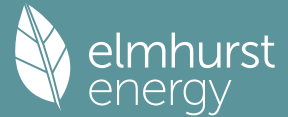


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Property Reference	OP-D320 P5MALL				Issued on Date	29/11/2024	
Assessment Reference	P5MALL		Prop Type Ref	P5MALL			
Property	P5MALL						
SAP Rating	81 B	DER	3.62	TER	8.69		
Environmental	96 A	% DER < TER				58.34	
CO ₂ Emissions (t/year)	0.7	DFEE	39.61	TFEE	40.42		
Compliance Check	See BREL	% DFEE < TFEE				2.01	
% DPER < TPER	16.92	DPER	37.93	TPER	45.66		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
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)
Ground floor	91.1500 (1b)	x 2.7500 (2b)	= 250.6625 (1b) - (3b)
First floor	121.3800 (1c)	x 2.3000 (2c)	= 279.1740 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 529.8365 (5)

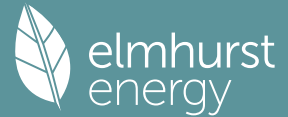
2. Ventilation rate

	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	0 * 10 = 0.0000 (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) = 0.0000 / (5) = 0.0000 (8)											
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	3.5000 (17)											
Infiltration rate	0.1750 (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) = 0.1487 (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	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												69.6000 (23c)
Effective ac	0.3417	0.3379	0.3342	0.3156	0.3119	0.2933	0.2933	0.2896	0.3007	0.3119	0.3193	0.3268 (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
Front Door			6.4200	1.0000	6.4200		(26)
Windows (Uw = 1.30)			27.4200	1.2357	33.8840		(27)
Ground Floor			91.1500	0.1100	10.0265		(28a)
Exposed Floor			31.2900	0.1400	4.3806		(28b)
External Wall	204.0400	27.3600	176.6800	0.1700	30.0356		(29a)
Dormer Cheeks	6.3500	4.3400	2.0100	0.1900	0.3819		(29a)
Garage Wall	30.7700	2.1400	28.6300	0.1700	4.8671		(29a)
Roof - ceiling	110.2400		110.2400	0.1100	12.1264		(30)
Roof - pitch	9.9200		9.9200	0.2000	1.9840		(30)
Dormer Roof	3.5400		3.5400	0.2000	0.7080		(30)
Bay Roof	1.0600		1.0600	0.1100	0.1166		(30)
Total net area of external elements Aum(A, m ²)			488.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	104.9307		(33)

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

100.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	20.4200	0.0500	1.0210
E2 Other lintels (including other steel lintels)	14.4200	0.0500	0.7210
E3 Sill	47.4400	0.0500	2.3720
E4 Jamb	48.9200	0.1600	7.8272
E5 Ground floor (normal)	34.4700	0.0000	0.0000
E6 Intermediate floor within a dwelling	19.7400	0.0600	1.1844
E10 Eaves (insulation at ceiling level)	20.1400	0.0600	1.2084
E12 Gable (insulation at ceiling level)	40.1700	0.0900	3.6153
E16 Corner (normal)	19.8900	-0.0900	-1.7901
E17 Corner (inverted - internal area greater than external area)	2.3600	0.2400	0.5664
E24 Eaves (insulation at ceiling level - inverted)	3.2700	0.0800	0.2616
R3 Jamb of roof window	13.6200	0.0600	0.8172
R6 Flat ceiling	12.8800	0.0600	0.7728
R8 Roof to wall (rafter)	5.3100	0.0400	0.2124
R7 Flat ceiling (inverted)	11.1900	0.3200	3.5808
E20 Exposed floor (normal)	11.1900	0.3200	3.5808
E21 Exposed floor (inverted)	2.5500	0.0600	0.1530
E13 Gable (insulation at rafter level)	2.5500	0.0400	0.1020
R5 Ridge (inverted)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			26.2062 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	131.1369 (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	59.7372	59.0870	58.4368	55.1858	54.5356	51.2845	51.2845	50.6343	52.5849	54.5356	55.8360	57.1364 (38)
Heat transfer coeff	190.8742	190.2240	189.5738	186.3227	185.6725	182.4215	182.4215	181.7713	183.7219	185.6725	186.9729	188.2733 (39)
Average = Sum(39)m / 12 =												186.1602
HLP	0.8981	0.8950	0.8920	0.8767	0.8736	0.8583	0.8583	0.8553	0.8645	0.8736	0.8797	0.8859 (40)
HLP (average)												0.8759
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

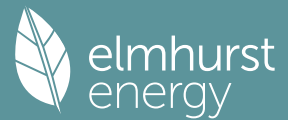
Assumed occupancy													3.0182 (42)
Hot water usage for mixer showers													
102.8850	101.3388	99.0858	94.7749	91.5937	88.0459	86.0294	88.2654	90.7165	94.5257	98.9291	102.4908	(42a)	
Hot water usage for baths													
34.0006	33.4957	32.7846	31.4735	30.4917	29.4031	28.8151	29.5212	30.2901	31.4549	32.7930	33.8857	(42b)	
Hot water usage for other uses													
47.9364	46.1932	44.4501	42.7070	40.9638	39.2207	39.2207	40.9638	42.7070	44.4501	46.1932	47.9364	(42c)	
Average daily hot water use (litres/day)												169.9590 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	184.8220	181.0278	176.3205	168.9554	163.0492	156.6697	154.0652	158.7505	163.7135	170.4307	177.9154	184.3129 (44)	
Energy content (annual)	292.7129	257.7811	270.9980	231.2915	219.4956	192.6437	186.3285	196.5662	201.8751	231.2728	253.4730	288.5894 (45)	
Distribution loss (46)m = 0.15 x (45)m													
43.9069	38.6672	40.6497	34.6937	32.9243	28.8966	27.9493	29.4849	30.2813	34.6909	38.0210	43.2884	(46)	
Water storage loss:													
Store volume												230.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)	
Temperature factor from Table 2b												0.7800 (49)	
Enter (49) or (54) in (55)												1.4040 (55)	
Total storage loss													
43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240	(56)	
If cylinder contains dedicated solar storage													
43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240	(57)	
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month													
391.0945	346.6419	369.3796	326.4995	317.8772	257.2757	253.1149	263.3526	266.5071	329.6544	348.6810	386.9710	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h	391.0945	346.6419	369.3796	326.4995	317.8772	257.2757	253.1149	263.3526	266.5071	329.6544	348.6810	386.9710 (64)	
12Total per year (kWh/year)												3857.0495 (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	141.2131	125.3513	133.9929	119.3748	116.8684	82.0636	80.5641	83.9682	85.1331	120.7843	126.7502	139.8421 (65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	210.8965	233.4926	210.8965	217.9264	210.8965	217.9264	210.8965	210.8965	217.9264	210.8965	217.9264	210.8965 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	382.8034	386.7757	376.7656	355.4553	328.5550	303.2724	286.3821	282.4098	292.4199	313.7301	340.6305	365.9131 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911 (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)	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287 (71)
Water heating gains (Table 5)	189.8026	186.5346	180.0980	165.7984	157.0811	113.9773	108.2851	112.8605	118.2404	162.3445	176.0419	187.9598 (72)
Total internal gains	851.7757	875.0761	836.0334	807.4534	764.8059	703.4494	673.8370	674.4401	696.8599	755.2444	802.8721	833.0426 (73)

6. Solar gains

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[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				11.9700	10.6334		0.6300		0.7000		0.7700	38.9899 (74)
South				15.4500	46.7521		0.6300		0.7000		0.7700	220.7502 (78)

Solar gains	259.6491	435.8698	586.8458	723.3956	815.7133	814.5773	783.1831	712.0169	632.9508	478.4356	309.6511	223.1766 (83)
Total gains	1111.4249	1310.9459	1422.8792	1530.8489	1580.5192	1518.0267	1457.0201	1386.4570	1329.8108	1233.6801	1112.5232	1056.2192 (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	30.9293	31.0351	31.1415	31.6849	31.7958	32.3625	32.3625	32.4782	32.1334	31.7958	31.5747	31.3566
alpha	3.0620	3.0690	3.0761	3.1123	3.1197	3.1575	3.1575	3.1652	3.1422	3.1197	3.1050	3.0904
util living area	0.9738	0.9563	0.9317	0.8792	0.7897	0.6524	0.5098	0.5481	0.7401	0.8940	0.9577	0.9773 (86)
Living	18.7868	19.0961	19.5005	20.0370	20.4921	20.8109	20.9361	20.9185	20.6982	20.1213	19.3766	18.7496
Non living	17.5376	17.9309	18.4430	19.1199	19.6711	20.0405	20.1615	20.1500	19.9210	19.2346	18.2984	17.4966
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	6	0	0	0	0	0	0	0	0	0	0	0
16 / 9	25	11	0	0	0	0	0	0	0	0	0	31
MIT	19.9891	19.4205	19.5005	20.0370	20.4921	20.8109	20.9361	20.9185	20.6982	20.1213	19.3766	19.7254 (87)
Th 2	20.1691	20.1717	20.1743	20.1874	20.1900	20.2031	20.2031	20.2057	20.1978	20.1900	20.1847	20.1795 (88)
util rest of house	0.9701	0.9503	0.9220	0.8611	0.7563	0.5951	0.4303	0.4696	0.6901	0.8746	0.9509	0.9741 (89)
MIT 2	19.2324	18.4227	18.4430	19.1199	19.6711	20.0405	20.1615	20.1500	19.9210	19.2346	18.2984	18.9953 (90)
Living area fraction									fLA = Living area /	(4) =		0.0781 (91)
MIT	19.2915	18.5006	18.5256	19.1916	19.7352	20.1007	20.2220	20.2100	19.9817	19.3039	18.3826	19.0524 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2915	18.5006	18.5256	19.1916	19.7352	20.1007	20.2220	20.2100	19.9817	19.3039	18.3826	19.0524 (93)

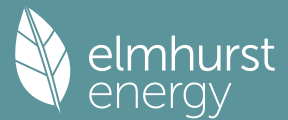
8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9655	0.9347	0.8967	0.8343	0.7350	0.5872	0.4323	0.4701	0.6750	0.8482	0.9301	0.9687 (94)
Useful gains	1073.0381	1225.2791	1275.9161	1277.2592	1161.6771	891.3478	629.8500	651.7668	897.6551	1046.3592	1034.7875	1023.1686 (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	2861.4929	2587.1594	2279.7432	1917.5548	1491.9230	1003.4407	660.7353	692.5496	1080.6030	1616.0685	2109.5441	2796.3050 (97)
Space heating kWh	1330.6104	915.1836	746.8474	461.0128	245.7029	0.0000	0.0000	0.0000	0.0000	423.8637	773.8247	1319.2135 (98a)
Space heating requirement - total per year (kWh/year)												6216.2590
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	1330.6104	915.1836	746.8474	461.0128	245.7029	0.0000	0.0000	0.0000	0.0000	423.8637	773.8247	1319.2135 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6216.2590
Space heating per m2										(98c) / (4) =		29.2489 (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 %)												266.6564 (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	1330.6104	915.1836	746.8474	461.0128	245.7029	0.0000	0.0000	0.0000	0.0000	423.8637	773.8247	1319.2135 (98)
Space heating efficiency (main heating system 1)	266.6564	266.6564	266.6564	266.6564	266.6564	0.0000	0.0000	0.0000	0.0000	266.6564	266.6564	266.6564 (210)
Space heating fuel (main heating system)	498.9980	343.2070	280.0785	172.8864	92.1421	0.0000	0.0000	0.0000	0.0000	158.9550	290.1954	494.7240 (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	391.0945	346.6419	369.3796	326.4995	317.8772	257.2757	253.1149	263.3526	266.5071	329.6544	348.6810	386.9710 (64)
Efficiency of water heater	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505 (216)
Fuel for water heating, kWh/month	140.4034	124.4449	132.6078	117.2137	114.1183	92.3623	90.8686	94.5439	95.6764	118.3464	125.1770	138.9231 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	97.6118	88.1655	97.6118	94.4630	97.6118	94.4630	97.6118	97.6118	94.4630	97.6118	94.4630	97.6118 (221)
Lighting	43.8201	35.1541	31.6524	23.1899	17.9126	14.6347	16.3404	21.2399	27.5885	36.1977	40.8852	45.0380 (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)

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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												2331.1865	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												278.5505		
Water heating fuel used												1384.6859	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.7780)														
mechanical ventilation fans (SFP = 1.7780)												1149.3001	(230a)	
Total electricity for the above, kWh/year												1149.3001	(231)	
Electricity for lighting (calculated in Appendix L)												353.6536	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												0.0000	(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												5218.8261	(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	2331.1865	0.1553	362.0647	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1384.6859	0.1415	195.9837	(264)
Space and water heating			558.0485	(265)
Pumps, fans and electric keep-hot	1149.3001	0.1387	159.4221	(267)
Energy for lighting	353.6536	0.1443	51.0431	(268)
Total CO2, kg/year			768.5137	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(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	2331.1865	1.5750	3671.5483	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1384.6859	1.5234	2109.4228	(278)
Space and water heating			5780.9711	(279)
Pumps, fans and electric keep-hot	1149.3001	1.5128	1738.6613	(281)
Energy for lighting	353.6536	1.5338	542.4456	(282)
Total Primary energy kWh/year			8062.0780	(286)
Dwelling Primary energy Rate (DPER)			37.9300	(287)

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

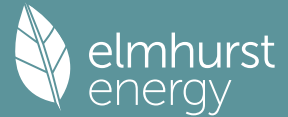
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	91.1500 (1b)	x 2.7500 (2b)	= 250.6625 (1b) - (3b)	
First floor	121.3800 (1c)	x 2.3000 (2c)	= 279.1740 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.5300			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	529.8365	(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) =	0.0755 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3255 (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) =	0.2767 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3528	0.3458	0.3389	0.3043	0.2974	0.2628	0.2628	0.2559	0.2767	0.2974	0.3113	0.3251	(22b)
Effective ac	0.5622	0.5598	0.5574	0.5463	0.5442	0.5345	0.5345	0.5327	0.5383	0.5442	0.5484	0.5528	(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
TER Opaque door			6.4200	1.0000	6.4200		(26)
TER Opening Type (Uw = 1.20)			27.4200	1.1450	31.3969		(27)
Ground Floor			91.1500	0.1300	11.8495		(28a)
Exposed Floor			31.2900	0.1300	4.0677		(28b)
External Wall	204.0400	27.3600	176.6800	0.1800	31.8024		(29a)
Dormer Cheeks	6.3500	4.3400	2.0100	0.1800	0.3618		(29a)
Garage Wall	30.7700	2.1400	28.6300	0.1800	5.1534		(29a)
Roof - ceiling	110.2400		110.2400	0.1100	12.1264		(30)
Roof - pitch	9.9200		9.9200	0.1100	1.0912		(30)
Dormer Roof	3.5400		3.5400	0.1100	0.3894		(30)
Bay Roof	1.0600		1.0600	0.1100	0.1166		(30)
Total net area of external elements Aum(A, m2)			488.3600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	104.7753	(33)

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

100.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	20.4200	0.0500	1.0210
E3 Sill	14.4200	0.0500	0.7210
E4 Jamb	47.4400	0.0500	2.3720
E5 Ground floor (normal)	48.9200	0.1600	7.8272
E6 Intermediate floor within a dwelling	34.4700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	19.7400	0.0600	1.1844
E12 Gable (insulation at ceiling level)	20.1400	0.0600	1.2084
E16 Corner (normal)	40.1700	0.0900	3.6153
E17 Corner (inverted - internal area greater than external area)	19.8900	-0.0900	-1.7901
E24 Eaves (insulation at ceiling level - inverted)	2.3600	0.2400	0.5664
R3 Jamb of roof window	3.2700	0.0800	0.2616
R6 Flat ceiling	13.6200	0.0600	0.8172
R8 Roof to wall (rafter)	12.8800	0.0600	0.7728
R7 Flat ceiling (inverted)	5.3100	0.0400	0.2124
E20 Exposed floor (normal)	11.1900	0.3200	3.5808
E21 Exposed floor (inverted)	11.1900	0.3200	3.5808
E13 Gable (insulation at rafter level)	2.5500	0.0800	0.2040
R5 Ridge (inverted)	2.5500	0.0400	0.1020

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

26.2572 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 131.0325 (37)

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

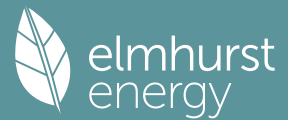
(38)m	Jan 98.3016	Feb 97.8792	Mar 97.4651	Apr 95.5203	May 95.1564	Jun 93.4625	Jul 93.4625	Aug 93.1488	Sep 94.1150	Oct 95.1564	Nov 95.8925	Dec 96.6621	(38)
Heat transfer coeff	229.3342	228.9117	228.4977	226.5528	226.1889	224.4950	224.4950	224.1814	225.1475	226.1889	226.9251	227.6946	(39)
Average = Sum(39)m / 12 =												226.5511	(39)

HLP	Jan 1.0791	Feb 1.0771	Mar 1.0751	Apr 1.0660	May 1.0643	Jun 1.0563	Jul 1.0563	Aug 1.0548	Sep 1.0594	Oct 1.0643	Nov 1.0677	Dec 1.0714	(40)
HLP (average)												1.0660	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0182 (42)
Hot water usage for mixer showers	74.8254	73.7010	72.0624	68.9272	66.6136	64.0334	62.5668	64.1930	65.9756	68.7459	71.9484	74.5388 (42a)	
Hot water usage for baths	32.3006	31.8209	31.1454	29.8998	28.9672	27.9330	27.3744	28.0452	28.7756	29.8822	31.1534	32.1914 (42b)	
Hot water usage for other uses	45.5396	43.8836	42.2276	40.5716	38.9156	37.2596	37.2596	38.9156	40.5716	42.2276	43.8836	45.5396 (42c)	
Average daily hot water use (litres/day)												140.3339 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	152.6656	149.4054	145.4353	139.3987	134.4963	129.2260	127.2008	131.1538	135.3228	140.8557	146.9854	152.2697 (44)	
Energy content (annual)	241.7850	212.7514	223.5287	190.8298	181.0579	158.8985	153.8384	162.3958	166.8665	191.1399	209.4076	238.4176 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2330.9172	
	36.2678	31.9127	33.5293	28.6245	27.1587	23.8348	23.0758	24.3594	25.0300	28.6710	31.4111	35.7626 (46)	
Water storage loss:													
Store volume												230.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.7973 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.9706 (55)	
Total storage loss													
	30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872 (56)	
If cylinder contains dedicated solar storage													
	30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872 (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													
	295.1346	260.9381	276.8783	242.4585	234.4076	210.5271	207.1880	215.7455	218.4952	244.4895	261.0363	291.7672 (62)	
WWHRS	-34.2071	-30.2530	-31.6792	-26.2316	-24.4469	-20.9194	-19.6086	-20.8518	-21.6440	-25.5159	-28.9065	-33.5736 (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													
	260.9276	230.6851	245.1991	216.2268	209.9606	189.6077	187.5794	194.8936	196.8512	218.9735	232.1298	258.1936 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2641.2281 (64)	
												2641 (64)	

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month	123.0732	109.2892	117.0030	104.7538	102.8815	94.1367	93.8310	96.6763	96.7861	106.2337	110.9310	121.9536 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	210.8965	233.4926	210.8965	217.9264	210.8965	217.9264	210.8965	210.8965	217.9264	210.8965	217.9264	210.8965 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	382.8034	386.7757	376.7656	355.4553	328.5550	303.2724	286.3821	282.4098	292.4199	313.7301	340.6305	365.9131 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911 (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)	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287 (71)
Water heating gains (Table 5)	165.4210	162.6328	157.2621	145.4914	138.2815	130.7454	126.1169	129.9413	134.4251	142.7872	154.0708	163.9161 (72)
Total internal gains	830.3941	854.1743	816.1975	790.1465	749.0063	720.2175	691.6688	691.5209	713.0446	738.6872	783.9010	811.9989 (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					11.9700	10.6334		0.6300	0.7000	0.7700		38.8989 (74)
South					15.4500	46.7521		0.6300	0.7000	0.7700		220.7502 (78)
Solar gains	259.6491	435.8698	586.8458	723.3956	815.7133	814.5773	783.1831	712.0169	632.9508	478.4356	309.6511	223.1766 (83)
Total gains	1090.0433	1290.0441	1403.0432	1513.5420	1564.7196	1534.7948	1474.8518	1403.5378	1345.9955	1217.1228	1093.5521	1035.1755 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
tau	25.7424	25.7899	25.8366	26.0584	26.1004	26.2973	26.2973	26.3341	26.2211	26.1004	26.0157	25.9278
alpha	2.7162	2.7193	2.7224	2.7372	2.7400	2.7532	2.7532	2.7556	2.7481	2.7400	2.7344	2.7285
util living area	0.9762	0.9618	0.9421	0.9011	0.8299	0.7089	0.5754	0.6132	0.7833	0.9133	0.9632	0.9792 (86)
MIT	18.2794	18.5935	19.0383	19.6388	20.2040	20.6542	20.8621	20.8307	20.5055	19.7730	18.9250	18.2267 (87)
Th 2	20.0180	20.0196	20.0212	20.0287	20.0301	20.0367	20.0367	20.0379	20.0342	20.0301	20.0273	20.0243 (88)
util rest of house	0.9726	0.9560	0.9328	0.8839	0.7965	0.6450	0.4772	0.5184	0.7305	0.8948	0.9567	0.9761 (89)
MIT 2	16.8062	17.2057	17.7702	18.5279	19.2208	19.7433	19.9505	19.9259	19.5856	18.7055	17.6354	16.7427 (90)
Living area fraction	16.9213	17.3141	17.8693	18.6147	19.2976	19.8144	20.0217	19.9965	19.6575	18.7889	17.7361	16.8586 (92)
MIT	16.9213	17.3141	17.8693	18.6147	19.2976	19.8144	20.0217	19.9965	19.6575	18.7889	17.7361	16.8586 (93)
Temperature adjustment												0.0000
adjusted MIT	16.9213	17.3141	17.8693	18.6147	19.2976	19.8144	20.0217	19.9965	19.6575	18.7889	17.7361	16.8586 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9549	0.9327	0.9044	0.8512	0.7660	0.6282	0.4755	0.5138	0.7059	0.8630	0.9338	0.9599 (94)
Useful gains	1040.8510	1203.1861	1268.8916	1288.3429	1198.5114	964.1382	701.2782	721.1857	950.1439	1050.3736	1021.1407	993.6820 (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	2894.4882	2841.7297	2597.8563	2200.8933	1718.4832	1170.6106	768.1459	806.2769	1251.2554	1852.2307	2413.5989	2882.2948 (97)
Space heating kWh	1379.1061	1101.1013	988.7497	657.0362	386.8590	0.0000	0.0000	0.0000	0.0000	596.5817	1002.5699	1405.1279 (98a)
Space heating requirement - total per year (kWh/year)												7517.1320
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	1379.1061	1101.1013	988.7497	657.0362	386.8590	0.0000	0.0000	0.0000	0.0000	596.5817	1002.5699	1405.1279 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7517.1320
Space heating per m2										(98c) / (4) =		35.3697 (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)
Space heating requirement	1379.1061	1101.1013	988.7497	657.0362	386.8590	0.0000	0.0000	0.0000	0.0000	596.5817	1002.5699	1405.1279 (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)	1494.1561	1192.9592	1071.2348	711.8486	419.1321	0.0000	0.0000	0.0000	0.0000	646.3507	1086.2079	1522.3488 (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)

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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	260.9276	230.6851	245.1991	216.2268	209.9606	189.6077	187.5794	194.8936	196.8512	218.9735	232.1298	258.1936	(64)
Efficiency of water heater	87.2347	87.0985	86.8535	86.3876	85.4112	79.8000	79.8000	79.8000	79.8000	86.1900	86.9562	79.8000	(216)
(217)m	87.2347	87.0985	86.8535	86.3876	85.4112	79.8000	79.8000	79.8000	79.8000	86.1900	86.9562	87.2721	(217)
Fuel for water heating, kWh/month	299.1098	264.8555	282.3134	250.2985	245.8234	237.6037	235.0619	244.2276	246.6807	254.0590	266.9502	295.8489	(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	43.8201	35.1541	31.6524	23.1899	17.9126	14.6347	16.3404	21.2399	27.5885	36.1977	40.8852	45.0380	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-78.8969	-108.0902	-150.9305	-164.5425	-172.9952	-159.6758	-157.4815	-150.6997	-138.2793	-120.9332	-85.5254	-68.5658	(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	-54.5647	-113.4996	-223.3670	-332.4100	-436.7386	-438.0250	-433.0691	-368.1061	-271.5844	-161.5111	-72.5612	-43.2643	(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												8144.2383	(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												3122.8325	(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)												353.6536	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4505.3171	(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												7201.4073	(238)

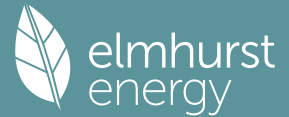
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	8144.2383	0.2100	1710.2900 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3122.8325	0.2100	655.7948 (264)
Space and water heating			2366.0849 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	353.6536	0.1443	51.0431 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1556.6160	0.1353	-210.5394
PV Unit electricity exported	-2948.7011	0.1262	-372.0024
Total			-582.5418 (269)
Total CO2, kg/year			1846.5154 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.6900 (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	8144.2383	1.1300	9202.9893 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3122.8325	1.1300	3528.8007 (278)
Space and water heating			12731.7900 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	353.6536	1.5338	542.4456 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1556.6160	1.4999	-2334.7922
PV Unit electricity exported	-2948.7011	0.4631	-1365.5367
Total			-3700.3289 (283)
Total Primary energy kWh/year			9704.0076 (286)
Target Primary Energy Rate (TPER)			45.6600 (287)

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Property Reference	OP-D320 P5MALL				Issued on Date	29/11/2024	
Assessment Reference	P5MALL		Prop Type Ref	P5MALL			
Property	P5MALL						
SAP Rating	81 B	DER	3.62	TER	8.69		
Environmental	96 A	% DER < TER				58.34	
CO ₂ Emissions (t/year)	0.7	DFEE	39.61	TFEE	40.42		
Compliance Check	See BREL	% DFEE < TFEE				2.01	
% DPER < TPER	16.92	DPER	37.93	TPER	45.66		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	91.1500 (1b)	x 2.7500 (2b)	= 250.6625 (1b) - (3b)
First floor	121.3800 (1c)	x 2.3000 (2c)	= 279.1740 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 529.8365 (5)

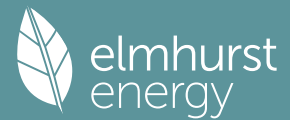
2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0755 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.2505 (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) = 0.2129 (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	0.2715 0.2662 0.2608 0.2342 0.2289 0.2023 0.2023 0.1970 0.2129 0.2289 0.2395 0.2502 (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	0.5368 0.5354 0.5340 0.5274 0.5262 0.5205 0.5205 0.5194 0.5227 0.5262 0.5287 0.5313 (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
Front Door			6.4200	1.0000	6.4200		(26)
Windows (Uw = 1.30)			27.4200	1.2357	33.8840		(27)
Ground Floor			91.1500	0.1100	10.0265		(28a)
Exposed Floor			31.2900	0.1400	4.3806		(28b)
External Wall	204.0400	27.3600	176.6800	0.1700	30.0356		(29a)
Dormer Cheeks	6.3500	4.3400	2.0100	0.1900	0.3819		(29a)
Garage Wall	30.7700	2.1400	28.6300	0.1700	4.8671		(29a)
Roof - ceiling	110.2400		110.2400	0.1100	12.1264		(30)
Roof - pitch	9.9200		9.9200	0.2000	1.9840		(30)
Dormer Roof	3.5400		3.5400	0.2000	0.7080		(30)
Bay Roof	1.0600		1.0600	0.1100	0.1166		(30)
Total net area of external elements Aum(A, m ²)			488.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	104.9307		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	20.4200	0.0500	1.0210
E3 Sill	14.4200	0.0500	0.7210
E4 Jamb	47.4400	0.0500	2.3720
E5 Ground floor (normal)	48.9200	0.1600	7.8272
E6 Intermediate floor within a dwelling	34.4700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	19.7400	0.0600	1.1844
E12 Gable (insulation at ceiling level)	20.1400	0.0600	1.2084
E16 Corner (normal)	40.1700	0.0900	3.6153
E17 Corner (inverted - internal area greater than external area)	19.8900	-0.0900	-1.7901
E24 Eaves (insulation at ceiling level - inverted)	2.3600	0.2400	0.5664
R3 Jamb of roof window	3.2700	0.0800	0.2616
R6 Flat ceiling	13.6200	0.0600	0.8172
R8 Roof to wall (rafter)	12.8800	0.0600	0.7728
R7 Flat ceiling (inverted)	5.3100	0.0400	0.2124
E20 Exposed floor (normal)	11.1900	0.3200	3.5808
E21 Exposed floor (inverted)	11.1900	0.3200	3.5808
E13 Gable (insulation at rafter level)	2.5500	0.0600	0.1530
R5 Ridge (inverted)	2.5500	0.0400	0.1020
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			26.2062 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	131.1369 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)			
(38)m	Jan 93.8659	Feb 93.6157	Mar 93.3705
Heat transfer coeff	225.0029	224.7527	224.5074
Average = Sum(39)m / 12 =			223.3556
	Apr 92.2187	May 92.0032	Jun 90.9999
	223.3556	223.1401	222.1369
	222.1369	221.9511	222.5233
	223.1401	223.5761	224.0318 (39)
			223.3546
HLP	Jan 1.0587	Feb 1.0575	Mar 1.0564
HLP (average)	1.0509	1.0499	1.0452
Days in mont	31	28	31
	30	31	30
	31	31	30
	31	30	31
			31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												3.0182 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	32.3006	31.8209	31.1454	29.8998	28.9672	27.9330	27.3744	28.0452	28.7756	29.8822	31.1534	32.1914 (42c)
Average daily hot water use (litres/day)	45.5396	43.8836	42.2276	40.5716	38.9156	37.2596	37.2596	38.9156	40.5716	42.2276	43.8836	45.5396 (43)
												71.3474 (43)
Daily hot water use	Jan 77.8402	Feb 75.7045	Mar 73.3730	Apr 70.4714	May 67.8828	Jun 65.1926	Jul 64.6340	Aug 66.9608	Sep 69.3472	Oct 72.1098	Nov 75.0369	Dec 77.7310 (44)
Energy content (annual)	123.2798	107.8022	112.7715	96.4719	91.3833	80.1619	78.1692	82.9115	85.5120	97.8523	106.9039	121.7079 (45)
Distribution loss (46)m = 0.15 x (45)m												1184.9273 (45)
Water 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 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	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	104.7878	91.6318	95.8558	82.0011	77.6758	68.1376	66.4439	70.4747	72.6852	83.1744	90.8683	103.4517 (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	104.7878	91.6318	95.8558	82.0011	77.6758	68.1376	66.4439	70.4747	72.6852	83.1744	90.8683	103.4517 (64)
12Total per year (kWh/year)												1007.1882 (64)
Electric shower(s)	59.9227	53.3916	58.3016	55.6365	56.6805	54.0677	55.8700	56.6805	55.6365	58.3016	57.2053	59.9227 (64a)
Heat gains from water heating, kWh/month	41.1776	36.2559	38.5394	34.4094	33.5891	30.5513	30.5785	31.7888	32.0804	35.3690	37.0184	40.8436 (65)
												681.6173 (64a)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan 150.9109	Feb 150.9109	Mar 150.9109	Apr 150.9109	May 150.9109	Jun 150.9109	Jul 150.9109	Aug 150.9109	Sep 150.9109	Oct 150.9109	Nov 150.9109	Dec 150.9109 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	210.8965	233.4926	210.8965	217.9264	210.8965	217.9264	210.8965	210.8965	217.9264	210.8965	217.9264	210.8965 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	382.8034	386.7757	376.7656	355.4553	328.5550	303.2724	286.3821	282.4098	292.4199	313.7301	340.6305	365.9131 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911 (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)	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287 (71)
Water heating gains (Table 5)	55.3463	53.9522	51.8002	47.7908	45.1466	42.4324	41.1001	42.7269	44.5562	47.5390	51.4145	54.8973 (72)
Total internal gains	717.3194	742.4937	707.7356	689.4458	652.8714	631.9045	606.6520	604.3065	623.1757	640.4389	678.2446	699.9802 (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	11.9700	10.6334	0.6300	0.7000	0.7700	38.8989	(74)

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South	15.4500		46.7521		0.6300		0.7000		0.7700		220.7502 (78)	
Solar gains	259.6491	435.8698	586.8458	723.3956	815.7133	814.5773	783.1831	712.0169	632.9508	478.4356	309.6511	223.1766 (83)
Total gains	976.9686	1178.3635	1294.5814	1412.8414	1468.5846	1446.4818	1389.8350	1316.3234	1256.1265	1118.8746	987.8958	923.1567 (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	26.2379	26.2671	26.2958	26.4314	26.4570	26.5765	26.5765	26.5987	26.5303	26.4570	26.4054	26.3517
alpha	2.7492	2.7511	2.7531	2.7621	2.7638	2.7718	2.7718	2.7732	2.7687	2.7638	2.7604	2.7568
util living area	0.9816	0.9687	0.9509	0.9128	0.8455	0.7285	0.5962	0.6361	0.8034	0.9263	0.9708	0.9842 (86)
MIT	18.2271	18.5447	18.9925	19.5961	20.1716	20.6337	20.8519	20.8171	20.4764	19.7235	18.8659	18.1664 (87)
Th 2	20.0347	20.0357	20.0366	20.0411	20.0419	20.0458	20.0458	20.0466	20.0443	20.0419	20.0402	20.0385 (88)
util rest of house	0.9788	0.9640	0.9429	0.8973	0.8143	0.6662	0.4978	0.5417	0.7533	0.9101	0.9655	0.9818 (89)
MIT 2	17.4743	17.7896	18.2334	18.8282	19.3804	19.8009	19.9726	19.9507	19.6698	18.9600	18.1140	17.4164 (90)
Living area fraction	17.5331	17.8486	18.2927	18.8882	19.4422	19.8659	20.0413	20.0183	19.7328	19.0196	18.1728	17.4750 (92)
MIT	17.5331	17.8486	18.2927	18.8882	19.4422	19.8659	20.0413	20.0183	19.7328	19.0196	18.1728	17.4750 (93)
Temperature adjustment												0.0000
adjusted MIT	17.5331	17.8486	18.2927	18.8882	19.4422	19.8659	20.0413	20.0183	19.7328	19.0196	18.1728	17.4750 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9681	0.9488	0.9235	0.8735	0.7908	0.6528	0.4973	0.5386	0.7339	0.8874	0.9509	0.9722 (94)
Useful gains	945.8258	1118.0370	1195.5335	1234.0856	1161.3115	944.3251	691.1404	708.9674	921.8246	992.9364	939.3452	897.5338 (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	2977.4819	2910.2235	2647.5387	2230.9143	1727.5941	1169.7606	764.4297	803.0965	1253.4201	1878.7521	2475.6022	2974.0207 (97)
Space heating kWh	1511.5522	1204.3493	1080.2919	717.7167	421.3143	0.0000	0.0000	0.0000	0.0000	659.0469	1106.1051	1544.9063 (98a)
Space heating requirement - total per year (kWh/year)												8245.2825
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	1511.5522	1204.3493	1080.2919	717.7167	421.3143	0.0000	0.0000	0.0000	0.0000	659.0469	1106.1051	1544.9063 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8245.2825
Space heating per m2												(98c) / (4) = 38.7959 (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	2088.0866	1643.8128	1686.8283	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6266	0.7056	0.6742	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1308.3236	1159.8254	1137.2052	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1582.1257	1520.3754	1438.8706	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	197.1375	268.2492	224.4391	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	49.2844	67.0623	56.1098	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												172.4564 (107)
Energy for space heating												38.7959 (99)
Energy for space cooling												0.8114 (108)
Total												39.6073 (109)
Fabric Energy Efficiency (DFEE)												39.6 (109)

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

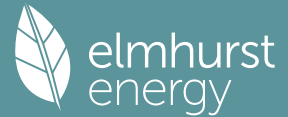
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	91.1500 (1b)	x 2.7500 (2b)	= 250.6625 (1b) - (3b)
First floor	121.3800 (1c)	x 2.3000 (2c)	= 279.1740 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 529.8365 (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)

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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) =	0.0755 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3255 (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) =		0.2767 (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)
	0.3528	0.3458	0.3389	0.3043	0.2974	0.2628	0.2628	0.2559	0.2767	0.2974	0.3113	0.3251	(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	0.5622	0.5598	0.5574	0.5463	0.5442	0.5345	0.5345	0.5327	0.5383	0.5442	0.5484	0.5528	(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	
TER Opaque door			6.4200	1.0000	6.4200			(26)
TER Opening Type (Uw = 1.20)			27.4200	1.1450	31.3969			(27)
Ground Floor			91.1500	0.1300	11.8495			(28a)
Exposed Floor			31.2900	0.1300	4.0677			(28b)
External Wall	204.0400	27.3600	176.6800	0.1800	31.8024			(29a)
Dormer Cheeks	6.3500	4.3400	2.0100	0.1800	0.3618			(29a)
Garage Wall	30.7700	2.1400	28.6300	0.1800	5.1534			(29a)
Roof - ceiling	110.2400		110.2400	0.1100	12.1264			(30)
Roof - pitch	9.9200		9.9200	0.1100	1.0912			(30)
Dormer Roof	3.5400		3.5400	0.1100	0.3894			(30)
Bay Roof	1.0600		1.0600	0.1100	0.1166			(30)
Total net area of external elements Aum(A, m2)			488.3600					(31)
Fabric heat loss, W/K = Sum (A x U)					104.7753			(33)
					(26)...(30) + (32) =			

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	20.4200	0.0500	1.0210
E2 Other lintels (including other steel lintels)	14.4200	0.0500	0.7210
E3 Sill	47.4400	0.0500	2.3720
E4 Jamb	48.9200	0.1600	7.8272
E5 Ground floor (normal)	34.4700	0.0000	0.0000
E6 Intermediate floor within a dwelling	19.7400	0.0600	1.1844
E10 Eaves (insulation at ceiling level)	20.1400	0.0600	1.2084
E12 Gable (insulation at ceiling level)	40.1700	0.0900	3.6153
E16 Corner (normal)	19.8900	-0.0900	-1.7901
E17 Corner (inverted - internal area greater than external area)	2.3600	0.2400	0.5664
E24 Eaves (insulation at ceiling level - inverted)	3.2700	0.0800	0.2616
R3 Jamb of roof window	13.6200	0.0600	0.8172
R6 Flat ceiling	12.8800	0.0600	0.7728
R8 Roof to wall (rafter)	5.3100	0.0400	0.2124
R7 Flat ceiling (inverted)	11.1900	0.3200	3.5808
E20 Exposed floor (normal)	11.1900	0.3200	3.5808
E21 Exposed floor (inverted)	2.5500	0.0800	0.2040
E13 Gable (insulation at rafter level)	2.5500	0.0400	0.1020
R5 Ridge (inverted)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.2572 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 131.0325 (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	98.3016	97.8792	97.4651	95.5203	95.1564	93.4625	93.4625	93.1488	94.1150	95.1564	95.8925	96.6621	(38)
Average = Sum(39)m / 12 =	229.3342	228.9117	228.4977	226.5528	226.1889	224.4950	224.4950	224.1814	225.1475	226.1889	226.9251	227.6946	(39)
												226.5511	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0791	1.0771	1.0751	1.0660	1.0643	1.0563	1.0563	1.0548	1.0594	1.0643	1.0677	1.0714	(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													3.0182 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	32.3006	31.8209	31.1454	29.8998	28.9672	27.9330	27.3744	28.0452	28.7756	29.8822	31.1534	32.1914	(42c)
Average daily hot water use (litres/day)	45.5396	43.8836	42.2276	40.5716	38.9156	37.2596	37.2596	38.9156	40.5716	42.2276	43.8836	45.5396	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	77.8402	75.7045	73.3730	70.4714	67.8828	65.1926	64.6340	66.9608	69.3472	72.1098	75.0369	77.7310	(44)
Energy content (annual)	123.2798	107.8022	112.7715	96.4719	91.3833	80.1619	78.1692	82.9115	85.5120	97.8523	106.9039	121.7079	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water 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	(46)
Total storage loss													

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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 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	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)
WWHRS	104.7878	91.6318	95.8558	82.0011	77.6758	68.1376	66.4439	70.4747	72.6852	83.1744	90.8683	103.4517 (62)
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 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
12Total per year (kWh/year)	104.7878	91.6318	95.8558	82.0011	77.6758	68.1376	66.4439	70.4747	72.6852	83.1744	90.8683	103.4517 (64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m =											1007.1882 (64)
	59.9227	53.3916	58.3016	55.6365	56.6805	54.0677	55.8700	56.6805	55.6365	58.3016	57.2053	59.9227 (64a)
Heat gains from water heating, kWh/month	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											681.6173 (64a)
	41.1776	36.2559	38.5394	34.4094	33.5891	30.5513	30.5785	31.7888	32.0804	35.3690	37.0184	40.8436 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	210.8965	233.4926	210.8965	217.9264	210.8965	217.9264	210.8965	210.8965	217.9264	210.8965	217.9264	210.8965	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	382.8034	386.7757	376.7656	355.4553	328.5550	303.2724	286.3821	282.4098	292.4199	313.7301	340.6305	365.9131	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	(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)	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	(71)
Water heating gains (Table 5)	55.3463	53.9522	51.8002	47.7908	45.1466	42.4324	41.1001	42.7269	44.5562	47.5390	51.4145	54.8973	(72)
Total internal gains	717.3194	742.4937	707.7356	689.4458	652.8714	631.9045	606.6520	604.3065	623.1757	640.4389	678.2446	699.9802	(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						11.9700	10.6334	0.6300	0.7000	0.7700		38.8989 (74)
South						15.4500	46.7521	0.6300	0.7000	0.7700		220.7502 (78)
Solar gains	259.6491	435.8698	586.8458	723.3956	815.7133	814.5773	783.1831	712.0169	632.9508	478.4356	309.6511	223.1766 (83)
Total gains	976.9686	1178.3635	1294.5814	1412.8414	1468.5846	1446.4818	1389.8350	1316.3234	1256.1265	1118.8746	987.8958	923.1567 (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	25.7424	25.7899	25.8366	26.0584	26.1004	26.2973	26.2973	26.3341	26.2211	26.1004	26.0157	25.9278
alpha	2.7162	2.7193	2.7224	2.7372	2.7400	2.7532	2.7532	2.7556	2.7481	2.7400	2.7344	2.7285
util living area	0.9817	0.9689	0.9514	0.9138	0.8474	0.7311	0.5996	0.6391	0.8056	0.9270	0.9709	0.9842 (86)
MIT	18.1760	18.4960	18.9495	19.5668	20.1505	20.6239	20.8468	20.8115	20.4635	19.6995	18.8320	18.1231 (87)
Th 2	20.0180	20.0196	20.0212	20.0287	20.0301	20.0367	20.0367	20.0379	20.0342	20.0301	20.0273	20.0243 (88)
util rest of house	0.9788	0.9641	0.9434	0.8982	0.8162	0.6686	0.5002	0.5440	0.7554	0.9109	0.9656	0.9818 (89)
MIT 2	17.4128	17.7310	18.1808	18.7912	19.3522	19.7854	19.9610	19.9393	19.6506	18.9287	18.0721	17.3643 (90)
Living area fraction	17.4724	17.7907	18.2409	18.8518	19.4146	19.8509	20.0302	20.0074	19.7141	18.9889	18.1315	17.4235 (92)
MIT Temperature adjustment	17.4724	17.7907	18.2409	18.8518	19.4146	19.8509	20.0302	20.0074	19.7141	18.9889	18.1315	17.4235 (93)
adjusted MIT	17.4724	17.7907	18.2409	18.8518	19.4146	19.8509	20.0302	20.0074	19.7141	18.9889	18.1315	17.4235 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9680	0.9488	0.9238	0.8742	0.7922	0.6548	0.4995	0.5407	0.7355	0.8879	0.9508	0.9721	(94)
Useful gains	945.6936	1118.0604	1195.8856	1235.0863	1163.4641	947.1460	694.2232	711.6741	923.8581	993.4975	939.3364	897.4118	(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	3020.8857	2950.8403	2682.7595	2254.6099	1744.9488	1178.7991	770.0692	808.7094	1263.9967	1897.4704	2503.3127	3010.9277	(97)
Space heating kWh	1543.9430	1231.6281	1106.2342	734.0570	432.6246	0.0000	0.0000	0.0000	0.0000	672.5558	1126.0629	1572.4559	(98a)
Space heating requirement - total per year (kWh/year)	8419.5613												
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	1543.9430	1231.6281	1106.2342	734.0570	432.6246	0.0000	0.0000	0.0000	0.0000	672.5558	1126.0629	1572.4559	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	8419.5613												
Space heating per m2	(98c) / (4) = 39.6159 (99)												

8c. Space cooling requirement

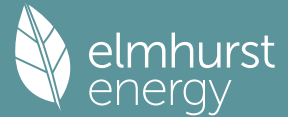
Calculated for June, July and August. See Table 10b

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	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	2110.2535	1661.2634	1703.7784	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6212	0.7003	0.6691	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1310.9827	1163.3365	1140.0056	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1582.1257	1520.3754	1438.8706	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	195.2230	265.6369	222.3556	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	48.8057	66.4092	55.5889	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement													170.8039 (107)
Energy for space heating													39.6159 (99)
Energy for space cooling													0.8037 (108)
Total													40.4195 (109)
Fabric Energy Efficiency (TFEE)													40.4 (109)

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Property Reference	OP-D320 P5MALL				Issued on Date	29/11/2024	
Assessment Reference	P5MALL		Prop Type Ref	P5MALL			
Property	P5MALL						
SAP Rating	81 B	DER	3.62	TER	8.69		
Environmental	96 A	% DER < TER				58.34	
CO ₂ Emissions (t/year)	0.7	DFEE	39.61	TFEE	40.42		
Compliance Check	See BREL	% DFEE < TFEE				2.01	
% DPER < TPER	16.92	DPER	37.93	TPER	45.66		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
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)
Ground floor	91.1500 (1b)	x 2.7500 (2b)	= 250.6625 (1b) - (3b)
First floor	121.3800 (1c)	x 2.3000 (2c)	= 279.1740 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 529.8365 (5)

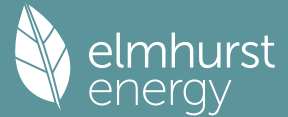
2. Ventilation rate

	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	0 * 10 = 0.0000 (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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.1750 (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) = 0.1487 (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	0.1897 0.1859 0.1822 0.1636 0.1599 0.1413 0.1413 0.1376 0.1487 0.1599 0.1673 0.1748 (22b)
Balanced mechanical ventilation with heat recovery	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	69.6000 (23c)
Effective ac	0.3417 0.3379 0.3342 0.3156 0.3119 0.2933 0.2933 0.2896 0.3007 0.3119 0.3193 0.3268 (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
Front Door			6.4200	1.0000	6.4200		(26)
Windows (Uw = 1.30)			27.4200	1.2357	33.8840		(27)
Ground Floor			91.1500	0.1100	10.0265		(28a)
Exposed Floor			31.2900	0.1400	4.3806		(28b)
External Wall	204.0400	27.3600	176.6800	0.1700	30.0356		(29a)
Dormer Cheeks	6.3500	4.3400	2.0100	0.1900	0.3819		(29a)
Garage Wall	30.7700	2.1400	28.6300	0.1700	4.8671		(29a)
Roof - ceiling	110.2400		110.2400	0.1100	12.1264		(30)
Roof - pitch	9.9200		9.9200	0.2000	1.9840		(30)
Dormer Roof	3.5400		3.5400	0.2000	0.7080		(30)
Bay Roof	1.0600		1.0600	0.1100	0.1166		(30)
Total net area of external elements Aum(A, m ²)			488.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	104.9307		(33)

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

100.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	20.4200	0.0500	1.0210
E2 Other lintels (including other steel lintels)	14.4200	0.0500	0.7210
E3 Sill	47.4400	0.0500	2.3720
E4 Jamb	48.9200	0.1600	7.8272
E5 Ground floor (normal)	34.4700	0.0000	0.0000
E6 Intermediate floor within a dwelling	19.7400	0.0600	1.1844
E10 Eaves (insulation at ceiling level)	20.1400	0.0600	1.2084
E12 Gable (insulation at ceiling level)	40.1700	0.0900	3.6153
E16 Corner (normal)	19.8900	-0.0900	-1.7901
E17 Corner (inverted - internal area greater than external area)	2.3600	0.2400	0.5664
E24 Eaves (insulation at ceiling level - inverted)	3.2700	0.0800	0.2616
R3 Jamb of roof window	13.6200	0.0600	0.8172
R6 Flat ceiling	12.8800	0.0600	0.7728
R8 Roof to wall (rafter)	5.3100	0.0400	0.2124
R7 Flat ceiling (inverted)	11.1900	0.3200	3.5808
E20 Exposed floor (normal)	11.1900	0.3200	3.5808
E21 Exposed floor (inverted)	2.5500	0.0600	0.1530
E13 Gable (insulation at rafter level)	2.5500	0.0400	0.1020
R5 Ridge (inverted)			

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

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 131.1369 (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	59.7372	59.0870	58.4368	55.1858	54.5356	51.2845	51.2845	50.6343	52.5849	54.5356	55.8360	57.1364 (38)
Heat transfer coeff	190.8742	190.2240	189.5738	186.3227	185.6725	182.4215	182.4215	181.7713	183.7219	185.6725	186.9729	188.2733 (39)
Average = Sum(39)m / 12 =												186.1602

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8981	0.8950	0.8920	0.8767	0.8736	0.8583	0.8583	0.8553	0.8645	0.8736	0.8797	0.8859 (40)
HLP (average)												0.8759
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

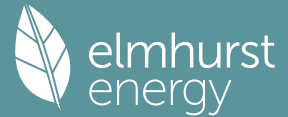
Assumed occupancy													3.0182 (42)
Hot water usage for mixer showers													
102.8850	101.3388	99.0858	94.7749	91.5937	88.0459	86.0294	88.2654	90.7165	94.5257	98.9291	102.4908	(42a)	
Hot water usage for baths													
34.0006	33.4957	32.7846	31.4735	30.4917	29.4031	28.8151	29.5212	30.2901	31.4549	32.7930	33.8857	(42b)	
Hot water usage for other uses													
47.9364	46.1932	44.4501	42.7070	40.9638	39.2207	39.2207	40.9638	42.7070	44.4501	46.1932	47.9364	(42c)	
Average daily hot water use (litres/day)												169.9590 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	184.8220	181.0278	176.3205	168.9554	163.0492	156.6697	154.0652	158.7505	163.7135	170.4307	177.9154	184.3129 (44)	
Energy content (annual)	292.7129	257.7811	270.9980	231.2915	219.4956	192.6437	186.3285	196.5662	201.8751	231.2728	253.4730	288.5894 (45)	
Distribution loss (46)m = 0.15 x (45)m													
43.9069	38.6672	40.6497	34.6937	32.9243	28.8966	27.9493	29.4849	30.2813	34.6909	38.0210	43.2884	(46)	
Water storage loss:													
Store volume												230.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)	
Temperature factor from Table 2b												0.7800 (49)	
Enter (49) or (54) in (55)												1.4040 (55)	
Total storage loss													
43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240	(56)	
If cylinder contains dedicated solar storage													
43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240	(57)	
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month													
391.0945	346.6419	369.3796	326.4995	317.8772	257.2757	253.1149	263.3526	266.5071	329.6544	348.6810	386.9710	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h	391.0945	346.6419	369.3796	326.4995	317.8772	257.2757	253.1149	263.3526	266.5071	329.6544	348.6810	386.9710 (64)	
12Total per year (kWh/year)												3857.0495 (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	141.2131	125.3513	133.9929	119.3748	116.8684	82.0636	80.5641	83.9682	85.1331	120.7843	126.7502	139.8421 (65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	210.8965	233.4926	210.8965	217.9264	210.8965	217.9264	210.8965	210.8965	217.9264	210.8965	217.9264	210.8965 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	382.8034	386.7757	376.7656	355.4553	328.5550	303.2724	286.3821	282.4098	292.4199	313.7301	340.6305	365.9131 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911 (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)	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287 (71)
Water heating gains (Table 5)	189.8026	186.5346	180.0980	165.7984	157.0811	113.9773	108.2851	112.8605	118.2404	162.3445	176.0419	187.9598 (72)
Total internal gains	851.7757	875.0761	836.0334	807.4534	764.8059	703.4494	673.8370	674.4401	696.8599	755.2444	802.8721	833.0426 (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 Specific data or Table 6c	Access factor Table 6d	Gains W	
North	11.9700				10.6334	0.6300		0.7000	0.7700	38.9899 (74)	
South	15.4500				46.7521	0.6300		0.7000	0.7700	220.7502 (78)	

Solar gains	259.6491	435.8698	586.8458	723.3956	815.7133	814.5773	783.1831	712.0169	632.9508	478.4356	309.6511	223.1766 (83)
Total gains	1111.4249	1310.9459	1422.8792	1530.8489	1580.5192	1518.0267	1457.0201	1386.4570	1329.8108	1233.6801	1112.5232	1056.2192 (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	30.9293	31.0351	31.1415	31.6849	31.7958	32.3625	32.3625	32.4782	32.1334	31.7958	31.5747	31.3566
alpha	3.0620	3.0690	3.0761	3.1123	3.1197	3.1575	3.1575	3.1652	3.1422	3.1197	3.1050	3.0904
util living area	0.9738	0.9563	0.9317	0.8792	0.7897	0.6524	0.5098	0.5481	0.7401	0.8940	0.9577	0.9773 (86)
Living	18.7868	19.0961	19.5005	20.0370	20.4921	20.8109	20.9361	20.9185	20.6982	20.1213	19.3766	18.7496
Non living	17.5376	17.9309	18.4430	19.1199	19.6711	20.0405	20.1615	20.1500	19.9210	19.2346	18.2984	17.4966
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	6	0	0	0	0	0	0	0	0	0	0	0
16 / 9	25	11	0	0	0	0	0	0	0	0	0	31
MIT	19.9891	19.4205	19.5005	20.0370	20.4921	20.8109	20.9361	20.9185	20.6982	20.1213	19.3766	19.7254 (87)
Th 2	20.1691	20.1717	20.1743	20.1874	20.1900	20.2031	20.2031	20.2057	20.1978	20.1900	20.1847	20.1795 (88)
util rest of house	0.9701	0.9503	0.9220	0.8611	0.7563	0.5951	0.4303	0.4696	0.6901	0.8746	0.9509	0.9741 (89)
MIT 2	19.2324	18.4227	18.4430	19.1199	19.6711	20.0405	20.1615	20.1500	19.9210	19.2346	18.2984	18.9953 (90)
Living area fraction									fLA = Living area /	(4) =		0.0781 (91)
MIT	19.2915	18.5006	18.5256	19.1916	19.7352	20.1007	20.2220	20.2100	19.9817	19.3039	18.3826	19.0524 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2915	18.5006	18.5256	19.1916	19.7352	20.1007	20.2220	20.2100	19.9817	19.3039	18.3826	19.0524 (93)

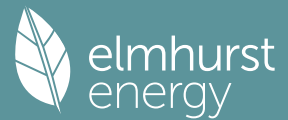
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9655	0.9347	0.8967	0.8343	0.7350	0.5872	0.4323	0.4701	0.6750	0.8482	0.9301	0.9687 (94)
Useful gains	1073.0381	1225.2791	1275.9161	1277.2592	1161.6771	891.3478	629.8500	651.7668	897.6551	1046.3592	1034.7875	1023.1686 (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	2861.4929	2587.1594	2279.7432	1917.5548	1491.9230	1003.4407	660.7353	692.5496	1080.6030	1616.0685	2109.5441	2796.3050 (97)
Space heating kWh	1330.6104	915.1836	746.8474	461.0128	245.7029	0.0000	0.0000	0.0000	0.0000	423.8637	773.8247	1319.2135 (98a)
Space heating requirement - total per year (kWh/year)												6216.2590
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	1330.6104	915.1836	746.8474	461.0128	245.7029	0.0000	0.0000	0.0000	0.0000	423.8637	773.8247	1319.2135 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6216.2590
Space heating per m2										(98c) / (4) =		29.2489 (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 %)												266.6564 (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	1330.6104	915.1836	746.8474	461.0128	245.7029	0.0000	0.0000	0.0000	0.0000	423.8637	773.8247	1319.2135 (98)
Space heating efficiency (main heating system 1)	266.6564	266.6564	266.6564	266.6564	266.6564	0.0000	0.0000	0.0000	0.0000	266.6564	266.6564	266.6564 (210)
Space heating fuel (main heating system)	498.9980	343.2070	280.0785	172.8864	92.1421	0.0000	0.0000	0.0000	0.0000	158.9550	290.1954	494.7240 (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	391.0945	346.6419	369.3796	326.4995	317.8772	257.2757	253.1149	263.3526	266.5071	329.6544	348.6810	386.9710 (64)
Efficiency of water heater	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505	278.5505 (216)
Fuel for water heating, kWh/month	140.4034	124.4449	132.6078	117.2137	114.1183	92.3623	90.8686	94.5439	95.6764	118.3464	125.1770	138.9231 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	97.6118	88.1655	97.6118	94.4630	97.6118	94.4630	97.6118	97.6118	94.4630	97.6118	94.4630	97.6118 (221)
Lighting	43.8201	35.1541	31.6524	23.1899	17.9126	14.6347	16.3404	21.2399	27.5885	36.1977	40.8852	45.0380 (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)

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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												2331.1865	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												278.5505		
Water heating fuel used												1384.6859	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.7780)														
mechanical ventilation fans (SFP = 1.7780)												1149.3001	(230a)	
Total electricity for the above, kWh/year												1149.3001	(231)	
Electricity for lighting (calculated in Appendix L)												353.6536	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												0.0000	(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												5218.8261	(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	2331.1865	0.1553	362.0647	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1384.6859	0.1415	195.9837	(264)
Space and water heating			558.0485	(265)
Pumps, fans and electric keep-hot	1149.3001	0.1387	159.4221	(267)
Energy for lighting	353.6536	0.1443	51.0431	(268)
Total CO2, kg/year			768.5137	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(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	2331.1865	1.5750	3671.5483	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1384.6859	1.5234	2109.4228	(278)
Space and water heating			5780.9711	(279)
Pumps, fans and electric keep-hot	1149.3001	1.5128	1738.6613	(281)
Energy for lighting	353.6536	1.5338	542.4456	(282)
Total Primary energy kWh/year			8062.0780	(286)
Dwelling Primary energy Rate (DPER)			37.9300	(287)

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

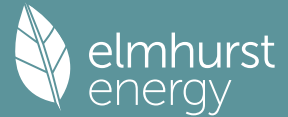
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	91.1500 (1b)	x 2.7500 (2b)	= 250.6625 (1b) - (3b)	
First floor	121.3800 (1c)	x 2.3000 (2c)	= 279.1740 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	212.5300			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	529.8365	(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) =	0.0755 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3255 (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) =	0.2767 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3528	0.3458	0.3389	0.3043	0.2974	0.2628	0.2628	0.2559	0.2767	0.2974	0.3113	0.3251	(22b)
Effective ac	0.5622	0.5598	0.5574	0.5463	0.5442	0.5345	0.5345	0.5327	0.5383	0.5442	0.5484	0.5528	(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	
TER Opaque door			6.4200	1.0000	6.4200			(26)
TER Opening Type (Uw = 1.20)			27.4200	1.1450	31.3969			(27)
Ground Floor			91.1500	0.1300	11.8495			(28a)
Exposed Floor			31.2900	0.1300	4.0677			(28b)
External Wall	204.0400	27.3600	176.6800	0.1800	31.8024			(29a)
Dormer Cheeks	6.3500	4.3400	2.0100	0.1800	0.3618			(29a)
Garage Wall	30.7700	2.1400	28.6300	0.1800	5.1534			(29a)
Roof - ceiling	110.2400		110.2400	0.1100	12.1264			(30)
Roof - pitch	9.9200		9.9200	0.1100	1.0912			(30)
Dormer Roof	3.5400		3.5400	0.1100	0.3894			(30)
Bay Roof	1.0600		1.0600	0.1100	0.1166			(30)
Total net area of external elements Aum(A, m2)			488.3600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	104.7753		(33)

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

100.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	20.4200	0.0500	1.0210
E3 Sill	14.4200	0.0500	0.7210
E4 Jamb	47.4400	0.0500	2.3720
E5 Ground floor (normal)	48.9200	0.1600	7.8272
E6 Intermediate floor within a dwelling	34.4700	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	19.7400	0.0600	1.1844
E12 Gable (insulation at ceiling level)	20.1400	0.0600	1.2084
E16 Corner (normal)	40.1700	0.0900	3.6153
E17 Corner (inverted - internal area greater than external area)	19.8900	-0.0900	-1.7901
E24 Eaves (insulation at ceiling level - inverted)	2.3600	0.2400	0.5664
R3 Jamb of roof window	3.2700	0.0800	0.2616
R6 Flat ceiling	13.6200	0.0600	0.8172
R8 Roof to wall (rafter)	12.8800	0.0600	0.7728
R7 Flat ceiling (inverted)	5.3100	0.0400	0.2124
E20 Exposed floor (normal)	11.1900	0.3200	3.5808
E21 Exposed floor (inverted)	11.1900	0.3200	3.5808
E13 Gable (insulation at rafter level)	2.5500	0.0800	0.2040
R5 Ridge (inverted)	2.5500	0.0400	0.1020

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

26.2572 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 131.0325 (37)

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

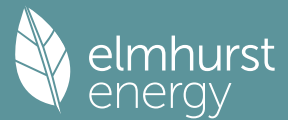
(38)m	Jan 98.3016	Feb 97.8792	Mar 97.4651	Apr 95.5203	May 95.1564	Jun 93.4625	Jul 93.4625	Aug 93.1488	Sep 94.1150	Oct 95.1564	Nov 95.8925	Dec 96.6621	(38)
Heat transfer coeff	229.3342	228.9117	228.4977	226.5528	226.1889	224.4950	224.4950	224.1814	225.1475	226.1889	226.9251	227.6946	(39)
Average = Sum(39)m / 12 =												226.5511	

HLP	Jan 1.0791	Feb 1.0771	Mar 1.0751	Apr 1.0660	May 1.0643	Jun 1.0563	Jul 1.0563	Aug 1.0548	Sep 1.0594	Oct 1.0643	Nov 1.0677	Dec 1.0714	(40)
HLP (average)												1.0660	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0182	(42)
Hot water usage for mixer showers														
74.8254	73.7010	72.0624	68.9272	66.6136	64.0334	62.5668	64.1930	65.9756	68.7459	71.9484	74.5388	74.5388	(42a)	
Hot water usage for baths														
32.3006	31.8209	31.1454	29.8998	28.9672	27.9330	27.3744	28.0452	28.7756	29.8822	31.1534	32.1914	32.1914	(42b)	
Hot water usage for other uses														
45.5396	43.8836	42.2276	40.5716	38.9156	37.2596	37.2596	38.9156	40.5716	42.2276	43.8836	45.5396	45.5396	(42c)	
Average daily hot water use (litres/day)													140.3339	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
152.6656	149.4054	145.4353	139.3987	134.4963	129.2260	127.2008	131.1538	135.3228	140.8557	146.9854	152.2697	152.2697	(44)	
Energy content (annual)	241.7850	212.7514	223.5287	190.8298	181.0579	158.8985	153.8384	162.3958	166.8665	191.1399	209.4076	238.4176	(45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2330.9172		
36.2678	31.9127	33.5293	28.6245	27.1587	23.8348	23.0758	24.3594	25.0300	28.6710	31.4111	35.7626	(46)		
Water storage loss:														
Store volume													230.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7973	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.9706	(55)
Total storage loss														
30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	(56)	
If cylinder contains dedicated solar storage														
30.0872	27.1756	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	29.1167	30.0872	29.1167	30.0872	30.0872	(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														
295.1346	260.9381	276.8783	242.4585	234.4076	210.5271	207.1880	215.7455	218.4952	244.4895	261.0363	291.7672	(62)		
WWHRS	-34.2071	-30.2530	-31.6792	-26.2316	-24.4469	-20.9194	-19.6086	-20.8518	-21.6440	-25.5159	-28.9065	-33.5736	(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														
260.9276	230.6851	245.1991	216.2268	209.9606	189.6077	187.5794	194.8936	196.8512	218.9735	232.1298	258.1936	(64)		
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =		2641.2281	(64)		
Electric shower(s)											2641	(64)		

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month	123.0732	109.2892	117.0030	104.7538	102.8815	94.1367	93.8310	96.6763	96.7861	106.2337	110.9310	121.9536 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109	150.9109 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	210.8965	233.4926	210.8965	217.9264	210.8965	217.9264	210.8965	210.8965	217.9264	210.8965	217.9264	210.8965 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	382.8034	386.7757	376.7656	355.4553	328.5550	303.2724	286.3821	282.4098	292.4199	313.7301	340.6305	365.9131 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911	38.0911 (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)	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287	-120.7287 (71)
Water heating gains (Table 5)	165.4210	162.6328	157.2621	145.4914	138.2815	130.7454	126.1169	129.9413	134.4251	142.7872	154.0708	163.9161 (72)
Total internal gains	830.3941	854.1743	816.1975	790.1465	749.0063	720.2175	691.6688	691.5209	713.0446	738.6872	783.9010	811.9989 (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			11.9700		10.6334		0.6300		0.7000		0.7700	38.8989 (74)
South			15.4500		46.7521		0.6300		0.7000		0.7700	220.7502 (78)
Solar gains	259.6491	435.8698	586.8458	723.3956	815.7133	814.5773	783.1831	712.0169	632.9508	478.4356	309.6511	223.1766 (83)
Total gains	1090.0433	1290.0441	1403.0432	1513.5420	1564.7196	1534.7948	1474.8518	1403.5378	1345.9955	1217.1228	1093.5521	1035.1755 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	25.7424	25.7899	25.8366	26.0584	26.1004	26.2973	26.2973	26.3341	26.2211	26.1004	26.0157	25.9278
util living area	2.7162	2.7193	2.7224	2.7372	2.7400	2.7532	2.7532	2.7556	2.7481	2.7400	2.7344	2.7285
	0.9762	0.9618	0.9421	0.9011	0.8299	0.7089	0.5754	0.6132	0.7833	0.9133	0.9632	0.9792 (86)
MIT	18.2794	18.5935	19.0383	19.6388	20.2040	20.6542	20.8621	20.8307	20.5055	19.7730	18.9250	18.2267 (87)
Th 2	20.0180	20.0196	20.0212	20.0287	20.0301	20.0367	20.0367	20.0379	20.0342	20.0301	20.0273	20.0243 (88)
util rest of house	0.9726	0.9560	0.9328	0.8839	0.7965	0.6450	0.4772	0.5184	0.7305	0.8948	0.9567	0.9761 (89)
MIT 2	16.8062	17.2057	17.7702	18.5279	19.2208	19.7433	19.9505	19.9259	19.5856	18.7055	17.6354	16.7427 (90)
Living area fraction	16.9213	17.3141	17.8693	18.6147	19.2976	19.8144	20.0217	19.9965	19.6575	18.7889	17.7361	16.8586 (92)
MIT	16.9213	17.3141	17.8693	18.6147	19.2976	19.8144	20.0217	19.9965	19.6575	18.7889	17.7361	16.8586 (93)
Temperature adjustment												0.0000
adjusted MIT	16.9213	17.3141	17.8693	18.6147	19.2976	19.8144	20.0217	19.9965	19.6575	18.7889	17.7361	16.8586 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9549	0.9327	0.9044	0.8512	0.7660	0.6282	0.4755	0.5138	0.7059	0.8630	0.9338	0.9599 (94)
Ext temp.	1040.8510	1203.1861	1268.8916	1288.3429	1198.5114	964.1382	701.2782	721.1857	950.1439	1050.3736	1021.1407	993.6820 (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	2894.4882	2841.7297	2597.8563	2200.8933	1718.4832	1170.6106	768.1459	806.2769	1251.2554	1852.2307	2413.5989	2882.2948 (97)
Space heating requirement - total per year (kWh/year)	1379.1061	1101.1013	988.7497	657.0362	386.8590	0.0000	0.0000	0.0000	0.0000	596.5817	1002.5699	1405.1279 (98a)
Solar heating kWh	1379.1061	1101.1013	988.7497	657.0362	386.8590	0.0000	0.0000	0.0000	0.0000	596.5817	1002.5699	1405.1279 (98a)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh	1379.1061	1101.1013	988.7497	657.0362	386.8590	0.0000	0.0000	0.0000	0.0000	596.5817	1002.5699	1405.1279 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1379.1061	1101.1013	988.7497	657.0362	386.8590	0.0000	0.0000	0.0000	0.0000	596.5817	1002.5699	1405.1279 (98c)
Space heating per m2												7517.1320 (98c) / (4) = 35.3697 (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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1379.1061	1101.1013	988.7497	657.0362	386.8590	0.0000	0.0000	0.0000	0.0000	596.5817	1002.5699	1405.1279 (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)	1494.1561	1192.9592	1071.2348	711.8486	419.1321	0.0000	0.0000	0.0000	0.0000	646.3507	1086.2079	1522.3488 (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)

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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	260.9276	230.6851	245.1991	216.2268	209.9606	189.6077	187.5794	194.8936	196.8512	218.9735	232.1298	258.1936	(64)
Efficiency of water heater	87.2347	87.0985	86.8535	86.3876	85.4112	79.8000	79.8000	79.8000	79.8000	86.1900	86.9562	79.8000	(216)
(217)m	87.2347	87.0985	86.8535	86.3876	85.4112	79.8000	79.8000	79.8000	79.8000	86.1900	86.9562	87.2721	(217)
Fuel for water heating, kWh/month	299.1098	264.8555	282.3134	250.2985	245.8234	237.6037	235.0619	244.2276	246.6807	254.0590	266.9502	295.8489	(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	43.8201	35.1541	31.6524	23.1899	17.9126	14.6347	16.3404	21.2399	27.5885	36.1977	40.8852	45.0380	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-78.8969	-108.0902	-150.9305	-164.5425	-172.9952	-159.6758	-157.4815	-150.6997	-138.2793	-120.9332	-85.5254	-68.5658	(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	-54.5647	-113.4996	-223.3670	-332.4100	-436.7386	-438.0250	-433.0691	-368.1061	-271.5844	-161.5111	-72.5612	-43.2643	(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												8144.2383	(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												3122.8325	(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)												353.6536	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4505.3171	(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												7201.4073	(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	8144.2383	0.2100	1710.2900 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3122.8325	0.2100	655.7948 (264)
Space and water heating			2366.0849 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	353.6536	0.1443	51.0431 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1556.6160	0.1353	-210.5394
PV Unit electricity exported	-2948.7011	0.1262	-372.0024
Total			-582.5418 (269)
Total CO2, kg/year			1846.5154 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.6900 (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	8144.2383	1.1300	9202.9893 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3122.8325	1.1300	3528.8007 (278)
Space and water heating			12731.7900 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	353.6536	1.5338	542.4456 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1556.6160	1.4999	-2334.7922
PV Unit electricity exported	-2948.7011	0.4631	-1365.5367
Total			-3700.3289 (283)
Total Primary energy kWh/year			9704.0076 (286)
Target Primary Energy Rate (TPER)			45.6600 (287)