	154.3494	162.9353	167.4208	191.7748	210.1032	239.2096 (45)
Energy content (annual)										Total = Sum(45)m =		2338.6598
Distribution loss (46)m = 0.15 x (45)m	36.3882	32.0187	33.6407	28.7195	27.2489	23.9139	23.1524	24.4403	25.1131	28.7662	31.5155	35.8814 (46)
Water storage loss (or HIU loss):												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	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	293.5471	259.4855	275.2301	240.7787	232.6183	208.7413	205.3083	213.8942	216.7359	242.7337	259.4183	290.1685 (62)
WVHRS	-34.3207	-30.3535	-31.7844	-26.3188	-24.5281	-20.9889	-19.6737	-20.9211	-21.7159	-25.6007	-29.0025	-33.6851 (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	259.2264	229.1320	243.4457	214.4600	208.0901	187.7524	185.6346	192.9731	195.0200	217.1330	230.4158	256.4834 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2619.7665 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	93.4003	82.4817	87.3099	75.9904	73.1415	65.3380	64.0609	66.9157	67.9962	76.5048	82.1881	92.2769 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	151.6519	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	209.8143	232.2944	209.8143	216.8081	209.8143	216.8081	209.8143	209.8143	216.8081	209.8143	216.8081	209.8143	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	393.2554	397.3361	387.0527	365.1606	337.5258	311.5529	294.2015	290.1207	300.4041	322.2962	349.9310	375.9039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	38.1652	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	-121.3215	(71)
Water heating gains (Table 5)	125.5380	122.7406	117.3520	105.5423	98.3084	90.7472	86.1034	89.9405	94.4392	102.8291	114.1501	124.0281	(72)
Total internal gains	800.1032	823.8666	785.7146	759.0066	717.1440	687.6038	658.6147	658.3710	680.1469	706.4351	752.3848	781.2418	(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
South				26.2360	46.7521	0.6300	0.7000	0.7700				374.8610 (78)
Northwest				7.2490	11.2829	0.6300	0.7000	0.7700				24.9961 (81)
Solar gains	399.8571	664.8060	873.7025	1034.4150	1123.4104	1102.1236	1067.8708	1001.9478	928.6267	724.3562	475.7897	344.3275 (83)
Total gains	1199.9603	1488.6726	1659.4171	1793.4216	1840.5544	1789.7274	1726.4855	1660.3188	1608.7735	1430.7913	1228.1745	1125.5693 (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	61.0468	61.1789	61.3090	61.9277	62.0448	62.5960	62.5960	62.6991	62.3825	62.0448	61.8083	61.5630	
alpha	5.0698	5.0786	5.0873	5.1285	5.1363	5.1731	5.1731	5.1799	5.1588	5.1363	5.1206	5.1042	
util living area	0.9978	0.9931	0.9827	0.9518	0.8753	0.7156	0.5400	0.5812	0.8066	0.9634	0.9943	0.9984	(86)
MIT	19.6182	19.8500	20.1325	20.4805	20.7679	20.9420	20.9888	20.9838	20.8887	20.5067	19.9919	19.5802	(87)
Th 2	20.0906	20.0924	20.0942	20.1024	20.1040	20.1112	20.1112	20.1125	20.1084	20.1040	20.1008	20.0976	(88)
util rest of house	0.9971	0.9911	0.9776	0.9366	0.8359	0.6369	0.4367	0.4774	0.7394	0.9488	0.9923	0.9979	(89)
MIT 2	18.4596	18.7567	19.1166	19.5557	19.8934	20.0734	20.1068	20.1056	20.0263	19.5949	18.9452	18.4159	(90)
Living area fraction									fLA = Living area / (4) =			0.1103	(91)
MIT	18.5873	18.8773	19.2286	19.6577	19.9899	20.1692	20.2041	20.2024	20.1214	19.6954	19.0606	18.5443	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5873	18.8773	19.2286	19.6577	19.9899	20.1692	20.2041	20.2024	20.1214	19.6954	19.0606	18.5443	(93)

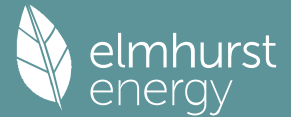
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9955	0.9873	0.9709	0.9272	0.8301	0.6424	0.4478	0.4883	0.7405	0.9402	0.9890	0.9967	(94)
Useful gains	1194.5398	1469.6928	1611.0634	1662.9097	1527.7877	1149.7575	773.1181	810.7810	1191.2907	1345.1613	1214.6119	1121.8168	(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	3171.3586	3095.8410	2813.2817	2353.9206	1810.5049	1205.5996	780.1943	821.7870	1307.9600	1986.4405	2622.1813	3157.3119	(97)
Space heating kWh	1470.7532	1092.7716	894.4505	497.5278	210.3416	0.0000	0.0000	0.0000	0.0000	477.1117	1013.4500	1514.4083	(98a)
Space heating requirement - total per year (kWh/year)												7170.8147	
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	1470.7532	1092.7716	894.4505	497.5278	210.3416	0.0000	0.0000	0.0000	0.0000	477.1117	1013.4500	1514.4083	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7170.8147	
Space heating per m ²										(98c) / (4) =		32.0227	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	1470.7532	1092.7716	894.4505	497.5278	210.3416	0.0000	0.0000	0.0000	0.0000	477.1117	1013.4500	1514.4083	(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)	1591.7242	1182.6532	968.0200	538.4500	227.6425	0.0000	0.0000	0.0000	0.0000	516.3547	1096.8073	1638.9701	(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	259.2264	229.1320	243.4457	214.4600	208.0901	187.7524	185.6346	192.9731	195.0200	217.1330	230.4158	256.4834	(64)
Efficiency of water heater												80.3000	(216)

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(217)m	87.4959	87.2797	86.9087	86.1218	84.4045	80.3000	80.3000	80.3000	80.3000	86.0187	87.1706	87.5421 (217)
Fuel for water heating, kWh/month	296.2728	262.5259	280.1167	249.0195	246.5391	233.8138	231.1763	240.3152	242.8642	252.4254	264.3274	292.9829 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041 (231)
Lighting	43.5953	34.9737	31.4900	23.0709	17.8206	14.5596	16.2566	21.1309	27.4470	36.0119	40.6754	44.8069 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-56.6483	-80.8381	-117.5349	-133.6172	-145.1706	-135.7140	-133.8820	-125.7886	-111.7984	-92.9566	-62.5654	-48.8497 (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	-29.0892	-61.5142	-122.9189	-185.6318	-246.5306	-248.2572	-245.4957	-207.4993	-151.5036	-88.4895	-38.9915	-22.9915 (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												7760.6220 (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												3092.3791 (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)												351.8387 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2894.2770 (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												8396.5629 (238)

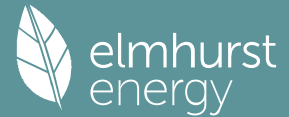
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	7760.6220	0.2100	1629.7306 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3092.3791	0.2100	649.3996 (264)
Space and water heating			2279.1302 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	351.8387	0.1443	50.7812 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1245.3641	0.1344	-167.3467
PV Unit electricity exported	-1648.9129	0.1257	-207.2982
Total			-374.6449 (269)
Total CO2, kg/year			1967.1958 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.7800 (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	7760.6220	1.1300	8769.5028 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3092.3791	1.1300	3494.3884 (278)
Space and water heating			12263.8913 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	351.8387	1.5338	539.6620 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1245.3641	1.4966	-1863.8350
PV Unit electricity exported	-1648.9129	0.4615	-760.9107
Total			-2624.7458 (283)
Total Primary energy kWh/year			10308.9083 (286)
Target Primary Energy Rate (TPER)			46.0400 (287)

Full SAP Calculation Printout



Plot Reference	002 2				Issued on Date	16/07/2026	
Assessment Reference	002 2			Plot Type Ref	002 2		
Plot Address	002 2, 002 2, 0				SAP Version	10.2	
SAP Rating	90 B	DER	1.95	TER	8.69		
Environmental	98 A	% DER < TER				77.56	
CO ₂ Emissions (t/year)	0.36	DFEE	31.41	TFEE	35.24		
Compliance Check	See BREL	% DFEE < TFEE				10.87	
% DPER < TPER	54.43	DPER	20.74	TPER	45.50		
Assessor Details	Mr. Scott Binstead				Assessor ID	U903-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Basement floor	58.5560 (1a)	x 2.6250 (2a)	= 153.7095 (1a) - (3a)
Ground floor	58.5560 (1b)	x 3.1330 (2b)	= 183.4559 (1b) - (3b)
First floor	58.5560 (1c)	x 3.0560 (2c)	= 178.9471 (1c) - (3c)
Second floor	48.2610 (1d)	x 3.0000 (2d)	= 144.7830 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	223.9290		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 660.8956 (5)

2. Ventilation rate

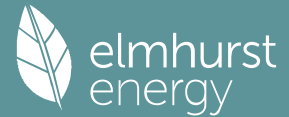
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	5 * 10 =	50.0000 (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) =	
Pressure test	50.0000 / (5) =	
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate	4.0100 (17)	
Number of sides sheltered	0.2762 (18)	
Shelter factor	2 (19)	
Infiltration rate adjusted to include shelter factor	(20) = 1 - [0.075 x (19)] =	
	(21) = (18) x (20) =	
	0.8500 (20)	
	0.2347 (21)	

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.2993	0.2934	0.2875	0.2582	0.2523	0.2230	0.2230	0.2171	0.2347	0.2523	0.2641	0.2758 (22b)
	0.5448	0.5430	0.5413	0.5333	0.5318	0.5249	0.5249	0.5236	0.5275	0.5318	0.5349	0.5380 (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							
Solid Door			1.9890	1.2000	2.3880		(26)
Windows			33.4850	1.1450	38.3473		(27)
Flr - Basement			58.5560	0.1100	6.4412	75.0000	4391.7000 (28a)
Ext Wall	99.1320	30.9590	68.1730	0.1600	10.9077	60.0000	4090.3802 (29a)
Top floor	38.1330	3.3790	34.7540	0.1400	4.8656	9.0000	312.7860 (29a)
Below Ground	15.4070		15.4070	0.1600	2.4651	60.0000	924.4200 (29a)
Wl - Dormer	2.5010	1.1360	1.3650	0.1400	0.1911	9.0000	12.2850 (29a)
Rf - Flat Roof	55.3870		55.3870	0.1100	6.0926	9.0000	498.4830 (30)
Total net area of external elements Aum(A, m ²)			269.1220				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.6985		(33)
Main dwelling							
Party Wall			223.1420	0.0000	0.0000	150.0000	33471.2997 (32)
Stud			26.9272			9.0000	242.3452 (32c)
Stud			119.2670			9.0000	1073.4034 (32c)
Stud			204.6909			9.0000	1842.2180 (32c)
Internal Floor 1			106.8170			9.0000	961.3530 (32d)
Internal Ceiling 1			106.8170			9.0000	961.3530 (32e)

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Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	15.4270	0.2680	4.1344
E3 Sill	9.9530	0.0220	0.2190
E4 Jamb	43.2120	0.0170	0.7346
E5 Ground floor (normal)	12.9960	0.0760	0.9877
E6 Intermediate floor within a dwelling	25.0210	0.0010	0.0250
E7 Party floor between dwellings (in blocks of flats)	1.4240	0.0370	0.0527
E14 Flat roof	11.9710	0.1600	1.9154
E15 Flat roof with parapet	12.7020	0.0800	1.0162
E16 Corner (normal)	20.3590	0.0460	0.9365
E17 Corner (inverted - internal area greater than external area)	4.0900	-0.0880	-0.3599
E18 Party wall between dwellings	23.7700	0.0400	0.9508
E24 Eaves (insulation at ceiling level - inverted)	11.4580	0.0750	0.8593
E25 Staggered party wall between dwellings	23.6280	0.0290	0.6852
P1 Party wall - Ground floor	20.0540	0.1030	2.0656
P2 Party wall - Intermediate floor within a dwelling	56.2260	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	17.1100	0.0800	1.3688
R1 Head of roof window	1.0320	0.2400	0.2477
R2 Sill of roof window	1.0320	0.2400	0.2477
R3 Jamb of roof window	4.4000	0.2400	1.0560
R9 Roof to wall (flat ceiling)	2.3270	0.1600	0.3723

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m
Heat transfer coeff
Average = Sum(39)m / 12 =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9290	0.9273	0.9256	0.9178	0.9164	0.9096	0.9096	0.9083	0.9122	0.9164	0.9193	0.9224
HLP (average)												0.9178
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

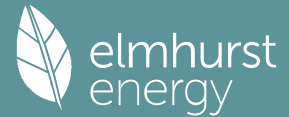
4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0330 (42)
Hot water usage for mixer showers													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													
Daily hot water use													
Energy content (annual)													
Distribution loss													
Water storage loss (or HIU loss):													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5800 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8532 (55)
Total storage loss													
If cylinder contains dedicated solar storage													
Primary loss													
Combi loss													
Total heat required for water heating calculated for each month													
VWHRs													
PV diverter													
Solar input													
FGHRs													
Output from w/h													
12Total per year (kWh/year)													
Electric shower(s)													
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month													

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

Metabolic gains (Table 5), Watts													
(66)m													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
Pumps, fans													
Losses e.g. evaporation (negative values) (Table 5)													
Water heating gains (Table 5)													
Total internal gains													

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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				
South				26.2360	46.7521	0.6300	0.7200	0.7700	385.5713	{78}			
Northwest				7.2490	11.2829	0.6300	0.7200	0.7700	25.7103	{81}			

Solar gains	411.2816	683.8004	898.6655	1063.9698	1155.5078	1133.6128	1098.3814	1030.5749	955.1588	745.0521	489.3837	354.1654	{83}
Total gains	1243.4903	1539.6413	1716.4855	1855.0410	1904.7573	1856.2813	1792.1016	1724.0513	1670.3704	1483.5927	1273.8331	1167.5127	{84}

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.1380	65.2569	65.3740	65.9294	66.0344	66.5274	66.5274	66.6196	66.3366	66.0344	65.8224	65.6022
alpha	5.3425	5.3505	5.3583	5.3953	5.4023	5.4352	5.4352	5.4413	5.4224	5.4023	5.3882	5.3735
util living area	0.9973	0.9914	0.9781	0.9383	0.8446	0.6681	0.4942	0.5336	0.7648	0.9526	0.9929	0.9981 (86)
Living	19.7537	19.9861	20.2593	20.5826	20.8324	20.9645	20.9941	20.9912	20.9261	20.5968	20.1073	19.7123
Non living	18.6707	18.9679	19.3144	19.7179	20.0047	20.1368	20.1571	20.1567	20.1042	19.7422	19.1288	18.6218
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.3625	19.9861	20.2593	20.5826	20.8324	20.9645	20.9941	20.9912	20.9261	20.5968	20.1073	19.8925 (87)
Th 2	20.1429	20.1444	20.1458	20.1524	20.1536	20.1594	20.1594	20.1604	20.1571	20.1536	20.1511	20.1485 (88)
util rest of house	0.9966	0.9890	0.9718	0.9203	0.8018	0.5931	0.4028	0.4407	0.6966	0.9351	0.9905	0.9975 (89)
MIT 2	19.5560	18.9679	19.3144	19.7179	20.0047	20.1368	20.1571	20.1567	20.1042	19.7422	19.1288	18.8969 (90)
Living area fraction									fLA =	Living area / (4) =		0.1103 (91)
MIT	19.6449	19.0802	19.4186	19.8133	20.0960	20.2281	20.2494	20.2487	20.1948	19.8365	19.2367	19.0067 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6449	19.0802	19.4186	19.8133	20.0960	20.2281	20.2494	20.2487	20.1948	19.8365	19.2367	19.0067 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9960	0.9849	0.9648	0.9117	0.7986	0.5995	0.4127	0.4507	0.6999	0.9269	0.9868	0.9965 (94)
Useful gains	1238.5481	1516.3864	1656.0404	1691.2564	1521.0830	1112.9157	739.6663	776.9848	1169.0762	1375.1763	1257.0474	1163.4202 (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	3192.1844	2944.5118	2677.7419	2243.0167	1722.8923	1146.3462	743.3203	782.8438	1244.9805	1895.3682	2498.5369	3058.4204 (97)
Space heating kWh	1453.5054	959.7003	760.1459	397.2674	150.1461	0.0000	0.0000	0.0000	0.0000	387.0227	893.8724	1409.8802 (98a)
Space heating requirement - total per year (kWh/year)												6411.5404
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	1453.5054	959.7003	760.1459	397.2674	150.1461	0.0000	0.0000	0.0000	0.0000	387.0227	893.8724	1409.8802 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6411.5404
Space heating per m2										(98c) / (4) =		28.6320 (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 %)												291.2093 (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	1453.5054	959.7003	760.1459	397.2674	150.1461	0.0000	0.0000	0.0000	0.0000	387.0227	893.8724	1409.8802 (98)
Space heating efficiency (main heating system 1)	291.2093	291.2093	291.2093	291.2093	291.2093	0.0000	0.0000	0.0000	0.0000	291.2093	291.2093	291.2093 (210)
Space heating fuel (main heating system)	499.1275	329.5569	261.0308	136.4199	51.5595	0.0000	0.0000	0.0000	0.0000	132.9019	306.9519	484.1467 (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	292.2998	258.3589	273.9828	239.5717	231.3709	207.5343	204.0610	212.6469	215.5288	241.4864	258.2112	288.9212 (64)
Efficiency of water heater	289.5288	289.5288	289.5288	289.5288	289.5288	289.5288	289.5288	289.5288	289.5288	289.5288	289.5288	289.5288 (216)
Fuel for water heating, kWh/month	100.9570	89.2342	94.6306	82.7454	79.9129	71.6800	70.4804	73.4458	74.4412	83.4067	89.1832	99.7901 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	40.4344	32.4380	29.2068	21.3982	16.5286	13.5040	15.0779	19.5988	25.4569	33.4009	37.7262	41.5582 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-13.7739	-24.2220	-44.0082	-59.9245	-71.8707	-68.5628	-67.0827	-58.4877	-44.8544	-30.6095	-16.3721	-11.2406 (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)

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Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.7013	-4.8084	-13.1310	-26.4755	-42.4077	-46.6372	-45.4101	-34.9587	-21.3856	-8.6737	-2.6359	-1.2586	(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												2201.6952	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												289.5288	
Water heating fuel used												1009.9076	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												326.3289	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-760.4928	(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												2777.4388	(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	2201.6952	0.1561	343.6788 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1009.9076	0.1410	142.4015 (264)
Space and water heating			486.0803 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	326.3289	0.1443	47.0993 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.0091	0.1313	-67.0739
PV Unit electricity exported	-249.4837	0.1190	-29.6816
Total			-96.7555 (269)
Total CO2, kg/year			436.4242 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.9500 (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	2201.6952	1.5779	3473.9611 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1009.9076	1.5214	1536.4619 (278)
Space and water heating			5010.4230 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	326.3289	1.5338	500.5341 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.0091	1.4849	-758.8096
PV Unit electricity exported	-249.4837	0.4363	-108.8498
Total			-867.6594 (283)
Total Primary energy kWh/year			4643.2977 (286)
Dwelling Primary energy Rate (DPER)			20.7400 (287)

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

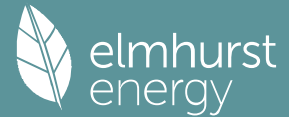
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Basement floor	58.5560 (1a)	x 2.6250 (2a)	= 153.7095 (1a) - (3a)
Ground floor	58.5560 (1b)	x 3.1330 (2b)	= 183.4559 (1b) - (3b)
First floor	58.5560 (1c)	x 3.0560 (2c)	= 178.9471 (1c) - (3c)
Second floor	48.2610 (1d)	x 3.0000 (2d)	= 144.7830 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	223.9290		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	660.8956 (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)

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Number of intermittent extract fans 4 * 10 = 40.0000 (7a)
 Number of passive vents 0 * 10 = 0.0000 (7b)
 Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.0605 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3105 (18)
 Number of sides sheltered 2 (19)
 Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2639 (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	0.3365	0.3299	0.3233	0.2903	0.2837	0.2507	0.2507	0.2441	0.2639	0.2837	0.2969	0.3101	(22b)
Effective ac	0.5566	0.5544	0.5523	0.5421	0.5403	0.5314	0.5314	0.5298	0.5348	0.5403	0.5441	0.5481	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.9890	1.0000	1.9900			(26)
TER Opening Type			33.4850	1.1450	38.3473			(27)
Flr - Basement			58.5560	0.1300	7.6123			(28a)
Ext Wall	99.1320	30.9590	68.1730	0.1800	12.2711			(29a)
Top floor	38.1330	3.3790	34.7540	0.1800	6.2557			(29a)
Below Ground	15.4070		15.4070	0.1800	2.7733			(29a)
Wl - Dormer	2.5010	1.1360	1.3650	0.1800	0.2457			(29a)
Rf - Flat Roof	55.3870		55.3870	0.1100	6.0926			(30)
Total net area of external elements Aum(A, m2)			269.1220					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 75.5880			(33)
Main dwelling								
Party Wall			223.1420	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							217.8460	(35)

List of Thermal Bridges	Length	Psi-value	Total	
K1 Element	15.4270	0.0500	0.7713	
E2 Other lintels (including other steel lintels)	9.9530	0.0500	0.4976	
E3 Sill	43.2120	0.0500	2.1606	
E4 Jamb	12.9960	0.1600	2.0794	
E5 Ground floor (normal)	25.0210	0.0000	0.0000	
E6 Intermediate floor within a dwelling	1.4240	0.0700	0.0997	
E7 Party floor between dwellings (in blocks of flats)	11.9710	0.0800	0.9577	
E14 Flat roof	12.7020	0.5600	7.1131	
E15 Flat roof with parapet	20.3590	0.0900	1.8323	
E16 Corner (normal)	4.0900	-0.0900	-0.3681	
E17 Corner (inverted - internal area greater than external area)	23.7700	0.0600	1.4262	
E18 Party wall between dwellings	11.4580	0.2400	2.7499	
E24 Eaves (insulation at ceiling level - inverted)	23.6280	0.0600	1.4177	
E25 Staggered party wall between dwellings	20.0540	0.0800	1.6043	
P1 Party wall - Ground floor	56.2260	0.0000	0.0000	
P2 Party wall - Intermediate floor within a dwelling	17.1100	0.1200	2.0532	
P4 Party wall - Roof (insulation at ceiling level)	1.0320	0.0800	0.0826	
R1 Head of roof window	1.0320	0.0600	0.0619	
R2 Sill of roof window	4.4000	0.0800	0.3520	
R3 Jamb of roof window	2.3270	0.0400	0.0931	
R9 Roof to wall (flat ceiling)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			24.9845	(36)
Point Thermal bridges			(36a) = 0.0000	
Total fabric heat loss			(33) + (36) + (36a) = 100.5725	(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	121.3977	120.9182	120.4481	118.2402	117.8271	115.9041	115.9041	115.5480	116.6448	117.8271	118.6628	119.5364	(38)
Average = Sum(39)m / 12 =	221.9702	221.4907	221.0206	218.8127	218.3996	216.4766	216.4766	216.1205	217.2173	218.3996	219.2353	220.1090	(39)
												218.8107	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9913	0.9891	0.9870	0.9772	0.9753	0.9667	0.9667	0.9651	0.9700	0.9753	0.9790	0.9829	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0330	(42)
Hot water usage for mixer showers	75.0739	73.9457	72.3017	69.1561	66.8348	64.2461	62.7746	64.4062	66.1947	68.9742	72.1874	74.7863	(42a)
Hot water usage for baths	32.4075	31.9262	31.2484	29.9987	29.0630	28.0254	27.4649	28.1380	28.8708	29.9810	31.2564	32.2979	(42b)
Hot water usage for other uses	45.6913	44.0298	42.3683	40.7068	39.0453	37.3838	37.3838	39.0453	40.7068	42.3683	44.0298	45.6913	(42c)
Average daily hot water use (litres/day)												140.8001	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	153.1727	149.9017	145.9184	139.8617	134.9431	129.6553	127.6234	131.5895	135.7723	141.3236	147.4736	152.7755	(44)
Distribution loss (46)m = 0.15 x (45)m	242.5882	213.4581	224.2712	191.4637	181.6593	159.4263	154.3494	162.9353	167.4208	191.7748	210.1032	239.2096	(45)
Store volume	Total = Sum(45)m =											2338.6598	
Water storage loss (or HIU loss):	36.3882	32.0187	33.6407	28.7195	27.2489	23.9139	23.1524	24.4403	25.1131	28.7662	31.5155	35.8814	(46)
a) If manufacturer declared loss factor is known (kWh/day):												250.0000	(47)
Temperature factor from Table 2b												1.8903	(48)
Enter (49) or (54) in (55)												0.5400	(49)
Total storage loss												1.0208	(55)
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)