

Full SAP Calculation Printout



Property Reference	OP-D320 P5HEAT				Issued on Date	29/11/2024
Assessment Reference	P5HEAT	Prop Type Ref	P5HEAT			
Property	P5HEAT					
SAP Rating	80 C	DER	3.75	TER	9.30	
Environmental	96 A	% DER < TER				59.68
CO ₂ Emissions (t/year)	0.65	DFEE	39.82	TFEE	40.28	
Compliance Check	See BREL	% DFEE < TFEE				1.12
% DPER < TPER	19.17	DPER	39.41	TPER	48.76	
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	72.6300 (1b)	x	2.4600 (2b)	=	178.6698 (1b)	- (3b)
First floor	72.6300 (1c)	x	2.6100 (2c)	=	189.5643 (1c)	- (3c)
Second floor	42.7300 (1d)	x	2.3200 (2d)	=	99.1336 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	187.9900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	467.3677	(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)	

	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	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000 (23a)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												69.6000 (23c)	
Effective ac	0.3417	0.3379	0.3342	0.3156	0.3119	0.2933	0.2933	0.2896	0.3007	0.3119	0.3193	0.3268 (25)	

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Front Door			4.2800	1.0000	4.2800			(26)
Windows (Uw = 1.30)			25.3100	1.2357	31.2766			(27)
Ground Floor			72.6300	0.1100	7.9893			(28a)
External Wall	205.9000	26.9700	178.9300	0.1700	30.4181			(29a)
Dormer Cheeks	5.6900	2.6200	3.0700	0.1900	0.5833			(29a)
Stud Wall	28.5100		28.5100	0.1700	4.8467			(29a)
Roof - ceiling	50.8300		50.8300	0.1100	5.5913			(30)
Roof - pitch	29.0900		29.0900	0.2000	5.8180			(30)
Dormer Roof	2.7600		2.7600	0.2000	0.5520			(30)
Total net area of external elements Aum(A, m ²)			395.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	91.3553			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000	(35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	19.5400	0.0500	0.9770
E3 Sill	15.6900	0.0500	0.7845
E4 Jamb	43.5000	0.0500	2.1750
E5 Ground floor (normal)	36.7800	0.1600	5.8848
E6 Intermediate floor within a dwelling	45.1800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.9700	0.0600	1.0182
E12 Gable (insulation at ceiling level)	15.6500	0.0600	0.9390
E16 Corner (normal)	39.2000	0.0900	3.5280
E17 Corner (inverted - internal area greater than external area)	10.7100	-0.0900	-0.9639
E24 Eaves (insulation at ceiling level - inverted)	21.6600	0.2400	5.1984
E13 Gable (insulation at rafter level)	6.3600	0.0800	0.5088
R1 Head of roof window	4.8400	0.0800	0.3872
R2 Sill of roof window	4.8400	0.0600	0.2904
R3 Jamb of roof window	7.9800	0.0800	0.6384
R6 Flat ceiling	26.5600	0.0600	1.5936
R8 Roof to wall (rafter)	26.0900	0.0600	1.5654
R7 Flat ceiling (inverted)	2.6600	0.0400	0.1064

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

Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	115.9865 (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	52.6941	52.1206	51.5470	48.6793	48.1057	45.2380	45.2380	44.6644	46.3851	48.1057	49.2528	50.3999	(38)
Heat transfer coeff	168.6806	168.1071	167.5335	164.6658	164.0922	161.2245	161.2245	160.6509	162.3716	164.0922	165.2393	166.3864	(39)
Average = Sum(39)m / 12 =												164.5224	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8973	0.8942	0.8912	0.8759	0.8729	0.8576	0.8576	0.8546	0.8637	0.8729	0.8790	0.8851	(40)
HLP (average)												0.8752	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

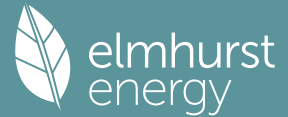
Assumed occupancy													2.9863 (42)
Hot water usage for mixer showers													
102.1485	100.6134	98.3765	94.0965	90.9380	87.4157	85.4136	87.6336	90.0671	93.8490	98.2209	101.7571	101.7571	(42a)
Hot water usage for baths													
33.7582	33.2568	32.5508	31.2490	30.2743	29.1935	28.6096	29.3107	30.0741	31.2306	32.5592	33.6441	33.6441	(42b)
Hot water usage for other uses													
47.5920	45.8614	44.1308	42.4002	40.6695	38.9389	38.9389	40.6695	42.4002	44.1308	45.8614	47.5920	47.5920	(42c)
Average daily hot water use (litres/day)												168.7421	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	183.4987	179.7316	175.0581	167.7457	161.8818	155.5481	152.9621	157.6138	162.5413	169.2104	176.6415	182.9932	(44)
Energy conte	290.6171	255.9355	269.0577	229.6355	217.9241	191.2645	184.9945	195.1589	200.4297	229.6169	251.6582	286.5231	(45)
Energy content (annual)										Total = Sum(45)m =		2802.8157	
Distribution loss (46)m = 0.15 x (45)m													
43.5926	38.3903	40.3587	34.4453	32.6886	28.6897	27.7492	29.2738	30.0645	34.4425	37.7487	42.9785	42.9785	(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	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	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													
388.9987	344.7963	367.4393	324.8435	316.3057	255.8965	251.7809	261.9453	265.0617	327.9985	346.8662	384.9047	384.9047	(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	388.9987	344.7963	367.4393	324.8435	316.3057	255.8965	251.7809	261.9453	265.0617	327.9985	346.8662	384.9047	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3836.8373	(64)
Electric shower(s)												3837	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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													
140.5163	124.7376	133.3478	118.8242	116.3458	81.6050	80.1206	83.5002	84.6525	120.2337	126.1468	139.1550	139.1550	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
196.1923	217.2129	196.1923	202.7320	196.1923	202.7320	196.1923	196.1923	202.7320	196.1923	202.7320	196.1923	196.1923	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
359.4832	363.2135	353.8132	333.8012	308.5396	284.7972	268.9359	265.2056	274.6058	294.6179	319.8795	343.6218	343.6218	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	(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)													
-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	(71)
Water heating gains (Table 5)													
188.8659	185.6214	179.2309	165.0336	156.3788	113.3403	107.6889	112.2315	117.5729	161.6044	175.2038	187.0363	187.0363	(72)
Total internal gains	812.3355	833.8418	797.0305	769.3609	728.9047	668.6636	640.6112	641.4234	662.7048	720.2087	765.6094	794.6445	(73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	13.1600				10.6334	0.6300		0.7000		0.7700	42.7661 (74)
South	8.9900				46.7521	0.6300		0.7000		0.7700	128.4495 (78)
West	3.1600				19.6403	0.6300		0.7000		0.7700	18.9673 (80)

Solar gains	190.1829	329.1994	467.9518	615.0538	725.3183	737.2202	703.5396	617.9065	517.9688	368.2146	228.6639	162.2419 (83)
Total gains	1002.5184	1163.0413	1264.9822	1384.4147	1454.2230	1405.8838	1344.1508	1259.3299	1180.6736	1088.4232	994.2733	956.8864 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
 Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	30.9576	31.0632	31.1695	31.7124	31.8232	32.3893	32.3893	32.5049	32.1605	31.8232	31.6023	31.3844
alpha	3.0638	3.0709	3.0780	3.1142	3.1215	3.1593	3.1593	3.1670	3.1440	3.1215	3.1068	3.0923
util living area	0.9724	0.9560	0.9309	0.8735	0.7753	0.6324	0.4922	0.5365	0.7384	0.8945	0.9565	0.9758 (86)
Living	18.8100	19.1019	19.5084	20.0613	20.5217	20.8277	20.9423	20.9235	20.7008	20.1205	19.3889	18.7766
Non living	17.5674	17.9386	18.4534	19.1495	19.7044	20.0566	20.1664	20.1542	19.9242	19.2341	18.3142	17.5313
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	13
MIT	19.8797	19.1019	19.5084	20.0613	20.5217	20.8277	20.9423	20.9235	20.7008	20.1205	19.3889	19.1809 (87)
Th 2	20.1698	20.1724	20.1750	20.1880	20.1906	20.2037	20.2037	20.2063	20.1984	20.1906	20.1854	20.1802 (88)
util rest of house	0.9686	0.9499	0.9210	0.8549	0.7409	0.5751	0.4144	0.4589	0.6884	0.8751	0.9496	0.9724 (89)
MIT 2	19.1323	17.9386	18.4534	19.1495	19.7044	20.0566	20.1664	20.1542	19.9242	19.2341	18.3142	18.1518 (90)
Living area fraction									FLA = Living area / (4) =			0.1122 (91)
MIT	19.2162	18.0692	18.5718	19.2518	19.7961	20.1432	20.2535	20.2406	20.0113	19.3335	18.4348	18.2673 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2162	18.0692	18.5718	19.2518	19.7961	20.1432	20.2535	20.2406	20.0113	19.3335	18.4348	18.2673 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9632	0.9291	0.8964	0.8291	0.7221	0.5704	0.4194	0.4624	0.6753	0.8498	0.9291	0.9618 (94)
Useful gains	965.6708	1080.5671	1133.8704	1147.8753	1050.1171	801.9424	563.8015	582.3667	797.3063	924.8916	923.8270	920.3574 (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	2516.0739	2213.8340	2022.4273	1704.5887	1328.5078	893.6933	589.0358	616.9906	959.8335	1433.1073	1872.9597	2340.6080 (97)
Space heating kWh	1153.4999	761.5553	661.0863	400.8336	207.1227	0.0000	0.0000	0.0000	0.0000	378.1125	683.3755	1056.6664 (98a)
Space heating requirement - total per year (kWh/year)												5302.2524
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	1153.4999	761.5553	661.0863	400.8336	207.1227	0.0000	0.0000	0.0000	0.0000	378.1125	683.3755	1056.6664 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5302.2524
Space heating per m2										(98c) / (4) =		28.2050 (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 %)												253.7369 (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	1153.4999	761.5553	661.0863	400.8336	207.1227	0.0000	0.0000	0.0000	0.0000	378.1125	683.3755	1056.6664 (98)
Space heating efficiency (main heating system 1)	253.7369	253.7369	253.7369	253.7369	253.7369	0.0000	0.0000	0.0000	0.0000	253.7369	253.7369	253.7369 (210)
Space heating fuel (main heating system)	454.6047	300.1358	260.5401	157.9721	81.6289	0.0000	0.0000	0.0000	0.0000	149.0175	269.3245	416.4418 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	388.9987	344.7963	367.4393	324.8435	316.3057	255.8965	251.7809	261.9453	265.0617	327.9985	346.8662	384.9047 (64)
Efficiency of water heater (217)m	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058 (216)
Fuel for water heating, kWh/month	138.4801	122.7444	130.8052	115.6414	112.6020	91.0969	89.6318	93.2502	94.3596	116.7646	123.4813	137.0227 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	86.1032	77.7706	86.1032	83.3256	86.1032	83.3256	86.1032	86.1032	83.3256	86.1032	83.3256	86.1032 (231)
Lighting	40.7649	32.7031	29.4455	21.5730	16.6636	13.6143	15.2011	19.7590	25.6650	33.6739	38.0345	41.8979 (232)
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)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	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 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												

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(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												2089.6655	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												280.9058	
Water heating fuel used												1365.8803	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.7780)													
mechanical ventilation fans (SFP = 1.7780)												1013.7953	(230a)
Total electricity for the above, kWh/year												1013.7953	(231)
Electricity for lighting (calculated in Appendix L)												328.9959	(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												4798.3370	(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	2089.6655	0.1551	324.1644	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1365.8803	0.1415	193.3218	(264)
Space and water heating			517.4861	(265)
Pumps, fans and electric keep-hot	1013.7953	0.1387	140.6259	(267)
Energy for lighting	328.9959	0.1443	47.4843	(268)
Total CO2, kg/year			705.5963	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7500	(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	2089.6655	1.5743	3289.7022	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1365.8803	1.5234	2080.7734	(278)
Space and water heating			5370.4756	(279)
Pumps, fans and electric keep-hot	1013.7953	1.5128	1533.6696	(281)
Energy for lighting	328.9959	1.5338	504.6249	(282)
Total Primary energy kWh/year			7408.7700	(286)
Dwelling Primary energy Rate (DPER)			39.4100	(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	72.6300 (1b)	x 2.4600 (2b)	= 178.6698 (1b) - (3b)	
First floor	72.6300 (1c)	x 2.6100 (2c)	= 189.5643 (1c) - (3c)	
Second floor	42.7300 (1d)	x 2.3200 (2d)	= 99.1336 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e) ... (1n)	187.9900		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e) ... (3n) =	467.3677 (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) =	0.0856 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3356 (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) =	0.2852 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3637	0.3566	0.3494	0.3138	0.3066	0.2710	0.2710	0.2639	0.2852	0.3066	0.3209	0.3352	(22b)
Effective ac	0.5661	0.5636	0.5611	0.5492	0.5470	0.5367	0.5367	0.5348	0.5407	0.5470	0.5515	0.5562	(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)			25.3100	1.1450	28.9809			(27)
Ground Floor			72.6300	0.1300	9.4419			(28a)
External Wall	205.9000	26.9700	178.9300	0.1800	32.2074			(29a)
Dormer Cheeks	5.6900	2.6200	3.0700	0.1800	0.5526			(29a)
Stud Wall	28.5100		28.5100	0.1800	5.1318			(29a)
Roof - ceiling	50.8300		50.8300	0.1100	5.5913			(30)
Roof - pitch	29.0900		29.0900	0.1100	3.1999			(30)
Dormer Roof	2.7600		2.7600	0.1100	0.3036			(30)
Total net area of external elements Aum(A, m2)			395.4100					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	89.6894		(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)	19.5400	0.0500	0.9770
E3 Sill	15.6900	0.0500	0.7845
E4 Jamb	43.5000	0.0500	2.1750
E5 Ground floor (normal)	36.7800	0.1600	5.8848
E6 Intermediate floor within a dwelling	45.1800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.9700	0.0600	1.0182
E12 Gable (insulation at ceiling level)	15.6500	0.0600	0.9390
E16 Corner (normal)	39.2000	0.0900	3.5280
E17 Corner (inverted - internal area greater than external area)	10.7100	-0.0900	-0.9639
E24 Eaves (insulation at ceiling level - inverted)	21.6600	0.2400	5.1984
E13 Gable (insulation at rafter level)	6.3600	0.0800	0.5088
R1 Head of roof window	4.8400	0.0800	0.3872
R2 Sill of roof window	4.8400	0.0600	0.2904
R3 Jamb of roof window	7.9800	0.0800	0.6384
R6 Flat ceiling	26.5600	0.0600	1.5936
R8 Roof to wall (rafter)	26.0900	0.0600	1.5654
R7 Flat ceiling (inverted)	2.6600	0.0400	0.1064

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

Point Thermal bridges	(36a) =	24.6312	(36)
Total fabric heat loss	(33) + (36) + (36a) =	114.3206	(37)

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

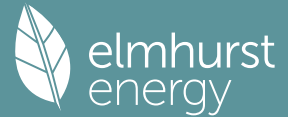
(38)m	Jan 87.3158	Feb 86.9198	Mar 86.5315	Apr 84.7080	May 84.3668	Jun 82.7785	Jul 82.7785	Aug 82.4844	Sep 83.3903	Oct 84.3668	Nov 85.0570	Dec 85.7786	(38)
Heat transfer coeff	201.6365	201.2404	200.8521	199.0286	198.6874	197.0991	197.0991	196.8050	197.7109	198.6874	199.3776	200.0992	(39)
Average = Sum(39)m / 12 =												199.0269	

HLP	Jan 1.0726	Feb 1.0705	Mar 1.0684	Apr 1.0587	May 1.0569	Jun 1.0485	Jul 1.0485	Aug 1.0469	Sep 1.0517	Oct 1.0569	Nov 1.0606	Dec 1.0644	(40)
HLP (average)												1.0587	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9863	(42)
Hot water usage for mixer showers	74.2898	73.1734	71.5465	68.4338	66.1367	63.5750	62.1190	63.7335	65.5034	68.2538	71.4334	74.0052	(42a)	
Hot water usage for baths	32.0703	31.5940	30.9233	29.6866	28.7606	27.7338	27.1792	27.8452	28.5704	29.6691	30.9312	31.9619	(42b)	
Hot water usage for other uses	45.2124	43.5683	41.9242	40.2801	38.6361	36.9920	36.9920	38.6361	40.2801	41.9242	43.5683	45.2124	(42c)	
Average daily hot water use (litres/day)													139.3291	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy content (annual)	151.5725	148.3357	144.3940	138.4006	133.5334	128.3008	126.2901	130.2148	134.3539	139.8472	145.9329	151.1795	(44)	
Distribution loss (46)m = 0.15 x (45)m	240.0538	211.2281	221.9283	189.4635	179.7616	157.7608	152.7369	161.2331	165.6718	189.7713	207.9082	236.7105	(45)	
Water storage loss:										Total = Sum(45)m =		2314.2278		
Store volume	36.0081	31.6842	33.2892	28.4195	26.9642	23.6641	22.9105	24.1850	24.8508	28.4657	31.1862	35.5066	(46)	
a) If manufacturer declared loss factor is known (kWh/day):														
Temperature factor from Table 2b													1.7973	(48)
Enter (49) or (54) in (55)													0.5400	(49)
Total storage loss													0.9706	(55)
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	(56)	
Primary 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	(57)	
Combi 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)	
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
WWHRS	293.4034	259.4148	275.2779	241.0921	233.1112	209.3895	206.0866	214.5827	217.3004	243.1209	259.5369	290.0601	(62)	
PV diverter	-33.9622	-30.0365	-31.4524	-26.0439	-24.2719	-20.7697	-19.4683	-20.7025	-21.4891	-25.3333	-28.6995	-33.3333	(63a)	
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
12Total per year (kWh/year)	259.4412	229.3784	243.8254	215.0483	208.8393	188.6198	186.6183	193.8802	195.8113	217.7876	230.8374	256.7268	(64)	
Electric shower(s)								Total per year (kWh/year) = Sum(64)m =				2626.8140	(64)	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)	
Heat gains from water heating, kWh/month														

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122.4976 108.7827 116.4708 104.2995 102.4504 93.7584 93.4647 96.2897 96.3888 105.7786 110.4324 121.3859 (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	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	196.1923	217.2129	196.1923	202.7320	196.1923	202.7320	196.1923	196.1923	202.7320	196.1923	202.7320	196.1923	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4832	363.2135	353.8132	333.8012	308.5396	284.7972	268.9359	265.2056	274.6058	294.6179	319.8795	343.6218	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	(71)
Water heating gains (Table 5)	164.6473	161.8791	156.5468	144.8605	137.7022	130.2200	125.6246	129.4216	133.8733	142.1756	153.3784	163.1531	(72)
Total internal gains	791.1168	813.0995	777.3464	752.1877	713.2281	685.5433	658.5468	658.6135	679.0052	703.7798	746.7839	773.7613	(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					13.1600	10.6334	0.6300	0.7000			0.7700	42.7661 (74)	
South					8.9900	46.7521	0.6300	0.7000			0.7700	128.4495 (78)	
West					3.1600	19.6403	0.6300	0.7000			0.7700	18.9673 (80)	
Solar gains	190.1829	329.1994	467.9518	615.0538	725.3183	737.2202	703.5396	617.9065	517.9688	368.2146	228.6639	162.2419	(83)
Total gains	981.2997	1142.2990	1245.2982	1367.2415	1438.5464	1422.7635	1362.0865	1276.5200	1196.9740	1071.9944	975.4479	936.0032	(84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.8978	25.9488	25.9989	26.2372	26.2822	26.4940	26.4940	26.5336	26.4120	26.2822	26.1912	26.0968	
alpha	2.7265	2.7299	2.7333	2.7491	2.7521	2.7663	2.7663	2.7689	2.7608	2.7521	2.7461	2.7398	
util living area	0.9752	0.9616	0.9414	0.8964	0.8175	0.6889	0.5555	0.5995	0.7801	0.9136	0.9624	0.9781	(86)
MIT	18.3133	18.6112	19.0576	19.6753	20.2469	20.6837	20.8757	20.8425	20.5166	19.7816	18.9486	18.2654	(87)
Th 2	20.0233	20.0250	20.0267	20.0347	20.0362	20.0431	20.0431	20.0444	20.0405	20.0362	20.0332	20.0300	(88)
util rest of house	0.9714	0.9558	0.9321	0.8786	0.7828	0.6243	0.4590	0.5056	0.7271	0.8952	0.9558	0.9748	(89)
MIT 2	16.8521	17.2311	17.7976	18.5759	19.2736	19.7768	19.9661	19.9407	19.6021	18.7198	17.6684	16.7950	(90)
Living area fraction	17.0161	17.3860	17.9391	18.6993	19.3829	19.8786	20.0682	20.0419	19.7048	18.8390	17.8121	16.9600	(91)
MIT	17.0161	17.3860	17.9391	18.6993	19.3829	19.8786	20.0682	20.0419	19.7048	18.8390	17.8121	16.9600	(92)
Temperature adjustment	17.0161	17.3860	17.9391	18.6993	19.3829	19.8786	20.0682	20.0419	19.7048	18.8390	17.8121	16.9600	(93)
adjusted MIT	17.0161	17.3860	17.9391	18.6993	19.3829	19.8786	20.0682	20.0419	19.7048	18.8390	17.8121	16.9600	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9537	0.9331	0.9044	0.8470	0.7549	0.6118	0.4617	0.5053	0.7052	0.8647	0.9333	0.9585	(94)
Useful gains	935.8761	1065.8354	1126.2729	1158.0658	1085.8927	870.5085	628.9318	645.0256	844.0939	926.9753	910.3898	897.1690	(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	2564.0343	2512.6859	2297.5609	1950.3480	1526.4926	1040.4107	683.5695	716.7471	1108.1273	1636.9811	2135.7436	2553.2745	(97)
Space heating kWh	1211.3497	972.2835	871.4383	570.4431	327.8063	0.0000	0.0000	0.0000	0.0000	528.2443	882.2547	1232.1425	(98a)
Space heating requirement - total per year (kWh/year)												6595.9625	
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	1211.3497	972.2835	871.4383	570.4431	327.8063	0.0000	0.0000	0.0000	0.0000	528.2443	882.2547	1232.1425	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6595.9625	
Space heating per m ²										(98c) / (4) =		35.0868	(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	1211.3497	972.2835	871.4383	570.4431	327.8063	0.0000	0.0000	0.0000	0.0000	528.2443	882.2547	1232.1425	(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)	1312.4049	1053.3949	944.1368	618.0316	355.1531	0.0000	0.0000	0.0000	0.0000	572.3124	955.8556	1334.9323	(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)

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Water heating													
Water heating requirement	259.4412	229.3784	243.8254	215.0483	208.8393	188.6198	186.6183	193.8802	195.8113	217.7876	230.8374	256.7268	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.0679	86.9286	86.6631	86.1403	85.0664	79.8000	79.8000	79.8000	79.8000	85.9695	86.7705	87.1060	(217)
Fuel for water heating, kWh/month	297.9759	263.8699	281.3485	249.6490	245.5014	236.3657	233.8575	242.9576	245.3776	253.3312	266.0320	294.7291	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	40.7649	32.7031	29.4455	21.5730	16.6636	13.6143	15.2011	19.7590	25.6650	33.6739	38.0345	41.8979	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-65.6239	-91.3311	-129.5416	-143.5469	-152.8814	-141.8417	-139.9269	-132.9505	-120.4756	-103.3010	-71.6604	-56.8620	(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	-40.7207	-85.2357	-168.7056	-252.4340	-332.9657	-334.4173	-330.6347	-280.4435	-206.1114	-121.7559	-54.3059	-32.2462	(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												7146.2215	(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												3110.9953	(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)												328.9959	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3589.9197	(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												7082.2930	(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	7146.2215	0.2100	1500.7065	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3110.9953	0.2100	653.3090	(264)
Space and water heating			2154.0155	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	328.9959	0.1443	47.4843	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1349.9430	0.1349	-182.1166	
PV Unit electricity exported	-2239.9767	0.1260	-282.2271	
Total			-464.3438	(269)
Total CO2, kg/year			1749.0853	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3000	(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	7146.2215	1.1300	8075.2303	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3110.9953	1.1300	3515.4247	(278)
Space and water heating			11590.6551	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	328.9959	1.5338	504.6249	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1349.9430	1.4986	-2023.0399	
PV Unit electricity exported	-2239.9767	0.4625	-1035.9755	
Total			-3059.0153	(283)
Total Primary energy kWh/year			9166.3654	(286)
Target Primary Energy Rate (TPER)			48.7600	(287)

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Property Reference	OP-D320 P5HEAT				Issued on Date	29/11/2024
Assessment Reference	P5HEAT	Prop Type Ref	P5HEAT			
Property	P5HEAT					
SAP Rating	80 C	DER	3.75	TER	9.30	
Environmental	96 A	% DER < TER				59.68
CO ₂ Emissions (t/year)	0.65	DFEE	39.82	TFEE	40.28	
Compliance Check	See BREL	% DFEE < TFEE				1.12
% DPER < TPER	19.17	DPER	39.41	TPER	48.76	
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	72.6300 (1b)	x 2.4600 (2b)	= 178.6698 (1b) - (3b)
First floor	72.6300 (1c)	x 2.6100 (2c)	= 189.5643 (1c) - (3c)
Second floor	42.7300 (1d)	x 2.3200 (2d)	= 99.1336 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	187.9900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	467.3677 (5)

2. Ventilation rate

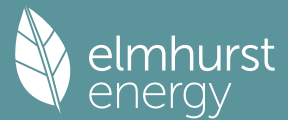
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0856 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.2606 (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) = 0.2215 (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	0.2824	0.2769	0.2713	0.2436	0.2381	0.2104	0.2104	0.2049	0.2215	0.2381	0.2492	0.2603 (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	0.5399	0.5383	0.5368	0.5297	0.5283	0.5221	0.5221	0.5210	0.5245	0.5283	0.5310	0.5339 (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)			25.3100	1.2357	31.2766		(27)
Ground Floor			72.6300	0.1100	7.9893		(28a)
External Wall	205.9000	26.9700	178.9300	0.1700	30.4181		(29a)
Dormer Cheeks	5.6900	2.6200	3.0700	0.1900	0.5833		(29a)
Stud Wall	28.5100		28.5100	0.1700	4.8467		(29a)
Roof - ceiling	50.8300		50.8300	0.1100	5.5913		(30)
Roof - pitch	29.0900		29.0900	0.2000	5.8180		(30)
Dormer Roof	2.7600		2.7600	0.2000	0.5520		(30)
Total net area of external elements Aum (A, m ²)			395.4100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	91.3553		(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	
E2 Other lintels (including other steel lintels)				19.5400	0.0500	0.9770	

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E3 Sill	15.6900	0.0500	0.7845
E4 Jamb	43.5000	0.0500	2.1750
E5 Ground floor (normal)	36.7800	0.1600	5.8848
E6 Intermediate floor within a dwelling	45.1800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.9700	0.0600	1.0182
E12 Gable (insulation at ceiling level)	15.6500	0.0600	0.9390
E16 Corner (normal)	39.2000	0.0900	3.5280
E17 Corner (inverted - internal area greater than external area)	10.7100	-0.0900	-0.9639
E24 Eaves (insulation at ceiling level - inverted)	21.6600	0.2400	5.1984
E13 Gable (insulation at rafter level)	6.3600	0.0800	0.5088
R1 Head of roof window	4.8400	0.0800	0.3872
R2 Sill of roof window	4.8400	0.0600	0.2904
R3 Jamb of roof window	7.9800	0.0800	0.6384
R6 Flat ceiling	26.5600	0.0600	1.5936
R8 Roof to wall (rafter)	26.0900	0.0600	1.5654
R7 Flat ceiling (inverted)	2.6600	0.0400	0.1064
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			24.6312 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	115.9865 (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	83.2661	83.0272	82.7931	81.6936	81.4879	80.5302	80.5302	80.3528	80.8991	81.4879	81.9040	82.3391 (38)
Average = Sum(39)m / 12 =	199.2526	199.0137	198.7796	197.6801	197.4744	196.5167	196.5167	196.3394	196.8856	197.4744	197.8905	198.3256 (39)
												197.6791
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0599	1.0586	1.0574	1.0515	1.0505	1.0454	1.0454	1.0444	1.0473	1.0505	1.0527	1.0550 (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												2.9863 (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	32.0703	31.5940	30.9233	29.6866	28.7606	27.7338	27.1792	27.8452	28.5704	29.6691	30.9312	31.9619 (42b)
Hot water usage for other uses	45.2124	43.5683	41.9242	40.2801	38.6361	36.9920	36.9920	38.6361	40.2801	41.9242	43.5683	45.2124 (42c)
Average daily hot water use (litres/day)												70.8364 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	77.2827	75.1623	72.8475	69.9667	67.3966	64.7258	64.1711	66.4813	68.8505	71.5933	74.4995	77.1743 (44)
Energy content (annual)	122.3969	107.0301	111.9639	95.7810	90.7288	79.5879	77.6094	82.3177	84.8996	97.1514	106.1383	120.8363 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1176.4413
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	104.0374	90.9756	95.1693	81.4138	77.1195	67.6497	65.9680	69.9700	72.1646	82.5787	90.2175	102.7108 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	104.0374	90.9756	95.1693	81.4138	77.1195	67.6497	65.9680	69.9700	72.1646	82.5787	90.2175	102.7108 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		999.9751 (64)
Electric shower(s)	59.4938	53.0094	57.8843	55.2383	56.2748	53.6807	55.4700	56.2748	55.2383	57.8843	56.7958	59.4938 (64a)
Heat gains from water heating, kWh/month	40.8828	35.9963	38.2634	34.1630	33.3486	30.3326	30.3595	31.5612	31.8507	35.1158	36.7533	40.5511 (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	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	196.1923	217.2129	196.1923	202.7320	196.1923	202.7320	196.1923	196.1923	202.7320	196.1923	202.7320	196.1923 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4832	363.2135	353.8132	333.8012	308.5396	284.7972	268.9359	265.2056	274.6058	294.6179	319.8795	343.6218 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314 (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)	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509 (71)
Water heating gains (Table 5)	54.9500	53.5659	51.4293	47.4486	44.8234	42.1286	40.8058	42.4210	44.2371	47.1986	51.0463	54.5042 (72)
Total internal gains	678.4195	701.7863	669.2289	651.7759	617.3493	597.4519	573.7280	571.6129	589.3690	605.8028	641.4519	662.1124 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
North	13.1600	10.6334	0.6300	0.7000	0.7700	42.7661 (74)						
South	8.9900	46.7521	0.6300	0.7000	0.7700	128.4495 (78)						
West	3.1600	19.6403	0.6300	0.7000	0.7700	18.9673 (80)						

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Solar gains	190.1829	329.1994	467.9518	615.0538	725.3183	737.2202	703.5396	617.9065	517.9688	368.2146	228.6639	162.2419 (83)
Total gains	868.6024	1030.9857	1137.1807	1266.8297	1342.6676	1334.6721	1277.2677	1189.5194	1107.3378	974.0174	870.1158	824.3543 (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	26.2077	26.2391	26.2700	26.4161	26.4437	26.5725	26.5725	26.5965	26.5227	26.4437	26.3880	26.3302
alpha	2.7472	2.7493	2.7513	2.7611	2.7629	2.7715	2.7715	2.7731	2.7682	2.7629	2.7592	2.7553
util living area	0.9814	0.9695	0.9517	0.9105	0.8365	0.7127	0.5807	0.6275	0.8045	0.9288	0.9711	0.9839 (86)
MIT	18.2287	18.5305	18.9826	19.6091	20.1985	20.6550	20.8616	20.8235	20.4740	19.7090	18.8606	18.1725 (87)
Th 2	20.0337	20.0348	20.0358	20.0406	20.0415	20.0457	20.0457	20.0465	20.0441	20.0415	20.0397	20.0378 (88)
util rest of house	0.9786	0.9649	0.9438	0.8946	0.8042	0.6494	0.4829	0.5331	0.7546	0.9130	0.9658	0.9814 (89)
MIT 2	17.4752	17.7750	18.2232	18.8400	19.4039	19.8167	19.9778	19.9544	19.6676	18.9459	18.1085	17.4220 (90)
Living area fraction	17.5598	17.8598	18.3084	18.9263	19.4931	19.9108	20.0770	20.0520	19.7581	19.0316	18.1929	0.1122 (91)
MIT	17.5598	17.8598	18.3084	18.9263	19.4931	19.9108	20.0770	20.0520	19.7581	19.0316	18.1929	17.5062 (92)
Temperature adjustment												0.0000
adjusted MIT	17.5598	17.8598	18.3084	18.9263	19.4931	19.9108	20.0770	20.0520	19.7581	19.0316	18.1929	17.5062 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9679	0.9501	0.9248	0.8712	0.7821	0.6393	0.4864	0.5337	0.7368	0.8912	0.9515	0.9718 (94)
Useful gains	840.7245	979.5883	1051.7164	1103.6956	1050.1382	853.2660	621.3124	634.8870	815.9089	868.0311	827.9417	801.0912 (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	2642.0404	2579.1748	2347.2694	1982.0063	1538.9335	1043.6647	683.2921	717.0226	1114.0024	1665.0167	2195.1811	2638.9637 (97)
Space heating kWh	1340.1790	1074.9221	963.8915	632.3837	363.6637	0.0000	0.0000	0.0000	0.0000	592.9573	984.4124	1367.3771 (98a)
Space heating requirement - total per year (kWh/year)												7319.7867
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	1340.1790	1074.9221	963.8915	632.3837	363.6637	0.0000	0.0000	0.0000	0.0000	592.9573	984.4124	1367.3771 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7319.7867
Space heating per m2										(98c) / (4) =		38.9371 (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	1847.2570	1454.2236	1492.1791	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6441	0.7204	0.6825	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1189.7761	1047.6091	1018.4678	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1461.6804	1398.6996	1300.2180	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	195.7711	261.2113	209.6221	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.9428	65.3028	52.4055	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												166.6511 (107)
Energy for space heating												38.9371 (99)
Energy for space cooling												0.8865 (108)
Total												39.8236 (109)
Fabric Energy Efficiency (DFEE)												39.8 (109)

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

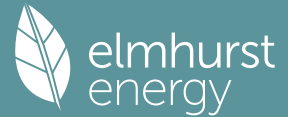
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	72.6300 (1b)	x 2.4600 (2b)	= 178.6698 (1b) - (3b)
First floor	72.6300 (1c)	x 2.6100 (2c)	= 189.5643 (1c) - (3c)
Second floor	42.7300 (1d)	x 2.3200 (2d)	= 99.1336 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	187.9900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	467.3677 (5)

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)

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Number of chimneys / flues attached to closed fire
Number of flues attached to solid fuel boiler
Number of flues attached to other heater
Number of blocked chimneys
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

0 * 10 = 0.0000 (6c)
0 * 20 = 0.0000 (6d)
0 * 35 = 0.0000 (6e)
0 * 20 = 0.0000 (6f)
4 * 10 = 40.0000 (7a)
0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.0856 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3356 (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) = 0.2852 (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	0.3637	0.3566	0.3494	0.3138	0.3066	0.2710	0.2710	0.2639	0.2852	0.3066	0.3209	0.3352 (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	0.5661	0.5636	0.5611	0.5492	0.5470	0.5367	0.5367	0.5348	0.5407	0.5470	0.5515	0.5562 (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)			25.3100	1.1450	28.9809		(27)
Ground Floor			72.6300	0.1300	9.4419		(28a)
External Wall	205.9000	26.9700	178.9300	0.1800	32.2074		(29a)
Dormer Cheeks	5.6900	2.6200	3.0700	0.1800	0.5526		(29a)
Stud Wall	28.5100		28.5100	0.1800	5.1318		(29a)
Roof - ceiling	50.8300		50.8300	0.1100	5.5913		(30)
Roof - pitch	29.0900		29.0900	0.1100	3.1999		(30)
Dormer Roof	2.7600		2.7600	0.1100	0.3036		(30)
Total net area of external elements Aum(A, m2)			395.4100				(31)
Fabric heat loss, W/K = Sum (A x U)					89.6894		(33)
					(26)...(30) + (32) =		

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

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	19.5400	0.0500	0.9770
E2 Other lintels (including other steel lintels)	15.6900	0.0500	0.7845
E3 Sill	43.5000	0.0500	2.1750
E4 Jamb	36.7800	0.1600	5.8848
E5 Ground floor (normal)	45.1800	0.0000	0.0000
E6 Intermediate floor within a dwelling	16.9700	0.0600	1.0182
E10 Eaves (insulation at ceiling level)	15.6500	0.0600	0.9390
E12 Gable (insulation at ceiling level)	39.2000	0.0900	3.5280
E16 Corner (normal)	10.7100	-0.0900	-0.9639
E17 Corner (inverted - internal area greater than external area)	21.6600	0.2400	5.1984
E24 Eaves (insulation at ceiling level - inverted)	6.3600	0.0800	0.5088
E13 Gable (insulation at rafter level)	4.8400	0.0800	0.3872
R1 Head of roof window	4.8400	0.0600	0.2904
R2 Sill of roof window	7.9800	0.0800	0.6384
R3 Jamb of roof window	26.5600	0.0600	1.5936
R6 Flat ceiling	26.0900	0.0600	1.5654
R8 Roof to wall (rafter)	2.6600	0.0400	0.1064
R7 Flat ceiling (inverted)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 24.6312 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 114.3206 (37)

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

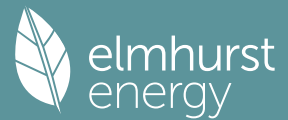
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	87.3158	86.9198	86.5315	84.7080	84.3668	82.7785	82.7785	82.4844	83.3903	84.3668	85.0570	85.7786 (38)
Heat transfer coeff	201.6365	201.2404	200.8521	199.0286	198.6874	197.0991	197.0991	196.8050	197.7109	198.6874	199.3776	200.0992 (39)
Average = Sum(39)m / 12 =												199.0269

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0726	1.0705	1.0684	1.0587	1.0569	1.0485	1.0485	1.0469	1.0517	1.0569	1.0606	1.0644 (40)
HLP (average)												1.0587
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9863 (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 32.0703 31.5940 30.9233 29.6866 28.7606 27.7338 27.1792 27.8452 28.5704 29.6691 30.9312 31.9619 (42b)
Hot water usage for other uses 45.2124 43.5683 41.9242 40.2801 38.6361 36.9920 36.9920 38.6361 40.2801 41.9242 43.5683 45.2124 (42c)
Average daily hot water use (litres/day) 70.8364 (43)
Daily hot water use
Energy conte 77.2827 75.1623 72.8475 69.9667 67.3966 64.7258 64.1711 66.4813 68.8505 71.5933 74.4995 77.1743 (44)
Energy content (annual) 122.3969 107.0301 111.9639 95.7810 90.7288 79.5879 77.6094 82.3177 84.8996 97.1514 106.1383 120.8363 (45)
Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1176.4413
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (46)
Water storage loss:
Total storage loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)
If cylinder contains dedicated solar storage 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	104.0374	90.9756	95.1693	81.4138	77.1195	67.6497	65.9680	69.9700	72.1646	82.5787	90.2175	102.7108 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	104.0374	90.9756	95.1693	81.4138	77.1195	67.6497	65.9680	69.9700	72.1646	82.5787	90.2175	102.7108 (64)
Total per year (kWh/year) = Sum(64)m =												999.9751 (64)
Electric shower(s)												1000 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												59.4938 (64a)
Heat gains from water heating, kWh/month												676.7381 (64a)
	40.8828	35.9963	38.2634	34.1630	33.3486	30.3326	30.3595	31.5612	31.8507	35.1158	36.7533	40.5511 (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	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	196.1923	217.2129	196.1923	202.7320	196.1923	202.7320	196.1923	196.1923	202.7320	196.1923	202.7320	196.1923 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	359.4832	363.2135	353.8132	333.8012	308.5396	284.7972	268.9359	265.2056	274.6058	294.6179	319.8795	343.6218 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314 (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)												
	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509 (71)
Water heating gains (Table 5)												
	54.9500	53.5659	51.4293	47.4486	44.8234	42.1286	40.8058	42.4210	44.2371	47.1986	51.0463	54.5042 (72)
Total internal gains	678.4195	701.7863	669.2289	651.7759	617.3493	597.4519	573.7280	571.6129	589.3690	605.8028	641.4519	662.1124 (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					13.1600	10.6334		0.6300	0.7000	0.7700	42.7661 (74)	
South					8.9900	46.7521		0.6300	0.7000	0.7700	128.4495 (78)	
West					3.1600	19.6403		0.6300	0.7000	0.7700	18.9673 (80)	
Solar gains	190.1829	329.1994	467.9518	615.0538	725.3183	737.2202	703.5396	617.9065	517.9688	368.2146	228.6639	162.2419 (83)
Total gains	868.6024	1030.9857	1137.1807	1266.8297	1342.6676	1334.6721	1277.2677	1189.5194	1107.3378	974.0174	870.1158	824.3543 (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	25.8978	25.9488	25.9989	26.2372	26.2822	26.4940	26.4940	26.5336	26.4120	26.2822	26.1912	26.0968
alpha	2.7265	2.7299	2.7333	2.7491	2.7521	2.7663	2.7663	2.7689	2.7608	2.7521	2.7461	2.7398
util living area	0.9814	0.9696	0.9519	0.9109	0.8374	0.7134	0.5816	0.6282	0.8053	0.9291	0.9711	0.9839 (86)
MIT	18.1968	18.5010	18.9573	19.5950	20.1891	20.6523	20.8602	20.8222	20.4694	19.6982	18.8436	18.1487 (87)
Th 2	20.0233	20.0250	20.0267	20.0347	20.0362	20.0431	20.0431	20.0444	20.0405	20.0362	20.0332	20.0300 (88)
util rest of house	0.9786	0.9650	0.9440	0.8950	0.8051	0.6501	0.4836	0.5337	0.7553	0.9133	0.9659	0.9814 (89)
MIT 2	17.4368	17.7395	18.1923	18.8224	19.3913	19.8125	19.9746	19.9517	19.6608	18.9318	18.0874	17.3934 (90)
Living area fraction	17.5221	17.8250	18.2781	18.9091	19.4808	19.9067	20.0740	20.0494	19.7515	19.0178	18.1723	17.4781 (92)
MIT	17.5221	17.8250	18.2781	18.9091	19.4808	19.9067	20.0740	20.0494	19.7515	19.0178	18.1723	17.4781 (93)
Temperature adjustment												0.0000
adjusted MIT	17.5221	17.8250	18.2781	18.9091	19.4808	19.9067	20.0740	20.0494	19.7515	19.0178	18.1723	17.4781 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9678	0.9502	0.9250	0.8716	0.7828	0.6399	0.4871	0.5342	0.7374	0.8914	0.9515	0.9717 (94)
Useful gains	840.6538	979.5963	1051.8942	1104.1490	1051.0967	854.0375	622.1304	635.4833	816.5524	868.2414	827.9379	801.0336 (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	2666.0663	2601.0246	2365.6645	1992.0937	1545.9489	1045.9515	684.7293	718.2266	1117.3717	1672.5155	2207.5637	2656.9427 (97)
Space heating kWh	1358.1068	1089.5998	977.4451	639.3202	368.1700	0.0000	0.0000	0.0000	0.0000	598.3799	993.3305	1380.7964 (98a)
Space heating requirement - total per year (kWh/year)												7405.1489
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	1358.1068	1089.5998	977.4451	639.3202	368.1700	0.0000	0.0000	0.0000	0.0000	598.3799	993.3305	1380.7964 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7405.1489
Space heating per m2												39.3912 (99)

8c. Space cooling requirement

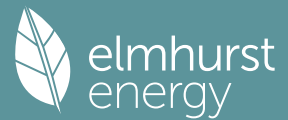
Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000

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Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1852.7318	1458.5336	1495.7181	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.6426	0.7189	0.6813	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1190.5250	1048.5667	1019.0908	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1461.6804	1398.6996	1300.2180	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	195.2319	260.4989	209.1586	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	FC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	48.8080	65.1247	52.2897	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling requirement									0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												166.2224 (107)
Energy for space cooling												39.3912 (99)
Total												0.8842 (108)
Fabric Energy Efficiency (TFEE)												40.2754 (109)
												40.3 (109)

Full SAP Calculation Printout



Property Reference	OP-D320 P5HEAT				Issued on Date	29/11/2024	
Assessment Reference	P5HEAT			Prop Type Ref	P5HEAT		
Property	P5HEAT						
SAP Rating	80 C		DER	3.75		TER	9.30
Environmental	96 A		% DER < TER				59.68
CO ₂ Emissions (t/year)	0.65		DFEE	39.82		TFEE	40.28
Compliance Check	See BREL		% DFEE < TFEE				1.12
% DPER < TPER	19.17		DPER	39.41		TPER	48.76
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	72.6300 (1b)	x	2.4600 (2b)	=	178.6698 (1b)	- (3b)
First floor	72.6300 (1c)	x	2.6100 (2c)	=	189.5643 (1c)	- (3c)
Second floor	42.7300 (1d)	x	2.3200 (2d)	=	99.1336 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	187.9900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	467.3677	(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)	

	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	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000 (23a)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												69.6000 (23c)	
Effective ac	0.3417	0.3379	0.3342	0.3156	0.3119	0.2933	0.2933	0.2896	0.3007	0.3119	0.3193	0.3268 (25)	

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Front Door			4.2800	1.0000	4.2800			(26)
Windows (Uw = 1.30)			25.3100	1.2357	31.2766			(27)
Ground Floor			72.6300	0.1100	7.9893			(28a)
External Wall	205.9000	26.9700	178.9300	0.1700	30.4181			(29a)
Dormer Cheeks	5.6900	2.6200	3.0700	0.1900	0.5833			(29a)
Stud Wall	28.5100		28.5100	0.1700	4.8467			(29a)
Roof - ceiling	50.8300		50.8300	0.1100	5.5913			(30)
Roof - pitch	29.0900		29.0900	0.2000	5.8180			(30)
Dormer Roof	2.7600		2.7600	0.2000	0.5520			(30)
Total net area of external elements Aum(A, m ²)			395.4100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	91.3553			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000	(35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	19.5400	0.0500	0.9770
E3 Sill	15.6900	0.0500	0.7845
E4 Jamb	43.5000	0.0500	2.1750
E5 Ground floor (normal)	36.7800	0.1600	5.8848
E6 Intermediate floor within a dwelling	45.1800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.9700	0.0600	1.0182
E12 Gable (insulation at ceiling level)	15.6500	0.0600	0.9390
E16 Corner (normal)	39.2000	0.0900	3.5280
E17 Corner (inverted - internal area greater than external area)	10.7100	-0.0900	-0.9639
E24 Eaves (insulation at ceiling level - inverted)	21.6600	0.2400	5.1984
E13 Gable (insulation at rafter level)	6.3600	0.0800	0.5088
R1 Head of roof window	4.8400	0.0800	0.3872
R2 Sill of roof window	4.8400	0.0600	0.2904
R3 Jamb of roof window	7.9800	0.0800	0.6384
R6 Flat ceiling	26.5600	0.0600	1.5936
R8 Roof to wall (rafter)	26.0900	0.0600	1.5654
R7 Flat ceiling (inverted)	2.6600	0.0400	0.1064

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

Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	115.9865 (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	52.6941	52.1206	51.5470	48.6793	48.1057	45.2380	45.2380	44.6644	46.3851	48.1057	49.2528	50.3999	(38)
Heat transfer coeff	168.6806	168.1071	167.5335	164.6658	164.0922	161.2245	161.2245	160.6509	162.3716	164.0922	165.2393	166.3864	(39)
Average = Sum(39)m / 12 =												164.5224	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8973	0.8942	0.8912	0.8759	0.8729	0.8576	0.8576	0.8546	0.8637	0.8729	0.8790	0.8851	(40)
HLP (average)												0.8752	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

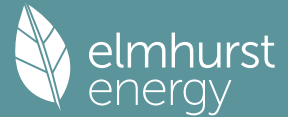
Assumed occupancy													2.9863 (42)
Hot water usage for mixer showers													
102.1485	100.6134	98.3765	94.0965	90.9380	87.4157	85.4136	87.6336	90.0671	93.8490	98.2209	101.7571	101.7571	(42a)
Hot water usage for baths													
33.7582	33.2568	32.5508	31.2490	30.2743	29.1935	28.6096	29.3107	30.0741	31.2306	32.5592	33.6441	33.6441	(42b)
Hot water usage for other uses													
47.5920	45.8614	44.1308	42.4002	40.6695	38.9389	38.9389	40.6695	42.4002	44.1308	45.8614	47.5920	47.5920	(42c)
Average daily hot water use (litres/day)												168.7421	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	183.4987	179.7316	175.0581	167.7457	161.8818	155.5481	152.9621	157.6138	162.5413	169.2104	176.6415	182.9932	(44)
Energy conte	290.6171	255.9355	269.0577	229.6355	217.9241	191.2645	184.9945	195.1589	200.4297	229.6169	251.6582	286.5231	(45)
Energy content (annual)										Total = Sum(45)m =		2802.8157	
Distribution loss (46)m = 0.15 x (45)m													
43.5926	38.3903	40.3587	34.4453	32.6886	28.6897	27.7492	29.2738	30.0645	34.4425	37.7487	42.9785	42.9785	(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	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	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													
388.9987	344.7963	367.4393	324.8435	316.3057	255.8965	251.7809	261.9453	265.0617	327.9985	346.8662	384.9047	384.9047	(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	388.9987	344.7963	367.4393	324.8435	316.3057	255.8965	251.7809	261.9453	265.0617	327.9985	346.8662	384.9047	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3836.8373	(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													
140.5163	124.7376	133.3478	118.8242	116.3458	81.6050	80.1206	83.5002	84.6525	120.2337	126.1468	139.1550	139.1550	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
196.1923	217.2129	196.1923	202.7320	196.1923	202.7320	196.1923	196.1923	202.7320	196.1923	202.7320	196.1923	196.1923	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
359.4832	363.2135	353.8132	333.8012	308.5396	284.7972	268.9359	265.2056	274.6058	294.6179	319.8795	343.6218	343.6218	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	(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)													
-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	(71)
Water heating gains (Table 5)													
188.8659	185.6214	179.2309	165.0336	156.3788	113.3403	107.6889	112.2315	117.5729	161.6044	175.2038	187.0363	187.0363	(72)
Total internal gains	812.3355	833.8418	797.0305	769.3609	728.9047	668.6636	640.6112	641.4234	662.7048	720.2087	765.6094	794.6445	(73)

6. Solar gains

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[Jan]			Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North			13.1600	10.6334	0.6300		0.7000		0.7700	42.7661 (74)
South			8.9900	46.7521	0.6300		0.7000		0.7700	128.4495 (78)
West			3.1600	19.6403	0.6300		0.7000		0.7700	18.9673 (80)

Solar gains	190.1829	329.1994	467.9518	615.0538	725.3183	737.2202	703.5396	617.9065	517.9688	368.2146	228.6639	162.2419 (83)
Total gains	1002.5184	1163.0413	1264.9822	1384.4147	1454.2230	1405.8838	1344.1508	1259.3299	1180.6736	1088.4232	994.2733	956.8864 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
 Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	30.9576	31.0632	31.1695	31.7124	31.8232	32.3893	32.3893	32.5049	32.1605	31.8232	31.6023	31.3844
alpha	3.0638	3.0709	3.0780	3.1142	3.1215	3.1593	3.1593	3.1670	3.1440	3.1215	3.1068	3.0923
util living area	0.9724	0.9560	0.9309	0.8735	0.7753	0.6324	0.4922	0.5365	0.7384	0.8945	0.9565	0.9758 (86)
Living	18.8100	19.1019	19.5084	20.0613	20.5217	20.8277	20.9423	20.9235	20.7008	20.1205	19.3889	18.7766
Non living	17.5674	17.9386	18.4534	19.1495	19.7044	20.0566	20.1664	20.1542	19.9242	19.2341	18.3142	17.5313
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	13
MIT	19.8797	19.1019	19.5084	20.0613	20.5217	20.8277	20.9423	20.9235	20.7008	20.1205	19.3889	19.1809 (87)
Th 2	20.1698	20.1724	20.1750	20.1880	20.1906	20.2037	20.2037	20.2063	20.1984	20.1906	20.1854	20.1802 (88)
util rest of house	0.9686	0.9499	0.9210	0.8549	0.7409	0.5751	0.4144	0.4589	0.6884	0.8751	0.9496	0.9724 (89)
MIT 2	19.1323	17.9386	18.4534	19.1495	19.7044	20.0566	20.1664	20.1542	19.9242	19.2341	18.3142	18.1518 (90)
Living area fraction									FLA = Living area / (4) =			0.1122 (91)
MIT	19.2162	18.0692	18.5718	19.2518	19.7961	20.1432	20.2535	20.2406	20.0113	19.3335	18.4348	18.2673 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2162	18.0692	18.5718	19.2518	19.7961	20.1432	20.2535	20.2406	20.0113	19.3335	18.4348	18.2673 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9632	0.9291	0.8964	0.8291	0.7221	0.5704	0.4194	0.4624	0.6753	0.8498	0.9291	0.9618 (94)
Useful gains	965.6708	1080.5671	1133.8704	1147.8753	1050.1171	801.9424	563.8015	582.3667	797.3063	924.8916	923.8270	920.3574 (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	2516.0739	2213.8340	2022.4273	1704.5887	1328.5078	893.6933	589.0358	616.9906	959.8335	1433.1073	1872.9597	2340.6080 (97)
Space heating kWh	1153.4999	761.5553	661.0863	400.8336	207.1227	0.0000	0.0000	0.0000	0.0000	378.1125	683.3755	1056.6664 (98a)
Space heating requirement - total per year (kWh/year)												5302.2524
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	1153.4999	761.5553	661.0863	400.8336	207.1227	0.0000	0.0000	0.0000	0.0000	378.1125	683.3755	1056.6664 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5302.2524
Space heating per m2										(98c) / (4) =		28.2050 (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 %) 253.7369 (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	1153.4999	761.5553	661.0863	400.8336	207.1227	0.0000	0.0000	0.0000	0.0000	378.1125	683.3755	1056.6664 (98)
Space heating efficiency (main heating system 1)	253.7369	253.7369	253.7369	253.7369	253.7369	0.0000	0.0000	0.0000	0.0000	253.7369	253.7369	253.7369 (210)
Space heating fuel (main heating system)	454.6047	300.1358	260.5401	157.9721	81.6289	0.0000	0.0000	0.0000	0.0000	149.0175	269.3245	416.4418 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating												
Water heating requirement	388.9987	344.7963	367.4393	324.8435	316.3057	255.8965	251.7809	261.9453	265.0617	327.9985	346.8662	384.9047 (64)
Efficiency of water heater (217)m	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058	280.9058 (216)
Fuel for water heating, kWh/month	138.4801	122.7444	130.8052	115.6414	112.6020	91.0969	89.6318	93.2502	94.3596	116.7646	123.4813	137.0227 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	86.1032	77.7706	86.1032	83.3256	86.1032	83.3256	86.1032	86.1032	83.3256	86.1032	83.3256	86.1032 (231)
Lighting	40.7649	32.7031	29.4455	21.5730	16.6636	13.6143	15.2011	19.7590	25.6650	33.6739	38.0345	41.8979 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												

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(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												2089.6655	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												280.9058	
Water heating fuel used												1365.8803	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.7780)													
mechanical ventilation fans (SFP = 1.7780)												1013.7953	(230a)
Total electricity for the above, kWh/year												1013.7953	(231)
Electricity for lighting (calculated in Appendix L)												328.9959	(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												4798.3370	(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	2089.6655	0.1551	324.1644	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1365.8803	0.1415	193.3218	(264)
Space and water heating			517.4861	(265)
Pumps, fans and electric keep-hot	1013.7953	0.1387	140.6259	(267)
Energy for lighting	328.9959	0.1443	47.4843	(268)
Total CO2, kg/year			705.5963	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7500	(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	2089.6655	1.5743	3289.7022	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1365.8803	1.5234	2080.7734	(278)
Space and water heating			5370.4756	(279)
Pumps, fans and electric keep-hot	1013.7953	1.5128	1533.6696	(281)
Energy for lighting	328.9959	1.5338	504.6249	(282)
Total Primary energy kWh/year			7408.7700	(286)
Dwelling Primary energy Rate (DPER)			39.4100	(287)

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

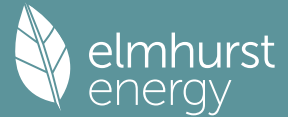
1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	72.6300 (1b)	x	2.4600 (2b)	=	178.6698 (1b) - (3b)	
First floor	72.6300 (1c)	x	2.6100 (2c)	=	189.5643 (1c) - (3c)	
Second floor	42.7300 (1d)	x	2.3200 (2d)	=	99.1336 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	187.9900				(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	=	467.3677 (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) =	0.0856 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3356 (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) =	0.2852 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3637	0.3566	0.3494	0.3138	0.3066	0.2710	0.2710	0.2639	0.2852	0.3066	0.3209	0.3352	(22b)
Effective ac	0.5661	0.5636	0.5611	0.5492	0.5470	0.5367	0.5367	0.5348	0.5407	0.5470	0.5515	0.5562	(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)			25.3100	1.1450	28.9809			(27)
Ground Floor			72.6300	0.1300	9.4419			(28a)
External Wall	205.9000	26.9700	178.9300	0.1800	32.2074			(29a)
Dormer Cheeks	5.6900	2.6200	3.0700	0.1800	0.5526			(29a)
Stud Wall	28.5100		28.5100	0.1800	5.1318			(29a)
Roof - ceiling	50.8300		50.8300	0.1100	5.5913			(30)
Roof - pitch	29.0900		29.0900	0.1100	3.1999			(30)
Dormer Roof	2.7600		2.7600	0.1100	0.3036			(30)
Total net area of external elements Aum(A, m2)			395.4100					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	89.6894		(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)	19.5400	0.0500	0.9770
E3 Sill	15.6900	0.0500	0.7845
E4 Jamb	43.5000	0.0500	2.1750
E5 Ground floor (normal)	36.7800	0.1600	5.8848
E6 Intermediate floor within a dwelling	45.1800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.9700	0.0600	1.0182
E12 Gable (insulation at ceiling level)	15.6500	0.0600	0.9390
E16 Corner (normal)	39.2000	0.0900	3.5280
E17 Corner (inverted - internal area greater than external area)	10.7100	-0.0900	-0.9639
E24 Eaves (insulation at ceiling level - inverted)	21.6600	0.2400	5.1984
E13 Gable (insulation at rafter level)	6.3600	0.0800	0.5088
R1 Head of roof window	4.8400	0.0800	0.3872
R2 Sill of roof window	4.8400	0.0600	0.2904
R3 Jamb of roof window	7.9800	0.0800	0.6384
R6 Flat ceiling	26.5600	0.0600	1.5936
R8 Roof to wall (rafter)	26.0900	0.0600	1.5654
R7 Flat ceiling (inverted)	2.6600	0.0400	0.1064

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

Point Thermal bridges

(36a) = 24.6312 (36)

Total fabric heat loss

(33) + (36) + (36a) = 114.3206 (37)

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

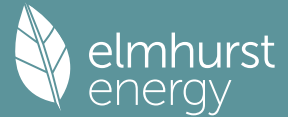
(38)m	Jan 87.3158	Feb 86.9198	Mar 86.5315	Apr 84.7080	May 84.3668	Jun 82.7785	Jul 82.7785	Aug 82.4844	Sep 83.3903	Oct 84.3668	Nov 85.0570	Dec 85.7786	(38)
Heat transfer coeff	201.6365	201.2404	200.8521	199.0286	198.6874	197.0991	197.0991	196.8050	197.7109	198.6874	199.3776	200.0992	(39)
Average = Sum(39)m / 12 =												199.0269	

HLP	Jan 1.0726	Feb 1.0705	Mar 1.0684	Apr 1.0587	May 1.0569	Jun 1.0485	Jul 1.0485	Aug 1.0469	Sep 1.0517	Oct 1.0569	Nov 1.0606	Dec 1.0644	(40)
HLP (average)												1.0587	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9863 (42)
Hot water usage for mixer showers	74.2898	73.1734	71.5465	68.4338	66.1367	63.5750	62.1190	63.7335	65.5034	68.2538	71.4334	74.0052 (42a)	
Hot water usage for baths	32.0703	31.5940	30.9233	29.6866	28.7606	27.7338	27.1792	27.8452	28.5704	29.6691	30.9312	31.9619 (42b)	
Hot water usage for other uses	45.2124	43.5683	41.9242	40.2801	38.6361	36.9920	36.9920	38.6361	40.2801	41.9242	43.5683	45.2124 (42c)	
Average daily hot water use (litres/day)												139.3291 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	151.5725	148.3357	144.3940	138.4006	133.5334	128.3008	126.2901	130.2148	134.3539	139.8472	145.9329	151.1795 (44)	
Distribution loss (46)m = 0.15 x (45)m	240.0538	211.2281	221.9283	189.4635	179.7616	157.7608	152.7369	161.2331	165.6718	189.7713	207.9082	236.7105 (45)	
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	293.4034	259.4148	275.2779	241.0921	233.1112	209.3895	206.0866	214.5827	217.3004	243.1209	259.5369	290.0601 (62)	
WWHRS	-33.9622	-30.0365	-31.4524	-26.0439	-24.2719	-20.7697	-19.4683	-20.7025	-21.4891	-25.3333	-28.6995	-33.3333 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	259.4412	229.3784	243.8254	215.0483	208.8393	188.6198	186.6183	193.8802	195.8113	217.7876	230.8374	256.7268 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2626.8140 (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)	
Heat gains from water heating, kWh/month												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)	

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122.4976 108.7827 116.4708 104.2995 102.4504 93.7584 93.4647 96.2897 96.3888 105.7786 110.4324 121.3859 (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	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	149.3136	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	196.1923	217.2129	196.1923	202.7320	196.1923	202.7320	196.1923	196.1923	202.7320	196.1923	202.7320	196.1923	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.4832	363.2135	353.8132	333.8012	308.5396	284.7972	268.9359	265.2056	274.6058	294.6179	319.8795	343.6218	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	37.9314	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	-119.4509	(71)
Water heating gains (Table 5)	164.6473	161.8791	156.5468	144.8605	137.7022	130.2200	125.6246	129.4216	133.8733	142.1756	153.3784	163.1531	(72)
Total internal gains	791.1168	813.0995	777.3464	752.1877	713.2281	685.5433	658.5468	658.6135	679.0052	703.7798	746.7839	773.7613	(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					13.1600	10.6334		0.6300	0.7000	0.7700		42.7661 (74)
South					8.9900	46.7521		0.6300	0.7000	0.7700		128.4495 (78)
West					3.1600	19.6403		0.6300	0.7000	0.7700		18.9673 (80)
Solar gains	190.1829	329.1994	467.9518	615.0538	725.3183	737.2202	703.5396	617.9065	517.9688	368.2146	228.6639	162.2419 (83)
Total gains	981.2997	1142.2990	1245.2982	1367.2415	1438.5464	1422.7635	1362.0865	1276.5200	1196.9740	1071.9944	975.4479	936.0032 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.8978	25.9488	25.9989	26.2372	26.2822	26.4940	26.4940	26.5336	26.4120	26.2822	26.1912	26.0968	
alpha	2.7265	2.7299	2.7333	2.7491	2.7521	2.7663	2.7663	2.7689	2.7608	2.7521	2.7461	2.7398	
util living area	0.9752	0.9616	0.9414	0.8964	0.8175	0.6889	0.5555	0.5995	0.7801	0.9136	0.9624	0.9781	(86)
MIT	18.3133	18.6112	19.0576	19.6753	20.2469	20.6837	20.8757	20.8425	20.5166	19.7816	18.9486	18.2654	(87)
Th 2	20.0233	20.0250	20.0267	20.0347	20.0362	20.0431	20.0431	20.0444	20.0405	20.0362	20.0332	20.0300	(88)
util rest of house	0.9714	0.9558	0.9321	0.8786	0.7828	0.6243	0.4590	0.5056	0.7271	0.8952	0.9558	0.9748	(89)
MIT 2	16.8521	17.2311	17.7976	18.5759	19.2736	19.7768	19.9661	19.9407	19.6021	18.7198	17.6684	16.7950	(90)
Living area fraction	17.0161	17.3860	17.9391	18.6993	19.3829	19.8786	20.0682	20.0419	19.7048	18.8390	17.8121	16.9600	(91)
MIT	17.0161	17.3860	17.9391	18.6993	19.3829	19.8786	20.0682	20.0419	19.7048	18.8390	17.8121	16.9600	(92)
Temperature adjustment	17.0161	17.3860	17.9391	18.6993	19.3829	19.8786	20.0682	20.0419	19.7048	18.8390	17.8121	16.9600	(93)
adjusted MIT	17.0161	17.3860	17.9391	18.6993	19.3829	19.8786	20.0682	20.0419	19.7048	18.8390	17.8121	16.9600	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9537	0.9331	0.9044	0.8470	0.7549	0.6118	0.4617	0.5053	0.7052	0.8647	0.9333	0.9585	(94)
Useful gains	935.8761	1065.8354	1126.2729	1158.0658	1085.8927	870.5085	628.9318	645.0256	844.0939	926.9753	910.3898	897.1690	(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	2564.0343	2512.6859	2297.5609	1950.3480	1526.4926	1040.4107	683.5695	716.7471	1108.1273	1636.9811	2135.7436	2553.2745	(97)
Space heating kWh	1211.3497	972.2835	871.4383	570.4431	327.8063	0.0000	0.0000	0.0000	0.0000	528.2443	882.2547	1232.1425	(98a)
Space heating requirement - total per year (kWh/year)												6595.9625	
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	1211.3497	972.2835	871.4383	570.4431	327.8063	0.0000	0.0000	0.0000	0.0000	528.2443	882.2547	1232.1425	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6595.9625	
Space heating per m ²												35.0868	(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	1211.3497	972.2835	871.4383	570.4431	327.8063	0.0000	0.0000	0.0000	0.0000	528.2443	882.2547	1232.1425	(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)	1312.4049	1053.3949	944.1368	618.0316	355.1531	0.0000	0.0000	0.0000	0.0000	572.3124	955.8556	1334.9323	(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)

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Water heating													
Water heating requirement	259.4412	229.3784	243.8254	215.0483	208.8393	188.6198	186.6183	193.8802	195.8113	217.7876	230.8374	256.7268	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.0679	86.9286	86.6631	86.1403	85.0664	79.8000	79.8000	79.8000	79.8000	85.9695	86.7705	87.1060	(217)
Fuel for water heating, kWh/month	297.9759	263.8699	281.3485	249.6490	245.5014	236.3657	233.8575	242.9576	245.3776	253.3312	266.0320	294.7291	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	40.7649	32.7031	29.4455	21.5730	16.6636	13.6143	15.2011	19.7590	25.6650	33.6739	38.0345	41.8979	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-65.6239	-91.3311	-129.5416	-143.5469	-152.8814	-141.8417	-139.9269	-132.9505	-120.4756	-103.3010	-71.6604	-56.8620	(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	-40.7207	-85.2357	-168.7056	-252.4340	-332.9657	-334.4173	-330.6347	-280.4435	-206.1114	-121.7559	-54.3059	-32.2462	(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												7146.2215	(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												3110.9953	(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)												328.9959	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3589.9197	(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												7082.2930	(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	7146.2215	0.2100	1500.7065	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3110.9953	0.2100	653.3090	(264)
Space and water heating			2154.0155	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	328.9959	0.1443	47.4843	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1349.9430	0.1349	-182.1166	
PV Unit electricity exported	-2239.9767	0.1260	-282.2271	
Total			-464.3438	(269)
Total CO2, kg/year			1749.0853	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3000	(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	7146.2215	1.1300	8075.2303	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3110.9953	1.1300	3515.4247	(278)
Space and water heating			11590.6551	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	328.9959	1.5338	504.6249	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1349.9430	1.4986	-2023.0399	
PV Unit electricity exported	-2239.9767	0.4625	-1035.9755	
Total			-3059.0153	(283)
Total Primary energy kWh/year			9166.3654	(286)
Target Primary Energy Rate (TPER)			48.7600	(287)