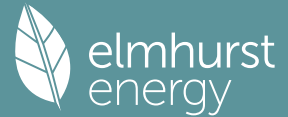


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Property Reference	OP-D320 P4ASTE				Issued on Date	29/11/2024
Assessment Reference	P4ASTE	Prop Type Ref	P4ASTE			
Property	P4ASTE					
SAP Rating	81 B	DER	3.85	TER	9.61	
Environmental	96 A	% DER < TER				59.94
CO ₂ Emissions (t/year)	0.53	DFEE	38.33	TFEE	39.29	
Compliance Check	See BREL	% DFEE < TFEE				2.44
% DPER < TPER	19.48	DPER	40.51	TPER	50.31	
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	64.9300 (1b)	x 2.6000 (2b)	= 168.8180 (1b) - (3b)
First floor	84.7200 (1c)	x 2.3000 (2c)	= 194.8560 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	149.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 363.6740 (5)

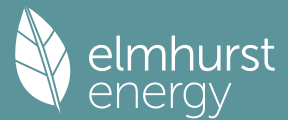
2. Ventilation rate

	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) =												71.2000 (23c)
Effective ac	0.3337	0.3299	0.3262	0.3076	0.3039	0.2853	0.2853	0.2816	0.2927	0.3039	0.3113	0.3188 (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			4.2800	1.0000	4.2800		(26)
Windows (Uw = 1.30)			19.3900	1.2357	23.9610		(27)
Ground Floor			64.9300	0.1100	7.1423		(28a)
Exposed Floor			19.7900	0.1400	2.7706		(28b)
External Wall	158.3200	22.8400	135.4800	0.1700	23.0316		(29a)
Dormer Cheeks	1.3500	0.8300	0.5200	0.1900	0.0988		(29a)
Garage Wall	10.7400		10.7400	0.1700	1.8258		(29a)
Stud Wall	5.7300		5.7300	0.1700	0.9741		(29a)
Roof - ceiling	77.6900		77.6900	0.1100	8.5459		(30)
Roof - pitch	7.7400		7.7400	0.2000	1.5480		(30)
Dormer Roof	0.9900		0.9900	0.2000	0.1980		(30)
Total net area of external elements Aum(A, m ²)			347.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.3761		(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	15.1000	0.0500	0.7550
E2 Other lintels (including other steel lintels)	12.5000	0.0500	0.6250
E3 Sill	35.2700	0.0500	1.7635
E4 Jamb	32.2600	0.1600	5.1616
E5 Ground floor (normal)	28.1300	0.0000	0.0000
E6 Intermediate floor within a dwelling	16.8000	0.0600	1.0080
E10 Eaves (insulation at ceiling level)	15.4600	0.0600	0.9276
E12 Gable (insulation at ceiling level)	22.0200	0.0900	1.9818
E16 Corner (normal)	3.9800	-0.0900	-0.3582
E17 Corner (inverted - internal area greater than external area)	2.3600	0.2400	0.5664
E24 Eaves (insulation at ceiling level - inverted)	1.3300	0.0800	0.1064
R3 Jamb of roof window	2.8300	0.0600	0.1698
R6 Flat ceiling	5.8800	0.0600	0.3528
R8 Roof to wall (rafter)	1.2500	0.0400	0.0500
R7 Flat ceiling (inverted)	13.8700	0.3200	4.4384
E20 Exposed floor (normal)	4.1300	0.3200	1.3216
E21 Exposed floor (inverted)	3.7000	0.0600	0.2220
E13 Gable (insulation at rafter level)	1.0300	0.0400	0.0412
R5 Ridge (inverted)	2.5700	0.0400	0.1028
E11 Eaves (insulation at rafter level)			

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

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 93.6118 (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	40.0429	39.5966	39.1503	36.9188	36.4725	34.2410	34.2410	33.7947	35.1336	36.4725	37.3651	38.2577
Heat transfer coeff	133.6547	133.2084	132.7621	130.5306	130.0844	127.8529	127.8529	127.4066	128.7455	130.0844	130.9769	131.8695
Average = Sum(39)m / 12 =						127.8529	127.8529	127.4066	128.7455	130.0844	130.9769	131.8695

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8931	0.8901	0.8872	0.8722	0.8693	0.8543	0.8543	0.8514	0.8603	0.8693	0.8752	0.8812
HLP (average)												0.8715
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

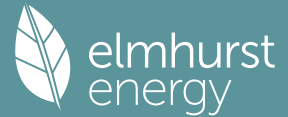
Assumed occupancy												2.9336 (42)
Hot water usage for mixer showers	100.9351	99.4183	97.2079	92.9788	89.8578	86.3773	84.3990	86.5926	88.9972	92.7342	97.0542	100.5484
Hot water usage for baths	33.3587	32.8633	32.1656	30.8793	29.9161	28.8480	28.2711	28.9639	29.7182	30.8611	32.1739	33.2459
Hot water usage for other uses	47.0247	45.3147	43.6047	41.8947	40.1847	38.4747	38.4747	40.1847	41.8947	43.6047	45.3147	47.0247
Average daily hot water use (litres/day)												166.7373

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	181.3185	177.5962	172.9782	165.7527	159.9586	153.7000	151.1448	155.7412	160.6101	167.2000	174.5428	180.8190
Energy conte	287.1642	252.8947	265.8611	226.9072	215.3350	188.9921	182.7965	192.8401	198.0483	226.8888	248.6682	283.1188
Energy content (annual)										Total = Sum(45)m =		2769.5150
Distribution loss (46)m = 0.15 x (45)m	43.0746	37.9342	39.8792	34.0361	32.3002	28.3488	27.4195	28.9260	29.7073	34.0333	37.3002	42.4678
Water storage loss:												
Store volume												230.0000
a) If manufacturer declared loss factor is known (kWh/day):												1.8000
Temperature factor from Table 2b												0.7800
Enter (49) or (54) in (55)												1.4040
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
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
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
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
Total heat required for water heating calculated for each month	385.5458	341.7555	364.2427	322.1152	313.7166	253.6241	249.5829	259.6265	262.6803	325.2704	343.8762	381.5004
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
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
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
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
Output from w/h	385.5458	341.7555	364.2427	322.1152	313.7166	253.6241	249.5829	259.6265	262.6803	325.2704	343.8762	381.5004
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3803.5366
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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month	139.3682	123.7265	132.2849	117.9170	115.4850	80.8495	79.3898	82.7293	83.8607	119.3266	125.1526	138.0231

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

Metabolic gains (Table 5), Watts												
(66)m	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	176.2078	195.0872	176.2078	182.0814	176.2078	182.0814	176.2078	176.2078	182.0814	176.2078	182.0814	176.2078
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	320.1417	323.4638	315.0923	297.2703	274.7733	253.6293	239.5038	236.1817	244.5533	262.3752	284.8722	306.0162
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682
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
Losses e.g. evaporation (negative values) (Table 5)	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456
Water heating gains (Table 5)	187.3228	184.1168	177.8023	163.7737	155.2217	112.2909	106.7067	111.1952	116.4732	160.3852	173.8230	185.5149
Total internal gains	750.6770	769.6725	736.1070	710.1301	673.2075	615.0063	589.4229	590.5894	610.1125	665.9729	707.7813	734.7436

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
North	10.6600				10.6334	0.6300	0.7000	0.7000	0.7700	34.6418 (74)	
South	8.7300				46.7521	0.6300	0.7000	0.7000	0.7700	124.7346 (78)	
Solar gains	159.3764	270.4854	372.7143	474.7996	549.8877	555.5208	531.4599	472.8735	407.0851	299.1437	136.6613 (83)
Total gains	910.0534	1040.1579	1108.8213	1184.9297	1223.0952	1170.5271	1120.8828	1063.4630	1017.1976	965.1166	871.4049 (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	31.1021	31.2063	31.3112	31.8465	31.9558	32.5135	32.5135	32.6274	32.2881	31.9558	31.7380	31.5232
alpha	3.0735	3.0804	3.0874	3.1231	3.1304	3.1676	3.1676	3.1752	3.1525	3.1304	3.1159	3.1015
util living area	0.9614	0.9415	0.9137	0.8534	0.7537	0.6117	0.4720	0.5104	0.7055	0.8676	0.9407	0.9657 (86)
Living	18.9701	19.2549	19.6329	20.1432	20.5654	20.8448	20.9492	20.9342	20.7415	20.2218	19.5308	18.9355
Non living	17.7716	18.1323	18.6091	19.2490	19.7548	20.0749	20.1740	20.1647	19.9674	19.3561	18.4931	17.7343
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.9616	19.2549	19.6329	20.1432	20.5654	20.8448	20.9492	20.9342	20.7415	20.2218	19.5308	19.2243 (87)
Th 2	20.1734	20.1759	20.1784	20.1912	20.1937	20.2065	20.2065	20.2090	20.2014	20.1937	20.1886	20.1835 (88)
util rest of house	0.9563	0.9339	0.9021	0.8328	0.7181	0.5547	0.3965	0.4350	0.6539	0.8450	0.9317	0.9611 (89)
MIT 2	19.2159	18.1323	18.6091	19.2490	19.7548	20.0749	20.1740	20.1647	19.9674	19.3561	18.4931	18.1756 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.2926	18.2478	18.7145	19.3410	19.8382	20.1542	20.2537	20.2439	20.0471	19.4452	18.5999	18.2836 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.2926	18.2478	18.7145	19.3410	19.8382	20.1542	20.2537	20.2439	20.0471	19.4452	18.5999	18.2836 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9497	0.9104	0.8760	0.8076	0.7007	0.5507	0.4012	0.4385	0.6430	0.8199	0.9084	0.9468 (94)
Useful gains	864.3067	946.9257	971.3097	956.9297	857.0146	644.6007	449.6534	466.2947	654.0193	791.2789	816.1118	825.0806 (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	2003.8322	1778.0410	1621.6199	1362.8705	1058.6552	710.1167	467.1409	489.7418	765.6608	1150.6179	1506.2255	1857.1918 (97)
Space heating kWh	847.8069	558.5095	483.8308	292.2774	150.0206	0.0000	0.0000	0.0000	0.0000	267.3482	496.8819	767.8907 (98a)
Space heating requirement - total per year (kWh/year)	3864.5660											
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	847.8069	558.5095	483.8308	292.2774	150.0206	0.0000	0.0000	0.0000	0.0000	267.3482	496.8819	767.8907 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3864.5660											
Space heating per m2	(98c) / (4) = 25.8240 (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 %)												246.8529 (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	847.8069	558.5095	483.8308	292.2774	150.0206	0.0000	0.0000	0.0000	0.0000	267.3482	496.8819	767.8907 (98)
Space heating efficiency (main heating system 1)	246.8529	246.8529	246.8529	246.8529	246.8529	0.0000	0.0000	0.0000	0.0000	246.8529	246.8529	246.8529 (210)
Space heating fuel (main heating system)	343.4462	226.2519	195.9996	118.4014	60.7733	0.0000	0.0000	0.0000	0.0000	108.3027	201.2866	311.0722 (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	385.5458	341.7555	364.2427	322.1152	313.7166	253.6241	249.5829	259.6265	262.6803	325.2704	343.8762	381.5004 (64)
Water heating requirement	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089 (216)
Efficiency of water heater (217)m	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089 (217)
Fuel for water heating, kWh/month	142.9488	126.7127	135.0503	119.4307	116.3167	94.0362	92.5379	96.2618	97.3940	120.6005	127.4990	141.4490 (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)
(221)m	55.9210	50.5093	55.9210	54.1171	55.9210	54.1171	55.9210	55.9210	54.1171	55.9210	54.1171	55.9210 (231)
Pumps and Fa	36.6125	29.3719	26.4462	19.3756	14.9663	12.2276	13.6527	17.7463	23.0507	30.2438	34.1603	37.6301 (232)
Lighting	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 PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
(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 (234a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
(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 (235a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
(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 (235c)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
(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 (233b)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
(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)	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)

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(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												1565.5340	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												269.7089	
Water heating fuel used												1410.2376	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.4840)													
mechanical ventilation fans (SFP = 1.4840)												658.4245	(230a)
Total electricity for the above, kWh/year												658.4245	(231)
Electricity for lighting (calculated in Appendix L)												295.4839	(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												3929.6799	(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	1565.5340	0.1552	242.9517	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1410.2376	0.1415	199.5994	(264)
Space and water heating			442.5511	(265)
Pumps, fans and electric keep-hot	658.4245	0.1387	91.3316	(267)
Energy for lighting	295.4839	0.1443	42.6475	(268)
Total CO2, kg/year			576.5301	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8500	(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	1565.5340	1.5745	2464.9232	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1410.2376	1.5234	2148.3452	(278)
Space and water heating			4613.2684	(279)
Pumps, fans and electric keep-hot	658.4245	1.5128	996.0646	(281)
Energy for lighting	295.4839	1.5338	453.2231	(282)
Total Primary energy kWh/year			6062.5561	(286)
Dwelling Primary energy Rate (DPER)			40.5100	(287)

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

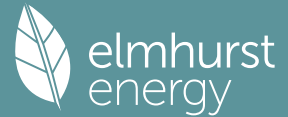
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	64.9300 (1b)	x 2.6000 (2b)	= 168.8180	(1b) - (3b)
First floor	84.7200 (1c)	x 2.3000 (2c)	= 194.8560	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	149.6500			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 363.6740	(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)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1100 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3600	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)

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Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.3060 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.3901	0.3825	0.3748	0.3366	0.3289	0.2907	0.2907	0.2830	0.3060	0.3289	0.3442	0.3595	(22b)
	0.5761	0.5731	0.5703	0.5566	0.5541	0.5423	0.5423	0.5401	0.5468	0.5541	0.5593	0.5646	(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			4.2800	1.0000	4.2800			(26)
TER Opening Type (Uw = 1.20)			19.3900	1.1450	22.2023			(27)
Ground Floor			64.9300	0.1300	8.4409			(28a)
Exposed Floor			19.7900	0.1300	2.5727			(28b)
External Wall	158.3200	22.8400	135.4800	0.1800	24.3864			(29a)
Dormer Cheeks	1.3500	0.8300	0.5200	0.1800	0.0936			(29a)
Garage Wall	10.7400		10.7400	0.1800	1.9332			(29a)
Stud Wall	5.7300		5.7300	0.1800	1.0314			(29a)
Roof - ceiling	77.6900		77.6900	0.1100	8.5459			(30)
Roof - pitch	7.7400		7.7400	0.1100	0.8514			(30)
Dormer Roof	0.9900		0.9900	0.1100	0.1089			(30)
Total net area of external elements Aum(A, m2)			347.2800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.4467			(33)

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

100.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	15.1000	0.0500	0.7550	
E2 Other lintels (including other steel lintels)	12.5000	0.0500	0.6250	
E3 Sill	35.2700	0.0500	1.7635	
E4 Jamb	32.2600	0.1600	5.1616	
E5 Ground floor (normal)	28.1300	0.0000	0.0000	
E6 Intermediate floor within a dwelling	16.8000	0.0600	1.0080	
E10 Eaves (insulation at ceiling level)	15.4600	0.0600	0.9276	
E12 Gable (insulation at ceiling level)	22.0200	0.0900	1.9818	
E16 Corner (normal)	3.9800	-0.0900	-0.3582	
E17 Corner (inverted - internal area greater than external area)	2.3600	0.2400	0.5664	
E24 Eaves (insulation at ceiling level - inverted)	1.3300	0.0800	0.1064	
R3 Jamb of roof window	2.8300	0.0600	0.1698	
R6 Flat ceiling	5.8800	0.0600	0.3528	
R8 Roof to wall (rafter)	1.2500	0.0400	0.0500	
R7 Flat ceiling (inverted)	13.8700	0.3200	4.4384	
E20 Exposed floor (normal)	4.1300	0.3200	1.3216	
E21 Exposed floor (inverted)	3.7000	0.0800	0.2960	
E13 Gable (insulation at rafter level)	1.0300	0.0400	0.0412	
R5 Ridge (inverted)	2.5700	0.0400	0.1028	
E11 Eaves (insulation at rafter level)				

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

Point Thermal bridges	(36a) =	19.3097	(36)
Total fabric heat loss	(33) + (36) + (36a) =	93.7564	(37)

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

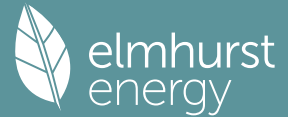
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	69.1396	68.7849	68.4373	66.8045	66.4990	65.0768	65.0768	64.8134	65.6246	66.4990	67.1170	67.7631	(38)
Average = Sum(39)m / 12 =	162.8960	162.5413	162.1937	160.5608	160.2553	158.8332	158.8332	158.5698	159.3810	160.2553	160.8734	161.5195	(39)
												160.5594	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0885	1.0861	1.0838	1.0729	1.0709	1.0614	1.0614	1.0596	1.0650	1.0709	1.0750	1.0793	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9336 (42)
Hot water usage for mixer showers													
Hot water usage for baths	73.4074	72.3042	70.6967	67.6209	65.3511	62.8198	61.3811	62.9764	64.7253	67.4431	70.5849	73.1261	(42a)
Hot water usage for other uses	31.6908	31.2201	30.5574	29.3353	28.4203	27.4056	26.8576	27.5157	28.2323	29.3180	30.5652	31.5837	(42b)
Average daily hot water use (litres/day)	44.6734	43.0489	41.4244	39.8000	38.1755	36.5510	36.5510	38.1755	39.8000	41.4244	43.0489	44.6734	(42c)
												137.6737	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	149.7716	146.5733	142.6785	136.7562	131.9468	126.7764	124.7896	128.6676	132.7575	138.1855	144.1990	149.3832	(44)
Distribution loss (46)m = 0.15 x (45)m	237.2015	208.7184	219.2915	187.2124	177.6258	155.8864	150.9222	159.3174	163.7033	187.5164	205.4379	233.8979	(45)
	35.5802	31.3078	32.8937	28.0819	26.6439	23.3830	22.6383	23.8976	24.5555	28.1275	30.8157	35.0847	(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	290.5512	256.9051	272.6411	238.8411	230.9754	207.5151	204.2718	212.6670	215.3319	240.8661	257.0666	287.2476	(62)
WWHRS	-33.5588	-29.6797	-31.0788	-25.7345	-23.9836	-20.5230	-19.2370	-20.4566	-21.2338	-25.0324	-28.3586	-32.9373	(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													
	256.9924	227.2255	241.5623	213.1066	206.9918	186.9921	185.0348	192.2104	194.0981	215.8337	228.7080	254.3103	(64)
													Total per year (kWh/year) = Sum(64)m = 2603.0658 (64)

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12Total per year (kWh/year)	2603 (64)										
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)											
Heat gains from water heating, kWh/month	121.5492	107.9483	115.5941	103.5511	101.7403	93.1352	92.8613	95.6527	95.7343	105.0289	109.6110 120.4508 (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	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	176.2078	195.0872	176.2078	182.0814	176.2078	182.0814	176.2078	176.2078	182.0814	176.2078	182.0814	176.2078 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	320.1417	323.4638	315.0923	297.2703	274.7733	253.6293	239.5038	236.1817	244.5533	262.3752	284.8722	306.0162 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682 (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)	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456 (71)
Water heating gains (Table 5)	163.3726	160.6373	155.3684	143.8209	136.7477	129.3544	124.8136	128.5655	132.9643	141.1679	152.2376	161.8962 (72)
Total internal gains	729.7268	749.1929	716.6732	693.1773	657.7335	632.0698	607.5299	607.9597	626.6036	649.7555	689.1958	714.1249 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	10.6600	10.6334	0.6300	0.7000	0.7700	34.6418 (74)
South	8.7300	46.7521	0.6300	0.7000	0.7700	124.7346 (78)
Solar gains	159.3764	270.4854	372.7143	474.7996	549.8877	555.5208 531.4599 472.8735 407.0851 299.1437 190.5882 136.6613 (83)
Total gains	889.1032	1019.6784	1089.3875	1167.9769	1207.6211	1187.5906 1138.9898 1080.8332 1033.6887 948.8992 879.7840 850.7862 (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	25.5190	25.5747	25.6295	25.8902	25.9395	26.1718	26.1718	26.2152	26.0818	25.9395	25.8399	25.7365
alpha	2.7013	2.7050	2.7086	2.7260	2.7293	2.7448	2.7448	2.7477	2.7388	2.7293	2.7227	2.7158
util living area	0.9666	0.9508	0.9292	0.8828	0.8035	0.6737	0.5397	0.5783	0.7548	0.8945	0.9506	0.9702 (86)
MIT	18.4090	18.7044	19.1317	19.7235	20.2713	20.6957	20.8817	20.8531	20.5514	19.8541	19.0417	18.3625 (87)
Th 2	20.0102	20.0122	20.0141	20.0230	20.0247	20.0325	20.0325	20.0340	20.0295	20.0247	20.0213	20.0178 (88)
util rest of house	0.9617	0.9436	0.9182	0.8632	0.7672	0.6081	0.4434	0.4843	0.6989	0.8730	0.9421	0.9658 (89)
MIT 2	16.9657	17.3404	17.8815	18.6257	19.2919	19.7786	19.9601	19.9387	19.6285	18.7987	17.7776	16.9111 (90)
Living area fraction									FLA = Living area / (4) =			0.1029 (91)
MIT	17.1142	17.4808	18.0102	18.7387	19.3926	19.8730	20.0549	20.0328	19.7234	18.9073	17.9077	17.0604 (92)
Temperature adjustment												0.0000
adjusted MIT	17.1142	17.4808	18.0102	18.7387	19.3926	19.8730	20.0549	20.0328	19.7234	18.9073	17.9077	17.0604 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9402	0.9174	0.8880	0.8306	0.7394	0.5960	0.4458	0.4842	0.6784	0.8410	0.9160	0.9457 (94)
Useful gains	835.9497	935.4555	967.3670	970.0884	892.8608	707.7782	507.7745	523.3263	701.2380	798.0605	805.9171	804.6298 (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	2087.3870	2044.8946	1866.8777	1579.7073	1232.7876	837.5302	548.7516	576.0515	896.2703	1331.2851	1738.6738	2077.2086 (97)
Space heating kWh	931.0693	745.5431	669.2359	438.9256	252.9056	0.0000	0.0000	0.0000	0.0000	396.7191	671.5848	946.7987 (98a)
Space heating requirement - total per year (kWh/year)												5052.7821
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	931.0693	745.5431	669.2359	438.9256	252.9056	0.0000	0.0000	0.0000	0.0000	396.7191	671.5848	946.7987 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5052.7821
Space heating per m2										(98c) / (4) =		33.7640 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	931.0693	745.5431	669.2359	438.9256	252.9056	0.0000	0.0000	0.0000	0.0000	396.7191	671.5848	946.7987 (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)	1008.7425	807.7390	725.0660	475.5424	274.0039	0.0000	0.0000	0.0000	0.0000	429.8149	727.6109	1025.7840 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

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Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	256.9924	227.2255	241.5623	213.1066	206.9918	186.9921	185.0348	192.2104	194.0981	215.8337	228.7080	254.3103 (64)
Efficiency of water heater	86.6852	86.5207	86.2210	85.6431	84.5102	79.8000	79.8000	79.8000	79.8000	85.4061	86.3267	79.8000 (216)
Fuel for water heating, kWh/month	296.4662	262.6256	280.1665	248.8310	244.9313	234.3260	231.8732	240.8651	243.2307	252.7147	264.9331	86.7290 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685 (231)
Lighting	36.6125	29.3719	26.4462	19.3756	14.9663	12.2276	13.6527	17.7463	23.0507	30.2438	34.1603	37.6301 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-58.7169	-81.7418	-115.9828	-128.5889	-137.0339	-127.2024	-125.5213	-119.2437	-107.9962	-92.5257	-64.1412	-50.8775 (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	-36.3534	-76.1060	-150.6452	-225.4114	-297.3052	-298.5652	-295.1529	-250.3236	-183.9671	-108.6713	-48.4706	-28.7838 (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												5474.3035 (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												3094.1876 (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)												295.4839 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3209.3279 (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												5740.6471 (238)

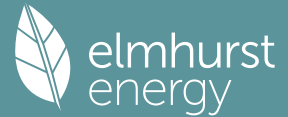
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5474.3035	0.2100	1149.6037 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3094.1876	0.2100	649.7794 (264)
Space and water heating			1799.3831 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	295.4839	0.1443	42.6475 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1209.5722	0.1349	-163.1614
PV Unit electricity exported	-1999.7557	0.1260	-251.9657
Total			-415.1271 (269)
Total CO2, kg/year			1438.8328 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6100 (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	5474.3035	1.1300	6185.9629 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3094.1876	1.1300	3496.4320 (278)
Space and water heating			9682.3949 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	295.4839	1.5338	453.2231 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1209.5722	1.4986	-1812.6102
PV Unit electricity exported	-1999.7557	0.4625	-924.8949
Total			-2737.5051 (283)
Total Primary energy kWh/year			7528.2137 (286)
Target Primary Energy Rate (TPER)			50.3100 (287)

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Property Reference	OP-D320 P4ASTE				Issued on Date	29/11/2024	
Assessment Reference	P4ASTE			Prop Type Ref	P4ASTE		
Property	P4ASTE						
SAP Rating	81 B	DER	3.85	TER	9.61		
Environmental	96 A	% DER < TER				59.94	
CO ₂ Emissions (t/year)	0.53	DFEE	38.33	TFEE	39.29		
Compliance Check	See BREL	% DFEE < TFEE				2.44	
% DPER < TPER	19.48	DPER	40.51	TPER	50.31		
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	64.9300 (1b)	x 2.6000 (2b)	= 168.8180 (1b) - (3b)
First floor	84.7200 (1c)	x 2.3000 (2c)	= 194.8560 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	149.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 363.6740 (5)

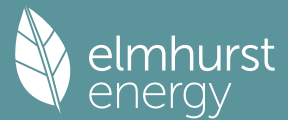
2. Ventilation rate

											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)
											Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											40.0000 / (5) =	0.1100 (8)
Pressure test											Yes	
Pressure Test Method											Blower Door	
Measured/design AP50											3.5000 (17)	
Infiltration rate											0.2850 (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) =	0.2422 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3089	0.3028	0.2967	0.2665	0.2604	0.2301	0.2301	0.2241	0.2422	0.2604	0.2725	0.2846 (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	0.5477	0.5458	0.5440	0.5355	0.5339	0.5265	0.5265	0.5251	0.5293	0.5339	0.5371	0.5405 (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			4.2800	1.0000	4.2800		(26)
Windows (Uw = 1.30)			19.3900	1.2357	23.9610		(27)
Ground Floor			64.9300	0.1100	7.1423		(28a)
Exposed Floor			19.7900	0.1400	2.7706		(28b)
External Wall	158.3200	22.8400	135.4800	0.1700	23.0316		(29a)
Dormer Cheeks	1.3500	0.8300	0.5200	0.1900	0.0988		(29a)
Garage Wall	10.7400		10.7400	0.1700	1.8258		(29a)
Stud Wall	5.7300		5.7300	0.1700	0.9741		(29a)
Roof - ceiling	77.6900		77.6900	0.1100	8.5459		(30)
Roof - pitch	7.7400		7.7400	0.2000	1.5480		(30)
Dormer Roof	0.9900		0.9900	0.2000	0.1980		(30)
Total net area of external elements Aum(A, m ²)			347.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.3761		(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)	15.1000	0.0500	0.7550
E3 Sill	12.5000	0.0500	0.6250
E4 Jamb	35.2700	0.0500	1.7635
E5 Ground floor (normal)	32.2600	0.1600	5.1616
E6 Intermediate floor within a dwelling	28.1300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.8000	0.0600	1.0080
E12 Gable (insulation at ceiling level)	15.4600	0.0600	0.9276
E16 Corner (normal)	22.0200	0.0900	1.9818
E17 Corner (inverted - internal area greater than external area)	3.9800	-0.0900	-0.3582
E24 Eaves (insulation at ceiling level - inverted)	2.3600	0.2400	0.5664
R3 Jamb of roof window	1.3300	0.0800	0.1064
R6 Flat ceiling	2.8300	0.0600	0.1698
R8 Roof to wall (rafter)	5.8800	0.0600	0.3528
R7 Flat ceiling (inverted)	1.2500	0.0400	0.0500
E20 Exposed floor (normal)	13.8700	0.3200	4.4384
E21 Exposed floor (inverted)	4.1300	0.3200	1.3216
E13 Gable (insulation at rafter level)	3.7000	0.0600	0.2220
R5 Ridge (inverted)	1.0300	0.0400	0.0412
E11 Eaves (insulation at rafter level)	2.5700	0.0400	0.1028
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			19.2357 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	93.6118 (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	65.7303	65.5081	65.2902	64.2668	64.0754	63.1841	63.1841	63.0190	63.5274	64.0754	64.4627	64.8676 (38)
Heat transfer coeff	159.3422	159.1199	158.9020	157.8787	157.6872	156.7959	156.7959	156.6309	157.1392	157.6872	158.0745	158.4795 (39)
Average = Sum(39)m / 12 =												157.8778
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0648	1.0633	1.0618	1.0550	1.0537	1.0478	1.0478	1.0466	1.0500	1.0537	1.0563	1.0590 (40)
HLP (average)												1.0550
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9336 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths												
31.6908	31.2201	30.5574	29.3353	28.4203	27.4056	26.8576	27.5157	28.2323	29.3180	30.5652	31.5837	(42b)
Hot water usage for other uses												
44.6734	43.0489	41.4244	39.8000	38.1755	36.5510	36.5510	38.1755	39.8000	41.4244	43.0489	44.6734	(42c)
Average daily hot water use (litres/day)												69.9946 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	76.3642	74.2691	71.9818	69.1353	66.5957	63.9566	63.4085	65.6912	68.0322	70.7424	73.6141	76.2571 (44)
Energy conte	120.9422	105.7582	110.6333	94.6427	89.6507	78.6421	76.6871	81.3394	83.8906	95.9968	104.8768	119.4001 (45)
Energy content (annual)										Total = Sum(45)m =		1162.4601
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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												
102.8009	89.8944	94.0383	80.4463	76.2031	66.8458	65.1841	69.1385	71.3070	81.5973	89.1453	101.4901	(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												
102.8009	89.8944	94.0383	80.4463	76.2031	66.8458	65.1841	69.1385	71.3070	81.5973	89.1453	101.4901	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		988.0911 (64)
Electric shower(s)												988
58.7871	52.3798	57.1967	54.5821	55.6063	53.0430	54.8111	55.6063	54.5821	57.1967	56.1212	58.7871	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												668.6994 (64a)
Heat gains from water heating, kWh/month												
40.3970	35.5685	37.8088	33.7571	32.9523	29.9722	29.9988	31.1862	31.4723	34.6985	36.3166	40.0693	(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	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
176.2078	195.0872	176.2078	182.0814	176.2078	182.0814	176.2078	176.2078	176.2078	182.0814	176.2078	182.0814	176.2078 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
320.1417	323.4638	315.0923	297.2703	274.7733	253.6293	239.5038	236.1817	244.5533	262.3752	284.8722	306.0162	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	(71)
Water heating gains (Table 5)												
54.2970	52.9294	50.8182	46.8849	44.2908	41.6281	40.3210	41.9169	43.7115	46.6378	50.4397	53.8566	(72)
Total internal gains	617.6512	638.4850	609.1230	593.2412	562.2766	544.3434	523.0372	521.3111	537.3508	552.2254	584.3980	603.0853 (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
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North	10.6600	10.6334	0.6300	0.7000	0.7700	34.6418 (74)
South	8.7300	46.7521	0.6300	0.7000	0.7700	124.7346 (78)

Solar gains	159.3764	270.4854	372.7143	474.7996	549.8877	555.5208	531.4599	472.8735	407.0851	299.1437	190.5882	136.6613 (83)
Total gains	777.0276	908.9705	981.8373	1068.0409	1112.1642	1099.8642	1054.4971	994.1847	944.4359	851.3691	774.9862	739.7466 (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	26.0882	26.1246	26.1604	26.3300	26.3620	26.5118	26.5118	26.5398	26.4539	26.3620	26.2974	26.2302
alpha	2.7392	2.7416	2.7440	2.7553	2.7575	2.7675	2.7675	2.7693	2.7636	2.7575	2.7532	2.7487
util living area	0.9755	0.9615	0.9424	0.8999	0.8256	0.7000	0.5666	0.6084	0.7827	0.9138	0.9625	0.9785 (86)
MIT	18.3279	18.6288	19.0620	19.6625	20.2271	20.6701	20.8694	20.8365	20.5130	19.7849	18.9560	18.2723 (87)
Th 2	20.0297	20.0309	20.0321	20.0378	20.0388	20.0437	20.0437	20.0446	20.0418	20.0388	20.0367	20.0345 (88)
util rest of house	0.9717	0.9558	0.9332	0.8826	0.7919	0.6360	0.4694	0.5142	0.7301	0.8955	0.9559	0.9752 (89)
MIT 2	17.5706	17.8690	18.2976	18.8882	19.4268	19.8261	19.9802	19.9603	19.6972	19.0154	18.1999	17.5186 (90)
Living area fraction	17.6485	17.9472	18.3763	18.9679	19.5091	19.9130	20.0717	20.0505	19.7811	19.0945	18.2777	17.5962 (91)
MIT	17.6485	17.9472	18.3763	18.9679	19.5091	19.9130	20.0717	20.0505	19.7811	19.0945	18.2777	17.5962 (92)
Temperature adjustment	17.6485	17.9472	18.3763	18.9679	19.5091	19.9130	20.0717	20.0505	19.7811	19.0945	18.2777	17.5962 (93)
adjusted MIT	17.6485	17.9472	18.3763	18.9679	19.5091	19.9130	20.0717	20.0505	19.7811	19.0945	18.2777	17.5962 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9588	0.9388	0.9126	0.8585	0.7700	0.6262	0.4725	0.5148	0.7133	0.8723	0.9392	0.9634 (94)
Useful gains	745.0214	853.3506	895.9942	916.9324	856.4044	688.7085	498.2914	511.8208	673.6630	742.6482	727.8555	712.6496 (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	2126.9854	2076.0697	1887.1625	1589.5099	1231.4021	833.0537	544.3556	571.7767	892.7268	1339.4819	1766.9154	2123.0214 (97)
Space heating kWh	1028.1812	821.6672	737.4292	484.2558	278.9983	0.0000	0.0000	0.0000	0.0000	444.0443	748.1231	1049.3166 (98a)
Space heating requirement - total per year (kWh/year)												5592.0157
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	1028.1812	821.6672	737.4292	484.2558	278.9983	0.0000	0.0000	0.0000	0.0000	444.0443	748.1231	1049.3166 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5592.0157
Space heating per m2												(98c) / (4) = 37.3673 (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	1473.8815	1160.2897	1190.3945	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6550	0.7312	0.6991	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	965.3820	848.4484	832.1726	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1199.1151	1149.8437	1082.9988	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	168.2878	224.2381	186.6147	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	42.0720	56.0595	46.6537	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												144.7852 (107)
Energy for space heating												37.3673 (99)
Energy for space cooling												0.9675 (108)
Total												38.3348 (109)
Fabric Energy Efficiency (DFEE)												38.3 (109)

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

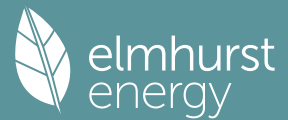
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	64.9300 (1b)	x 2.6000 (2b)	= 168.8180 (1b) - (3b)
First floor	84.7200 (1c)	x 2.3000 (2c)	= 194.8560 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	149.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	363.6740 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)

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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	Air changes per hour	0.1100 (8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				5.0000	(17)
Infiltration rate				0.3600	(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) =			0.3060	(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
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
	0.3901	0.3825	0.3748	0.3366	0.3289	0.2907	0.2907	0.2830	0.3060	0.3289	0.3442	0.3595
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	0.5761	0.5731	0.5703	0.5566	0.5541	0.5423	0.5423	0.5401	0.5468	0.5541	0.5593	0.5646
												(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			4.2800	1.0000	4.2800		(26)
TER Opening Type (Uw = 1.20)			19.3900	1.1450	22.2023		(27)
Ground Floor			64.9300	0.1300	8.4409		(28a)
Exposed Floor			19.7900	0.1300	2.5727		(28b)
External Wall	158.3200	22.8400	135.4800	0.1800	24.3864		(29a)
Dormer Cheeks	1.3500	0.8300	0.5200	0.1800	0.0936		(29a)
Garage Wall	10.7400		10.7400	0.1800	1.9332		(29a)
Stud Wall	5.7300		5.7300	0.1800	1.0314		(29a)
Roof - ceiling	77.6900		77.6900	0.1100	8.5459		(30)
Roof - pitch	7.7400		7.7400	0.1100	0.8514		(30)
Dormer Roof	0.9900		0.9900	0.1100	0.1089		(30)
Total net area of external elements Aum(A, m2)			347.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.4467		(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)	15.1000	0.0500	0.7550
E3 Sill	12.5000	0.0500	0.6250
E4 Jamb	35.2700	0.0500	1.7635
E5 Ground floor (normal)	32.2600	0.1600	5.1616
E6 Intermediate floor within a dwelling	28.1300	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.8000	0.0600	1.0080
E12 Gable (insulation at ceiling level)	15.4600	0.0600	0.9276
E16 Corner (normal)	22.0200	0.0900	1.9818
E17 Corner (inverted - internal area greater than external area)	3.9800	-0.0900	-0.3582
E24 Eaves (insulation at ceiling level - inverted)	2.3600	0.2400	0.5664
R3 Jamb of roof window	1.3300	0.0800	0.1064
R6 Flat ceiling	2.8300	0.0600	0.1698
R8 Roof to wall (rafter)	5.8800	0.0600	0.3528
R7 Flat ceiling (inverted)	1.2500	0.0400	0.0500
E20 Exposed floor (normal)	13.8700	0.3200	4.4384
E21 Exposed floor (inverted)	4.1300	0.3200	1.3216
E13 Gable (insulation at rafter level)	3.7000	0.0800	0.2960
R5 Ridge (inverted)	1.0300	0.0400	0.0412
E11 Eaves (insulation at rafter level)	2.5700	0.0400	0.1028

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.3097 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 93.7564 (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	69.1396	68.7849	68.4373	66.8045	66.4990	65.0768	65.0768	64.8134	65.6246	66.4990	67.1170	67.7631
Average = Sum(39)m / 12 =	162.8960	162.5413	162.1937	160.5608	160.2553	158.8332	158.8332	158.5698	159.3810	160.2553	160.8734	161.5195
												(39)

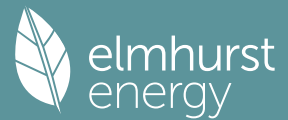
160.5594

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0885	1.0861	1.0838	1.0729	1.0709	1.0614	1.0614	1.0596	1.0650	1.0709	1.0750	1.0793
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												2.9336 (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
Hot water usage for other uses	31.6908	31.2201	30.5574	29.3353	28.4203	27.4056	26.8576	27.5157	28.2323	29.3180	30.5652	31.5837
Average daily hot water use (litres/day)	44.6734	43.0489	41.4244	39.8000	38.1755	36.5510	36.5510	38.1755	39.8000	41.4244	43.0489	44.6734
												(42c)
												(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	76.3642	74.2691	71.9818	69.1353	66.5957	63.9566	63.4085	65.6912	68.0322	70.7424	73.6141	76.2571
Energy content (annual)	120.9422	105.7582	110.6333	94.6427	89.6507	78.6421	76.6871	81.3394	83.8906	95.9968	104.8768	119.4001
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
												(46)

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Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(59)
Total heat required for water heating calculated for each month	102.8009	89.8944	94.0383	80.4463	76.2031	66.8458	65.1841	69.1385	71.3070	81.5973	89.1453	101.4901 (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	102.8009	89.8944	94.0383	80.4463	76.2031	66.8458	65.1841	69.1385	71.3070	81.5973	89.1453	101.4901 (64)
Total per year (kWh/year)											988.0911	(64)
Electric shower(s)											988	(64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											668.6994	(64a)
Heat gains from water heating, kWh/month												
	40.3970	35.5685	37.8088	33.7571	32.9523	29.9722	29.9988	31.1862	31.4723	34.6985	36.3166	40.0693 (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	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	176.2078	195.0872	176.2078	182.0814	176.2078	182.0814	176.2078	176.2078	182.0814	176.2078	182.0814	176.2078 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	320.1417	323.4638	315.0923	297.2703	274.7733	253.6293	239.5038	236.1817	244.5533	262.3752	284.8722	306.0162 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682 (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)												
	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456 (71)
Water heating gains (Table 5)												
	54.2970	52.9294	50.8182	46.8849	44.2908	41.6281	40.3210	41.9169	43.7115	46.6378	50.4397	53.8566 (72)
Total internal gains	617.6512	638.4850	609.1230	593.2412	562.2766	544.3434	523.0372	521.3111	537.3508	552.2254	584.3980	603.0853 (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				10.6600	10.6334	0.6300	0.7000	0.7700	34.6418 (74)			
South				8.7300	46.7521	0.6300	0.7000	0.7700	124.7346 (78)			
Solar gains	159.3764	270.4854	372.7143	474.7996	549.8877	555.5208	531.4599	472.8735	407.0851	299.1437	190.5882	136.6613 (83)
Total gains	777.0276	908.9705	981.8373	1068.0409	1112.1642	1099.8642	1054.4971	994.1847	944.4359	851.3691	774.9862	739.7466 (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	25.5190	25.5747	25.6295	25.8902	25.9395	26.1718	26.1718	26.2152	26.0818	25.9395	25.8399	25.7365
alpha	2.7013	2.7050	2.7086	2.7260	2.7293	2.7448	2.7448	2.7477	2.7388	2.7293	2.7227	2.7158
util living area	0.9756	0.9619	0.9431	0.9012	0.8282	0.7035	0.5708	0.6122	0.7856	0.9148	0.9628	0.9785 (86)
MIT	18.2678	18.5717	19.0115	19.6276	20.2024	20.6586	20.8636	20.8301	20.4976	19.7561	18.9155	18.2207 (87)
Th 2	20.0102	20.0122	20.0141	20.0230	20.0247	20.0325	20.0325	20.0340	20.0295	20.0247	20.0213	20.0178 (88)
util rest of house												
	0.9718	0.9561	0.9339	0.8839	0.7945	0.6391	0.4724	0.5171	0.7328	0.8965	0.9562	0.9752 (89)
MIT 2	17.4985	17.8003	18.2360	18.8444	19.3935	19.8076	19.9664	19.9465	19.6743	18.9780	18.1499	17.4567 (90)
Living area fraction	17.5777	17.8797	18.3158	18.9250	19.4768	19.8952	20.0587	20.0374	19.7590	19.0581	18.2286	17.5353 (91)
MIT	17.5777	17.8797	18.3158	18.9250	19.4768	19.8952	20.0587	20.0374	19.7590	19.0581	18.2286	17.5353 (92)
Temperature adjustment												0.0000
adjusted MIT	17.5777	17.8797	18.3158	18.9250	19.4768	19.8952	20.0587	20.0374	19.7590	19.0581	18.2286	17.5353 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9587	0.9389	0.9130	0.8595	0.7720	0.6287	0.4753	0.5174	0.7155	0.8731	0.9393	0.9633 (94)
Useful gains	744.9586	853.4760	896.4490	918.0338	858.6240	691.5379	501.2239	514.4299	675.7007	743.3103	727.9321	712.5751 (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	2162.8761	2109.7336	1916.4505	1609.6199	1246.2689	841.0490	549.3582	576.7841	901.9405	1355.4499	1790.3027	2153.9073 (97)
Space heating kWh	1054.9306	844.2051	758.8811	497.9420	288.4078	0.0000	0.0000	0.0000	0.0000	455.4319	764.9068	1072.3512 (98a)
Space heating requirement - total per year (kWh/year)												5737.0565
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	1054.9306	844.2051	758.8811	497.9420	288.4078	0.0000	0.0000	0.0000	0.0000	455.4319	764.9068	1072.3512 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5737.0565
Space heating per m ²	(98c) / (4) =											38.3365 (99)

8c. Space cooling requirement

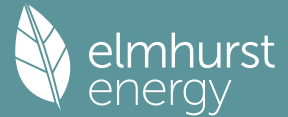
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 Calculated for June, July and August. See Table 10b

	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	1493.0320	1175.3656	1205.1307	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6485	0.7249	0.6929	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	968.1681	851.9826	835.0174	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1199.1151	1149.8437	1082.9988	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	166.2819	221.6087	184.4982	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	41.5705	55.4022	46.1245	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												143.0972 (107)
Energy for space heating												38.3365 (99)
Energy for space cooling												0.9562 (108)
Total												39.2927 (109)
Fabric Energy Efficiency (TFEE)												39.3 (109)

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Property Reference	OP-D320 P4ASTE				Issued on Date	29/11/2024
Assessment Reference	P4ASTE	Prop Type Ref	P4ASTE			
Property	P4ASTE					
SAP Rating	81 B	DER	3.85	TER	9.61	
Environmental	96 A	% DER < TER				59.94
CO ₂ Emissions (t/year)	0.53	DFEE	38.33	TFEE	39.29	
Compliance Check	See BREL	% DFEE < TFEE				2.44
% DPER < TPER	19.48	DPER	40.51	TPER	50.31	
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	64.9300 (1b)	x 2.6000 (2b)	= 168.8180 (1b) - (3b)
First floor	84.7200 (1c)	x 2.3000 (2c)	= 194.8560 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	149.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 363.6740 (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											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											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	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)	
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) =													71.2000 (23c)
Effective ac	0.3337	0.3299	0.3262	0.3076	0.3039	0.2853	0.2853	0.2816	0.2927	0.3039	0.3113	0.3188 (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			4.2800	1.0000	4.2800		(26)
Windows (Uw = 1.30)			19.3900	1.2357	23.9610		(27)
Ground Floor			64.9300	0.1100	7.1423		(28a)
Exposed Floor			19.7900	0.1400	2.7706		(28b)
External Wall	158.3200	22.8400	135.4800	0.1700	23.0316		(29a)
Dormer Cheeks	1.3500	0.8300	0.5200	0.1900	0.0988		(29a)
Garage Wall	10.7400		10.7400	0.1700	1.8258		(29a)
Stud Wall	5.7300		5.7300	0.1700	0.9741		(29a)
Roof - ceiling	77.6900		77.6900	0.1100	8.5459		(30)
Roof - pitch	7.7400		7.7400	0.2000	1.5480		(30)
Dormer Roof	0.9900		0.9900	0.2000	0.1980		(30)
Total net area of external elements Aum(A, m ²)			347.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.3761		(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	15.1000	0.0500	0.7550
E2 Other lintels (including other steel lintels)	12.5000	0.0500	0.6250
E3 Sill	35.2700	0.0500	1.7635
E4 Jamb	32.2600	0.1600	5.1616
E5 Ground floor (normal)	28.1300	0.0000	0.0000
E6 Intermediate floor within a dwelling	16.8000	0.0600	1.0080
E10 Eaves (insulation at ceiling level)	15.4600	0.0600	0.9276
E12 Gable (insulation at ceiling level)	22.0200	0.0900	1.9818
E16 Corner (normal)	3.9800	-0.0900	-0.3582
E17 Corner (inverted - internal area greater than external area)	2.3600	0.2400	0.5664
E24 Eaves (insulation at ceiling level - inverted)	1.3300	0.0800	0.1064
R3 Jamb of roof window	2.8300	0.0600	0.1698
R6 Flat ceiling	5.8800	0.0600	0.3528
R8 Roof to wall (rafter)	1.2500	0.0400	0.0500
R7 Flat ceiling (inverted)	13.8700	0.3200	4.4384
E20 Exposed floor (normal)	4.1300	0.3200	1.3216
E21 Exposed floor (inverted)	3.7000	0.0600	0.2220
E13 Gable (insulation at rafter level)	1.0300	0.0400	0.0412
R5 Ridge (inverted)	2.5700	0.0400	0.1028
E11 Eaves (insulation at rafter level)			

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

Point Thermal bridges	(36a) =	19.2357 (36)
Total fabric heat loss	(33) + (36) + (36a) =	93.6118 (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	40.0429	39.5966	39.1503	36.9188	36.4725	34.2410	34.2410	33.7947	35.1336	36.4725	37.3651	38.2577 (38)
Heat transfer coeff	133.6547	133.2084	132.7621	130.5306	130.0844	127.8529	127.8529	127.4066	128.7455	130.0844	130.9769	131.8695 (39)
Average = Sum(39)m / 12 =												130.4191

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8931	0.8901	0.8872	0.8722	0.8693	0.8543	0.8543	0.8514	0.8603	0.8693	0.8752	0.8812 (40)
HLP (average)												0.8715
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

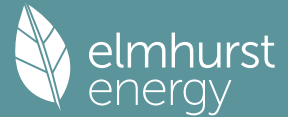
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9336 (42)
Hot water usage for mixer showers	100.9351	99.4183	97.2079	92.9788	89.8578	86.3773	84.3990	86.5926	88.9972	92.7342	97.0542	100.5484 (42a)
Hot water usage for baths	33.3587	32.8633	32.1656	30.8793	29.9161	28.8480	28.2711	28.9639	29.7182	30.8611	32.1739	33.2459 (42b)
Hot water usage for other uses	47.0247	45.3147	43.6047	41.8947	40.1847	38.4747	38.4747	40.1847	41.8947	43.6047	45.3147	47.0247 (42c)
Average daily hot water use (litres/day)												166.7373 (43)
Daily hot water use	181.3185	177.5962	172.9782	165.7527	159.9586	153.7000	151.1448	155.7412	160.6101	167.2000	174.5428	180.8190 (44)
Energy conte	287.1642	252.8947	265.8611	226.9072	215.3350	188.9921	182.7965	192.8401	198.0483	226.8888	248.6682	283.1188 (45)
Energy content (annual)										Total = Sum(45)m =		2769.5150
Distribution loss (46)m = 0.15 x (45)m	43.0746	37.9342	39.8792	34.0361	32.3002	28.3488	27.4195	28.9260	29.7073	34.0333	37.3002	42.4678 (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	0.0000 (61)
Total heat required for water heating calculated for each month	385.5458	341.7555	364.2427	322.1152	313.7166	253.6241	249.5829	259.6265	262.6803	325.2704	343.8762	381.5004 (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	385.5458	341.7555	364.2427	322.1152	313.7166	253.6241	249.5829	259.6265	262.6803	325.2704	343.8762	381.5004 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3803.5366 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	139.3682	123.7265	132.2849	117.9170	115.4850	80.8495	79.3898	82.7293	83.8607	119.3266	125.1526	138.0231 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	176.2078	195.0872	176.2078	182.0814	176.2078	182.0814	176.2078	176.2078	182.0814	176.2078	182.0814	176.2078 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	320.1417	323.4638	315.0923	297.2703	274.7733	253.6293	239.5038	236.1817	244.5533	262.3752	284.8722	306.0162 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682 (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)	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456 (71)
Water heating gains (Table 5)	187.3228	184.1168	177.8023	163.7737	155.2217	112.2909	106.7067	111.1952	116.4732	160.3852	173.8230	185.5149 (72)
Total internal gains	750.6770	769.6725	736.1070	710.1301	673.2075	615.0063	589.4229	590.5894	610.1125	665.9729	707.7813	734.7436 (73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W		
North	10.6600				10.6334	0.6300		0.7000	0.7700	34.6418 (74)		
South	8.7300				46.7521	0.6300		0.7000	0.7700	124.7346 (78)		
Solar gains	159.3764	270.4854	372.7143	474.7996	549.8877	555.5208	531.4599	472.8735	407.0851	299.1437	190.5882	136.6613 (83)
Total gains	910.0534	1040.1579	1108.8213	1184.9297	1223.0952	1170.5271	1120.8828	1063.4630	1017.1976	965.1166	898.3694	871.4049 (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	31.1021	31.2063	31.3112	31.8465	31.9558	32.5135	32.5135	32.6274	32.2881	31.9558	31.7380	31.5232
alpha	3.0735	3.0804	3.0874	3.1231	3.1304	3.1676	3.1676	3.1752	3.1525	3.1304	3.1159	3.1015
util living area	0.9614	0.9415	0.9137	0.8534	0.7537	0.6117	0.4720	0.5104	0.7055	0.8676	0.9407	0.9657 (86)
Living	18.9701	19.2549	19.6329	20.1432	20.5654	20.8448	20.9492	20.9342	20.7415	20.2218	19.5308	18.9355
Non living	17.7716	18.1323	18.6091	19.2490	19.7548	20.0749	20.1740	20.1647	19.9674	19.3561	18.4931	17.7343
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.9616	19.2549	19.6329	20.1432	20.5654	20.8448	20.9492	20.9342	20.7415	20.2218	19.5308	19.2243 (87)
Th 2	20.1734	20.1759	20.1784	20.1912	20.1937	20.2065	20.2065	20.2090	20.2014	20.1937	20.1886	20.1835 (88)
util rest of house	0.9563	0.9339	0.9021	0.8328	0.7181	0.5547	0.3965	0.4350	0.6539	0.8450	0.9317	0.9611 (89)
MIT 2	19.2159	18.1323	18.6091	19.2490	19.7548	20.0749	20.1740	20.1647	19.9674	19.3561	18.4931	18.1756 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.2926	18.2478	18.7145	19.3410	19.8382	20.1542	20.2537	20.2439	20.0471	19.4452	18.5999	18.2836 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.2926	18.2478	18.7145	19.3410	19.8382	20.1542	20.2537	20.2439	20.0471	19.4452	18.5999	18.2836 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9497	0.9104	0.8760	0.8076	0.7007	0.5507	0.4012	0.4385	0.6430	0.8199	0.9084	0.9468 (94)
Useful gains	864.3067	946.9257	971.3097	956.9297	857.0146	644.6007	449.6534	466.2947	654.0193	791.2789	816.1118	825.0806 (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	2003.8322	1778.0410	1621.6199	1362.8705	1058.6552	710.1167	467.1409	489.7418	765.6608	1150.6179	1506.2255	1857.1918 (97)
Space heating kWh	847.8069	558.5095	483.8308	292.2774	150.0206	0.0000	0.0000	0.0000	0.0000	267.3482	496.8819	767.8907 (98a)
Space heating requirement - total per year (kWh/year)	3864.5660											
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	847.8069	558.5095	483.8308	292.2774	150.0206	0.0000	0.0000	0.0000	0.0000	267.3482	496.8819	767.8907 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3864.5660											
Space heating per m2	(98c) / (4) =											
	25.8240 (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 %)	246.8529 (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	847.8069	558.5095	483.8308	292.2774	150.0206	0.0000	0.0000	0.0000	0.0000	267.3482	496.8819	767.8907 (98)
Space heating efficiency (main heating system 1)	246.8529	246.8529	246.8529	246.8529	246.8529	0.0000	0.0000	0.0000	0.0000	246.8529	246.8529	246.8529 (210)
Space heating fuel (main heating system)	343.4462	226.2519	195.9996	118.4014	60.7733	0.0000	0.0000	0.0000	0.0000	108.3027	201.2866	311.0722 (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	385.5458	341.7555	364.2427	322.1152	313.7166	253.6241	249.5829	259.6265	262.6803	325.2704	343.8762	381.5004 (64)
Water heating requirement	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089 (216)
Efficiency of water heater	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089	269.7089 (217)
Fuel for water heating, kWh/month	142.9488	126.7127	135.0503	119.4307	116.3167	94.0362	92.5379	96.2618	97.3940	120.6005	127.4990	141.4490 (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)
(221)m	55.9210	50.5093	55.9210	54.1171	55.9210	54.1171	55.9210	55.9210	54.1171	55.9210	54.1171	55.9210 (231)
Pumps and Fa	36.6125	29.3719	26.4462	19.3756	14.9663	12.2276	13.6527	17.7463	23.0507	30.2438	34.1603	37.6301 (232)
Lighting	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 PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
(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 (234a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
(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 (235a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
(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 (235c)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
(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 (233b)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
(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)	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)

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(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												1565.5340	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												269.7089	
Water heating fuel used												1410.2376	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.4840)													
mechanical ventilation fans (SFP = 1.4840)												658.4245	(230a)
Total electricity for the above, kWh/year												658.4245	(231)
Electricity for lighting (calculated in Appendix L)												295.4839	(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												3929.6799	(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	1565.5340	0.1552	242.9517	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1410.2376	0.1415	199.5994	(264)
Space and water heating			442.5511	(265)
Pumps, fans and electric keep-hot	658.4245	0.1387	91.3316	(267)
Energy for lighting	295.4839	0.1443	42.6475	(268)
Total CO2, kg/year			576.5301	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8500	(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	1565.5340	1.5745	2464.9232	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1410.2376	1.5234	2148.3452	(278)
Space and water heating			4613.2684	(279)
Pumps, fans and electric keep-hot	658.4245	1.5128	996.0646	(281)
Energy for lighting	295.4839	1.5338	453.2231	(282)
Total Primary energy kWh/year			6062.5561	(286)
Dwelling Primary energy Rate (DPER)			40.5100	(287)

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

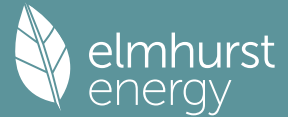
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	64.9300 (1b)	x 2.6000 (2b)	= 168.8180	(1b) - (3b)
First floor	84.7200 (1c)	x 2.3000 (2c)	= 194.8560	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	149.6500			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 363.6740	(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)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1100 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3600	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)

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Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.3060 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.3901	0.3825	0.3748	0.3366	0.3289	0.2907	0.2907	0.2830	0.3060	0.3289	0.3442	0.3595	(22b)
	0.5761	0.5731	0.5703	0.5566	0.5541	0.5423	0.5423	0.5401	0.5468	0.5541	0.5593	0.5646	(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			4.2800	1.0000	4.2800			(26)
TER Opening Type (Uw = 1.20)			19.3900	1.1450	22.2023			(27)
Ground Floor			64.9300	0.1300	8.4409			(28a)
Exposed Floor			19.7900	0.1300	2.5727			(28b)
External Wall	158.3200	22.8400	135.4800	0.1800	24.3864			(29a)
Dormer Cheeks	1.3500	0.8300	0.5200	0.1800	0.0936			(29a)
Garage Wall	10.7400		10.7400	0.1800	1.9332			(29a)
Stud Wall	5.7300		5.7300	0.1800	1.0314			(29a)
Roof - ceiling	77.6900		77.6900	0.1100	8.5459			(30)
Roof - pitch	7.7400		7.7400	0.1100	0.8514			(30)
Dormer Roof	0.9900		0.9900	0.1100	0.1089			(30)
Total net area of external elements Aum(A, m2)			347.2800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	74.4467			(33)

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

100.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	15.1000	0.0500	0.7550	
E2 Other lintels (including other steel lintels)	12.5000	0.0500	0.6250	
E3 Sill	35.2700	0.0500	1.7635	
E4 Jamb	32.2600	0.1600	5.1616	
E5 Ground floor (normal)	28.1300	0.0000	0.0000	
E6 Intermediate floor within a dwelling	16.8000	0.0600	1.0080	
E10 Eaves (insulation at ceiling level)	15.4600	0.0600	0.9276	
E12 Gable (insulation at ceiling level)	22.0200	0.0900	1.9818	
E16 Corner (normal)	3.9800	-0.0900	-0.3582	
E17 Corner (inverted - internal area greater than external area)	2.3600	0.2400	0.5664	
E24 Eaves (insulation at ceiling level - inverted)	1.3300	0.0800	0.1064	
R3 Jamb of roof window	2.8300	0.0600	0.1698	
R6 Flat ceiling	5.8800	0.0600	0.3528	
R8 Roof to wall (rafter)	1.2500	0.0400	0.0500	
R7 Flat ceiling (inverted)	13.8700	0.3200	4.4384	
E20 Exposed floor (normal)	4.1300	0.3200	1.3216	
E21 Exposed floor (inverted)	3.7000	0.0800	0.2960	
E13 Gable (insulation at rafter level)	1.0300	0.0400	0.0412	
R5 Ridge (inverted)	2.5700	0.0400	0.1028	
E11 Eaves (insulation at rafter level)				

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

Point Thermal bridges	(36a) =	19.3097	(36)
Total fabric heat loss	(33) + (36) + (36a) =	93.7564	(37)

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

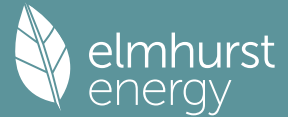
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	69.1396	68.7849	68.4373	66.8045	66.4990	65.0768	65.0768	64.8134	65.6246	66.4990	67.1170	67.7631	(38)
Average = Sum(39)m / 12 =	162.8960	162.5413	162.1937	160.5608	160.2553	158.8332	158.8332	158.5698	159.3810	160.2553	160.8734	161.5195	(39)
												160.5594	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0885	1.0861	1.0838	1.0729	1.0709	1.0614	1.0614	1.0596	1.0650	1.0709	1.0750	1.0793	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9336 (42)
Hot water usage for mixer showers													
Hot water usage for baths	73.4074	72.3042	70.6967	67.6209	65.3511	62.8198	61.3811	62.9764	64.7253	67.4431	70.5849	73.1261	(42a)
Hot water usage for other uses	31.6908	31.2201	30.5574	29.3353	28.4203	27.4056	26.8576	27.5157	28.2323	29.3180	30.5652	31.5837	(42b)
Average daily hot water use (litres/day)	44.6734	43.0489	41.4244	39.8000	38.1755	36.5510	36.5510	38.1755	39.8000	41.4244	43.0489	44.6734	(42c)
												137.6737	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	149.7716	146.5733	142.6785	136.7562	131.9468	126.7764	124.7896	128.6676	132.7575	138.1855	144.1990	149.3832	(44)
Distribution loss (46)m = 0.15 x (45)m	237.2015	208.7184	219.2915	187.2124	177.6258	155.8864	150.9222	159.3174	163.7033	187.5164	205.4379	233.8979	(45)
	35.5802	31.3078	32.8937	28.0819	26.6439	23.3830	22.6383	23.8976	24.5555	28.1275	30.8157	35.0847	(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	290.5512	256.9051	272.6411	238.8411	230.9754	207.5151	204.2718	212.6670	215.3319	240.8661	257.0666	287.2476	(62)
WWHRS	-33.5588	-29.6797	-31.0788	-25.7345	-23.9836	-20.5230	-19.2370	-20.4566	-21.2338	-25.0324	-28.3586	-32.9373	(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	256.9924	227.2255	241.5623	213.1066	206.9918	186.9921	185.0348	192.2104	194.0981	215.8337	228.7080	254.3103	(64)
												2603.0658	(64)

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12Total per year (kWh/year)	2603 (64)										
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)											
Heat gains from water heating, kWh/month	121.5492	107.9483	115.5941	103.5511	101.7403	93.1352	92.8613	95.6527	95.7343	105.0289	109.6110 120.4508 (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	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821	146.6821 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	176.2078	195.0872	176.2078	182.0814	176.2078	182.0814	176.2078	176.2078	182.0814	176.2078	182.0814	176.2078 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	320.1417	323.4638	315.0923	297.2703	274.7733	253.6293	239.5038	236.1817	244.5533	262.3752	284.8722	306.0162 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682	37.6682 (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)	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456	-117.3456 (71)
Water heating gains (Table 5)	163.3726	160.6373	155.3684	143.8209	136.7477	129.3544	124.8136	128.5655	132.9643	141.1679	152.2376	161.8962 (72)
Total internal gains	729.7268	749.1929	716.6732	693.1773	657.7335	632.0698	607.5299	607.9597	626.6036	649.7555	689.1958	714.1249 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	10.6600	10.6334	0.6300	0.7000	0.7700	34.6418 (74)
South	8.7300	46.7521	0.6300	0.7000	0.7700	124.7346 (78)
Solar gains	159.3764	270.4854	372.7143	474.7996	549.8877	555.5208 531.4599 472.8735 407.0851 299.1437 190.5882 136.6613 (83)
Total gains	889.1032	1019.6784	1089.3875	1167.9769	1207.6211	1187.5906 1138.9898 1080.8332 1033.6887 948.8992 879.7840 850.7862 (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	25.5190	25.5747	25.6295	25.8902	25.9395	26.1718	26.1718	26.2152	26.0818	25.9395	25.8399	25.7365
alpha	2.7013	2.7050	2.7086	2.7260	2.7293	2.7448	2.7448	2.7477	2.7388	2.7293	2.7227	2.7158
util living area	0.9666	0.9508	0.9292	0.8828	0.8035	0.6737	0.5397	0.5783	0.7548	0.8945	0.9506	0.9702 (86)
MIT	18.4090	18.7044	19.1317	19.7235	20.2713	20.6957	20.8817	20.8531	20.5514	19.8541	19.0417	18.3625 (87)
Th 2	20.0102	20.0122	20.0141	20.0230	20.0247	20.0325	20.0325	20.0340	20.0295	20.0247	20.0213	20.0178 (88)
util rest of house	0.9617	0.9436	0.9182	0.8632	0.7672	0.6081	0.4434	0.4843	0.6989	0.8730	0.9421	0.9658 (89)
MIT 2	16.9657	17.3404	17.8815	18.6257	19.2919	19.7786	19.9601	19.9387	19.6285	18.7987	17.7776	16.9111 (90)
Living area fraction									FLA = Living area / (4) =			0.1029 (91)
MIT	17.1142	17.4808	18.0102	18.7387	19.3926	19.8730	20.0549	20.0328	19.7234	18.9073	17.9077	17.0604 (92)
Temperature adjustment												0.0000
adjusted MIT	17.1142	17.4808	18.0102	18.7387	19.3926	19.8730	20.0549	20.0328	19.7234	18.9073	17.9077	17.0604 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9402	0.9174	0.8880	0.8306	0.7394	0.5960	0.4458	0.4842	0.6784	0.8410	0.9160	0.9457 (94)
Useful gains	835.9497	935.4555	967.3670	970.0884	892.8608	707.7782	507.7745	523.3263	701.2380	798.0605	805.9171	804.6298 (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	2087.3870	2044.8946	1866.8777	1579.7073	1232.7876	837.5302	548.7516	576.0515	896.2703	1331.2851	1738.6738	2077.2086 (97)
Space heating kWh	931.0693	745.5431	669.2359	438.9256	252.9056	0.0000	0.0000	0.0000	0.0000	396.7191	671.5848	946.7987 (98a)
Space heating requirement - total per year (kWh/year)												5052.7821
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	931.0693	745.5431	669.2359	438.9256	252.9056	0.0000	0.0000	0.0000	0.0000	396.7191	671.5848	946.7987 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5052.7821
Space heating per m2										(98c) / (4) =		33.7640 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	931.0693	745.5431	669.2359	438.9256	252.9056	0.0000	0.0000	0.0000	0.0000	396.7191	671.5848	946.7987 (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)	1008.7425	807.7390	725.0660	475.5424	274.0039	0.0000	0.0000	0.0000	0.0000	429.8149	727.6109	1025.7840 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)

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Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	256.9924	227.2255	241.5623	213.1066	206.9918	186.9921	185.0348	192.2104	194.0981	215.8337	228.7080	254.3103 (64)
Efficiency of water heater	86.6852	86.5207	86.2210	85.6431	84.5102	79.8000	79.8000	79.8000	79.8000	85.4061	86.3267	79.8000 (216)
Fuel for water heating, kWh/month	296.4662	262.6256	280.1665	248.8310	244.9313	234.3260	231.8732	240.8651	243.2307	252.7147	264.9331	86.7290 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685 (231)
Lighting	36.6125	29.3719	26.4462	19.3756	14.9663	12.2276	13.6527	17.7463	23.0507	30.2438	34.1603	37.6301 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-58.7169	-81.7418	-115.9828	-128.5889	-137.0339	-127.2024	-125.5213	-119.2437	-107.9962	-92.5257	-64.1412	-50.8775 (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	-36.3534	-76.1060	-150.6452	-225.4114	-297.3052	-298.5652	-295.1529	-250.3236	-183.9671	-108.6713	-48.4706	-28.7838 (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												5474.3035 (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												3094.1876 (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)												295.4839 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3209.3279 (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												5740.6471 (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	5474.3035	0.2100	1149.6037 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3094.1876	0.2100	649.7794 (264)
Space and water heating			1799.3831 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	295.4839	0.1443	42.6475 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1209.5722	0.1349	-163.1614
PV Unit electricity exported	-1999.7557	0.1260	-251.9657
Total			-415.1271 (269)
Total CO2, kg/year			1438.8328 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6100 (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	5474.3035	1.1300	6185.9629 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3094.1876	1.1300	3496.4320 (278)
Space and water heating			9682.3949 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	295.4839	1.5338	453.2231 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1209.5722	1.4986	-1812.6102
PV Unit electricity exported	-1999.7557	0.4625	-924.8949
Total			-2737.5051 (283)
Total Primary energy kWh/year			7528.2137 (286)
Target Primary Energy Rate (TPER)			50.3100 (287)