

Full SAP Calculation Printout



Property Reference	14 Pilgrims View		Issued on Date	06/03/2024	
Assessment Reference	14 Pilgrims View	Prop Type Ref	Bungalow		
Property	Pilgrims View, 14, Guildford, Surrey, GU12 6HU				
SAP Rating	87 B	DER	3.95	TER	13.44
Environmental	97 A	% DER < TER			70.61
CO ₂ Emissions (t/year)	0.18	DFEE	42.66	TFEE	49.41
Compliance Check	See BREL	% DFEE < TFEE			13.67
% DPER < TPER	42.13	DPER	41.57	TPER	71.83
Assessor Details	Mr. Andrew Simpson			Assessor ID	AX44-0001
Client	Graham Powell, Graham Powell				

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	50.0000 (1b)	2.4000 (2b)	120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		120.0000 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 120.0000 (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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0833 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	4.0000 (17)
Infiltration rate	0.2833	0.2833 (18)
Number of sides sheltered	2	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2408 (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	0.3071	0.3010	0.2950	0.2649	0.2589	0.2288	0.2288	0.2228	0.2408	0.2589	0.2709	0.2830 (22b)
Effective ac	0.5471	0.5453	0.5435	0.5351	0.5335	0.5262	0.5262	0.5248	0.5290	0.5335	0.5367	0.5400 (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
Door			1.8900	1.2000	2.2680		(26)
Window (Uw = 1.20)			14.8200	1.1450	16.9695		(27)
Ground floor			50.0000	0.1100	5.5000		(28a)
Brick wall	17.2800	6.3200	10.9600	0.1800	1.9728		(29a)
Weatherboard wall	59.5200	10.3900	49.1300	0.1700	8.3521		(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000		(30)
Total net area of external elements Aum(A, m ²)			176.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 40.5624		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.8700	0.0230	0.2500
E3 Sill	6.6000	0.0200	0.1320
E4 Jamb	22.2000	0.0150	0.3330
E5 Ground floor (normal)	32.0000	0.0600	1.9200
E10 Eaves (insulation at ceiling level)	20.6000	0.0590	1.2154
E12 Gable (insulation at ceiling level)	11.4000	0.0430	0.4902
E16 Corner (normal)	12.0000	0.0410	0.4920
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0760	-0.1824

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Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 4.6502 (36)
 Total fabric heat loss (33) + (36) + (36a) = 45.2126 (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
(39)m	21.6669	21.5944	21.5233	21.1896	21.1271	20.8364	20.8364	20.7826	20.9484	21.1271	21.2535	21.3855 (38)
Heat transfer coeff	66.8795	66.8070	66.7359	66.4022	66.3397	66.0490	66.0490	65.9952	66.1610	66.3397	66.4660	66.5981 (39)
Average = Sum(39)m / 12 =												66.4019

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3376	1.3361	1.3347	1.3280	1.3268	1.3210	1.3210	1.3199	1.3232	1.3268	1.3293	1.3320 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 (42)
Hot water usage for baths	63.7276	62.7811	61.4483	58.9909	57.1508	55.1104	54.0083	55.3318	56.7728	58.9561	61.4641	63.5121 (42b)
Hot water usage for other uses	33.6193	32.3968	31.1742	29.9517	28.7292	27.5067	27.5067	28.7292	29.9517	31.1742	32.3968	33.6193 (42c)
Average daily hot water use (litres/day)												89.6485 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy cont	97.3468	95.1779	92.6226	88.9426	85.8800	82.6171	81.5150	84.0610	86.7245	90.1303	93.8609	97.1314 (44)
Energy content (annual)	154.1736	135.5320	142.3574	121.7580	115.6110	101.5874	98.5853	104.0851	106.9400	122.3060	133.7220	152.0843 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1260	20.3298	21.3536	18.2637	17.3416	15.2381	14.7878	15.6128	16.0410	18.3459	20.0583	22.8126 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	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	204.2200	180.7352	192.4038	170.1900	165.6574	150.0194	148.6317	154.1315	155.3720	172.3524	182.1540	202.1307 (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	204.2200	180.7352	192.4038	170.1900	165.6574	150.0194	148.6317	154.1315	155.3720	172.3524	182.1540	202.1307 (64)
Total per year (kWh/year)												2077.9982 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	91.2998	81.2270	87.3710	79.2301	78.4778	72.5234	72.8167	74.6454	74.3032	80.7039	83.2082	90.6051 (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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.2626	82.2193	74.2626	76.7380	74.2626	76.7380	74.2626	74.2626	76.7380	74.2626	76.7380	74.2626 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505 (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)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040 (71)
Water heating gains (Table 5)	122.7148	120.8735	117.4341	110.0419	105.4809	100.7270	97.8720	100.3298	103.1988	108.4729	115.5669	121.7811 (72)
Total internal gains	392.5629	400.2061	384.9599	371.8467	354.4639	342.4612	330.6345	331.5645	340.7590	351.7540	371.6699	385.1328 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
North	1.8400	10.6334	0.6300	0.7000	0.7700	5.9795 (74)						
East	7.0700	19.6403	0.6300	0.7000	0.7700	42.4364 (76)						
South	5.9100	46.7521	0.6300	0.7000	0.7700	84.4423 (78)						
Solar gains	132.8582	232.7364	332.2935	429.6797	493.8493	494.7899	475.2277	427.3381	366.3721	261.2701	160.3826	112.8483 (83)
Total gains	525.4211	632.9425	717.2535	801.5265	848.3133	837.2511	805.8622	758.9026	707.1311	613.0241	532.0524	497.9812 (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)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	51.9176	51.9739	52.0293	52.2908	52.3400	52.5704	52.5704	52.6133	52.4814	52.3400	52.2405	52.1370
alpha	4.4612	4.4649	4.4686	4.4861	4.4893	4.5047	4.5047	4.5076	4.4988	4.4893	4.4827	4.4758
util living area	0.9814	0.9592	0.9157	0.8187	0.6698	0.4931	0.3583	0.3961	0.6105	0.8626	0.9624	0.9850 (86)
Living	19.9958	20.2021	20.4472	20.7017	20.8551	20.9160	20.9284	20.9268	20.8925	20.6801	20.2898	19.9530
Non living	18.6756	18.9323	19.2294	19.5221	19.6757	19.7288	19.7355	19.7359	19.7126	19.5099	19.0498	18.6252
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4863	20.2021	20.4472	20.7017	20.8551	20.9160	20.9284	20.9268	20.8925	20.6801	20.2898	20.0994 (87)
Th 2	19.8115	19.8126	19.8137	19.8189	19.8199	19.8244	19.8244	19.8253	19.8227	19.8199	19.8179	19.8159 (88)
util rest of house	0.9757	0.9475	0.8927	0.7745	0.6021	0.4076	0.2638	0.2970	0.5200	0.8169	0.9495	0.9804 (89)
MIT 2	19.3587	18.9323	19.2294	19.5221	19.6757	19.7288	19.7355	19.7359	19.7126	19.5099	19.0498	18.8398 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.9638	19.6137	19.8829	20.1551	20.3086	20.3658	20.3756	20.3749	20.3457	20.1378	19.7152	19.5157 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9638	19.6137	19.8829	20.1551	20.3086	20.3658	20.3756	20.3749	20.3457	20.1378	19.7152	19.5157 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9765	0.9452	0.8942	0.7880	0.6312	0.4476	0.3084	0.3438	0.5615	0.8305	0.9481	0.9789 (94)
Useful gains	513.0804	598.2381	641.3683	631.6073	535.4449	374.7765	248.5016	260.8917	397.0618	509.1336	504.4643	487.4798 (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	1047.5834	982.9786	893.1197	747.3617	571.0913	380.8268	249.3766	262.3250	413.2249	632.7367	838.4806	1019.9972 (97)
Space heating kWh	397.6702	258.5456	187.3031	83.3431	26.5209	0.0000	0.0000	0.0000	0.0000	91.9607	240.4917	396.1930 (98a)
Space heating requirement - total per year (kWh/year)												1682.0284
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	397.6702	258.5456	187.3031	83.3431	26.5209	0.0000	0.0000	0.0000	0.0000	91.9607	240.4917	396.1930 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1682.0284
Space heating per m2												(98c) / (4) = 33.6406 (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 %)												356.3576 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	397.6702	258.5456	187.3031	83.3431	26.5209	0.0000	0.0000	0.0000	0.0000	91.9607	240.4917	396.1930 (98)
Space heating efficiency (main heating system 1)	356.3576	356.3576	356.3576	356.3576	356.3576	0.0000	0.0000	0.0000	0.0000	356.3576	356.3576	356.3576 (210)
Space heating fuel (main heating system)	111.5930	72.5523	52.5604	23.3875	7.4422	0.0000	0.0000	0.0000	0.0000	25.8057	67.4861	111.1785 (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	204.2200	180.7352	192.4038	170.1900	165.6574	150.0194	148.6317	154.1315	155.3720	172.3524	182.1540	202.1307 (64)
Efficiency of water heater (217)m	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621 (216)
Fuel for water heating, kWh/month	74.9535	66.3341	70.6167	62.4637	60.8002	55.0606	54.5513	56.5699	57.0252	63.2574	66.8548	74.1867 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	13.9681	11.2057	10.0895	7.3920	5.7098	4.6649	5.2087	6.7704	8.7941	11.5383	13.0325	14.3563 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												472.0057 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												272.4621
Water heating fuel used												762.6741 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												112.7302 (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)

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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	1347.4100 (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	472.0057	0.1568	73.9886 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	762.6741	0.1407	107.3390 (264)
Space and water heating			181.3277 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	112.7302	0.1443	16.2704 (268)
Total CO2, kg/year			197.5981 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	472.0057	1.5803	745.8973 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	762.6741	1.5204	1159.5689 (278)
Space and water heating			1905.4662 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	112.7302	1.5338	172.9093 (282)
Total Primary energy kWh/year			2078.3756 (286)
Dwelling Primary energy Rate (DPER)			41.5700 (287)

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

 1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (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	2 * 10 =	20.0000 (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) =	Air changes per hour 20.0000 / (5) = 0.1667 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4167 (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) =	0.3542 (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	0.4516	0.4427	0.4339	0.3896	0.3807	0.3365	0.3365	0.3276	0.3542	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6020	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5537	0.5627	0.5725	0.5794	0.5866 (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
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			10.6100	1.1450	12.1489		(27)
Ground floor			50.0000	0.1300	6.5000		(28a)
Brick wall	17.2800	5.0600	12.2200	0.1800	2.1996		(29a)
Weatherboard wall	59.5200	7.4400	52.0800	0.1800	9.3744		(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000		(30)

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Total net area of external elements Aum(A, m2) 176.8000 (31)
 Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 37.6129 (33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.8700	0.0500	0.5435
E3 Sill	6.6000	0.0500	0.3300
E4 Jamb	22.2000	0.0500	1.1100
E5 Ground floor (normal)	32.0000	0.1600	5.1200
E10 Eaves (insulation at ceiling level)	20.6000	0.0600	1.2360
E12 Gable (insulation at ceiling level)	11.4000	0.0600	0.6840
E16 Corner (normal)	12.0000	0.0900	1.0800
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0900	-0.2160

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.8875 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 47.5004 (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	23.8374	23.6806	23.5269	22.8051	22.6701	22.0414	22.0414	21.9250	22.2836	22.6701	22.9433	23.2289
Average = Sum(39)m / 12 =	71.3377	71.1810	71.0273	70.3055	70.1705	69.5418	69.5418	69.4254	69.7839	70.1705	70.4437	70.7293

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.4268	1.4236	1.4205	1.4061	1.4034	1.3908	1.3908	1.3885	1.3957	1.4034	1.4089	1.4146
HLP (average)												1.4061
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.6901
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
Hot water usage for baths	60.5412	59.6421	58.3759	56.0413	54.2933	52.3549	51.3079	52.5652	53.9342	56.0083	58.3909	60.3365
Hot water usage for other uses	31.9393	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383
Average daily hot water use (litres/day)	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720
Daily hot water use	92.4795	90.4190	87.9914	84.4955	81.5860	78.4863	77.4393	79.8580	82.3883	85.6238	89.1678	92.2748
Energy conte	146.4649	128.7554	135.2396	115.6701	109.8304	96.5080	93.6561	98.8808	101.5930	116.1907	127.0359	144.4801
Energy content (annual)												1414.3051
Distribution loss (46)m = 0.15 x (45)m	21.9697	19.3133	20.2859	17.3505	16.4746	14.4762	14.0484	14.8321	15.2390	17.4286	19.0554	21.6720
Water storage loss:												150.0000
Store volume												1.3938
a) If manufacturer declared loss factor is known (kWh/day):												0.5400
Temperature factor from Table 2b												0.7527
Enter (49) or (54) in (55)												23.3325
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325
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
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total heat required for water heating calculated for each month	193.0598	170.8411	181.8345	160.7619	156.4254	141.5999	140.2510	145.4757	146.6849	162.7856	172.1278	191.0750
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	193.0598	170.8411	181.8345	160.7619	156.4254	141.5999	140.2510	145.4757	146.6849	162.7856	172.1278	191.0750
12Total per year (kWh/year)												1962.9225
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month	85.9755	76.4798	82.2431	74.5338	73.7945	68.1624	68.4166	70.1538	69.8532	75.9093	78.3129	85.3155

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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.4150	82.3880	74.4150	76.8955	74.4150	76.8955	74.4150	74.4150	76.8955	74.4150	76.8955	74.4150
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040
Water heating gains (Table 5)	115.5585	113.8092	110.5418	103.5191	99.1862	94.6700	91.9578	94.2927	97.0183	102.0287	108.7679	114.6714
Total internal gains	388.5589	396.3105	381.2200	368.4815	351.3216	336.5617	324.8726	325.6798	334.7359	348.4622	368.0284	381.1755

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	1.3200	10.6334	0.6300	0.7000	0.7700	4.2896

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East		5.0600	19.6403	0.6300	0.7000	0.7700	30.3717 (76)
South		4.2300	46.7521	0.6300	0.7000	0.7700	60.4384 (78)

Solar gains	95.0998	166.5938	237.8617	307.5817	353.5265	354.2044	340.1986	305.9091	262.2586	187.0194	114.8019	80.7766 (83)
Total gains	483.6587	562.9042	619.0817	676.0632	704.8482	690.7661	665.0712	631.5889	596.9945	535.4815	482.8302	461.9521 (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	48.6730	48.7802	48.8857	49.3876	49.4827	49.9300	49.9300	50.0137	49.7567	49.4827	49.2908	49.0917
alpha	4.2449	4.2520	4.2590	4.2925	4.2988	4.3287	4.3287	4.3342	4.3171	4.2988	4.2861	4.2728
util living area	0.9869	0.9746	0.9510	0.8912	0.7788	0.6065	0.4513	0.4923	0.7160	0.9127	0.9749	0.9891 (86)
MIT	19.5427	19.7800	20.0986	20.4916	20.7876	20.9463	20.9880	20.9827	20.8891	20.5060	19.9590	19.5042 (87)
Th 2	19.7429	19.7453	19.7476	19.7587	19.7607	19.7704	19.7704	19.7722	19.7666	19.7607	19.7565	19.7522 (88)
util rest of house	0.9827	0.9667	0.9353	0.8568	0.7131	0.5053	0.3296	0.3675	0.6198	0.8772	0.9656	0.9856 (89)
MIT 2	18.1024	18.4021	18.7988	19.2746	19.5950	19.7426	19.7671	19.7669	19.6998	19.3056	18.6390	18.0601 (90)
Living area fraction									fLA = Living area / (4) =			0.5366 (91)
MIT	18.8753	19.1415	19.4963	19.9276	20.2349	20.3885	20.4222	20.4193	20.3380	19.9498	19.3473	18.8350 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8753	19.1415	19.4963	19.9276	20.2349	20.3885	20.4222	20.4193	20.3380	19.9498	19.3473	18.8350 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9789	0.9618	0.9315	0.8621	0.7400	0.5579	0.3951	0.4346	0.6671	0.8835	0.9616	0.9821 (94)
Useful gains	473.4330	541.4050	576.7040	582.8391	521.5956	385.3570	262.7712	274.4638	398.2460	473.1158	464.3029	453.6929 (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	1039.7673	1013.7248	923.0893	775.3038	598.8994	402.5448	265.8060	279.0388	435.3089	656.0771	862.7461	1035.1233 (97)
Space heating kWh	421.3528	317.3989	257.7106	138.5746	57.5140	0.0000	0.0000	0.0000	0.0000	136.1232	286.8791	432.5842 (98a)
Space heating requirement - total per year (kWh/year)												2048.1374
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	421.3528	317.3989	257.7106	138.5746	57.5140	0.0000	0.0000	0.0000	0.0000	136.1232	286.8791	432.5842 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2048.1374
Space heating per m2												(98c) / (4) = 40.9627 (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	421.3528	317.3989	257.7106	138.5746	57.5140	0.0000	0.0000	0.0000	0.0000	136.1232	286.8791	432.5842 (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)	456.5035	343.8774	279.2098	150.1350	62.3120	0.0000	0.0000	0.0000	0.0000	147.4791	310.8116	468.6719 (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	193.0598	170.8411	181.8345	160.7619	156.4254	141.5999	140.2510	145.4757	146.6849	162.7856	172.1278	191.0750 (64)
Efficiency of water heater (217)m	85.7608	85.4287	84.8416	83.7285	82.0352	79.8000	79.8000	79.8000	79.8000	83.6614	85.1967	79.8000 (216)
Fuel for water heating, kWh/month	225.1143	199.9811	214.3223	192.0038	190.6808	177.4434	175.7531	182.3004	183.8156	194.5766	202.0356	222.6096 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	15.4620	12.4042	11.1686	8.1826	6.3205	5.1639	5.7657	7.4945	9.7346	12.7724	14.4264	15.8917 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-39.7184	-52.7523	-71.5440	-75.8432	-78.2282	-71.9045	-71.0945	-68.8388	-64.3582	-58.1385	-42.5366	-34.7430 (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	-33.4914	-68.8000	-133.7755	-196.7582	-256.2390	-255.9622	-252.8499	-215.7503	-160.4710	-96.7953	-44.1812	-26.6010 (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												2219.0004 (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												2360.6368 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	124.7869 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2471.3753 (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	2319.0488 (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	2219.0004	0.2100	465.9901 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2360.6368	0.2100	495.7337 (264)
Space and water heating			961.7238 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	124.7869	0.1443	18.0106 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.7003	0.1358	-99.1071
PV Unit electricity exported	-1741.6750	0.1265	-220.3814
Total			-319.4885 (269)
Total CO2, kg/year			672.1752 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4400 (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	2219.0004	1.1300	2507.4704 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2360.6368	1.1300	2667.5196 (278)
Space and water heating			5174.9900 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	124.7869	1.5338	191.4023 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-729.7003	1.5020	-1096.0318
PV Unit electricity exported	-1741.6750	0.4645	-809.0023
Total			-1905.0341 (283)
Total Primary energy kWh/year			3591.4590 (286)
Target Primary Energy Rate (TPER)			71.8300 (287)

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

 1. Overall dwelling characteristics

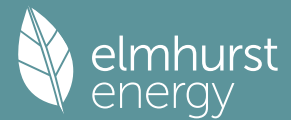
	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (5)

 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	2 * 10 =	20.0000 (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) =	20.0000 / (5) = 0.1667 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.3667 (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) =	0.3117 (21)

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

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Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3974	0.3896	0.3818	0.3428	0.3350	0.2961	0.2961	0.2883	0.3117	0.3350	0.3506	0.3662 (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	0.5790	0.5759	0.5729	0.5588	0.5561	0.5438	0.5438	0.5416	0.5486	0.5561	0.5615	0.5671 (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
Door			1.8900	1.2000	2.2680		(26)
Window (Uw = 1.20)			14.8200	1.1450	16.9695		(27)
Ground floor			50.0000	0.1100	5.5000		(28a)
Brick wall	17.2800	6.3200	10.9600	0.1800	1.9728		(29a)
Weatherboard wall	59.5200	10.3900	49.1300	0.1700	8.3521		(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000		(30)
Total net area of external elements Aum(A, m ²)			176.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	40.5624	(33)

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

250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.8700	0.0230	0.2500
E3 Sill	6.6000	0.0200	0.1320
E4 Jamb	22.2000	0.0150	0.3330
E5 Ground floor (normal)	32.0000	0.0600	1.9200
E10 Eaves (insulation at ceiling level)	20.6000	0.0590	1.2154
E12 Gable (insulation at ceiling level)	11.4000	0.0430	0.4902
E16 Corner (normal)	12.0000	0.0410	0.4920
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0760	-0.1824

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

4.6502 (36)

Point Thermal bridges

(33) + (36) + (36a) = 45.2126 (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
22.9266	22.8051	22.6861	22.1272	22.0226	21.5358	21.5358	21.4456	21.7233	22.0226	22.2342	22.4553	(38)
Heat transfer coeff	68.1391	68.0177	67.8987	67.3398	67.2352	66.7483	66.7483	66.6582	66.9359	67.2352	67.4467	67.6679 (39)
Average = Sum(39)m / 12 =												67.3393

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.3628	1.3604	1.3580	1.3468	1.3447	1.3350	1.3350	1.3332	1.3387	1.3447	1.3489	1.3534 (40)	1.3468
HLP (average)												1.3468
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6901 (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	22.7244	22.3869	21.9117	21.0354	20.3792	19.6517	19.2587	19.7306	20.2445	21.0230	21.9173	22.6476	(42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
Average daily hot water use (litres/day)													50.1040 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
54.6627	53.1639	51.5272	49.4895	47.6720	45.7830	45.3900	47.0234	48.6986	50.6385	52.6942	54.5859	54.5859 (44)	
Energy conte	86.5724	75.7046	79.1954	67.7487	64.1757	56.2956	54.8953	58.2247	60.0502	68.7160	75.0726	85.4684 (45)	
Energy content (annual)										Total = Sum(45)m =		832.1197	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Total heat required for water heating calculated for each month	73.5866	64.3489	67.3161	57.5864	54.5493	47.8512	46.6610	49.4910	51.0427	58.4086	63.8117	72.6481 (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	73.5866	64.3489	67.3161	57.5864	54.5493	47.8512	46.6610	49.4910	51.0427	58.4086	63.8117	72.6481 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		707.3017 (64)	
Electric shower(s)	42.0893	37.5019	40.9507	39.0787	39.8120	37.9768	39.2427	39.8120	39.0787	40.9507	40.1807	42.0893 (64a)	
Heat gains from water heating, kWh/month	28.9190	25.4627	27.0667	24.1663	23.5903	21.4570	21.4759	22.3258	22.5304	24.8398	25.9981	28.6844 (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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.2626	82.2193	74.2626	76.7380	74.2626	76.7380	74.2626	74.2626	76.7380	74.2626	76.7380	74.2626 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505 (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)												

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	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040 (71)
Water heating gains (Table 5)	38.8696	37.8910	36.3800	33.5643	31.7074	29.8014	28.8655	30.0077	31.2922	33.3869	36.1085	38.5542 (72)
Total internal gains	308.7177	317.2236	303.9058	295.3692	280.6905	271.5357	261.6280	261.2424	268.8523	276.6680	292.2114	301.9060 (73)

6. Solar gains

[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	1.8400	10.6334	0.6300	0.7000	0.7000	0.7700	5.9795 (74)					
East	7.0700	19.6403	0.6300	0.7000	0.7700	42.4364 (76)						
South	5.9100	46.7521	0.6300	0.7000	0.7700	84.4423 (78)						
Solar gains	132.8582	232.7364	332.2935	429.6797	493.8493	494.7899	475.2277	427.3381	366.3721	261.2701	160.3826	112.8483 (83)
Total gains	441.5758	549.9600	636.1993	725.0489	774.5398	766.3256	736.8557	688.5805	635.2244	537.9380	452.5940	414.7543 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	50.9578	51.0488	51.1383	51.5627	51.6429	52.0196	52.0196	52.0900	51.8739	51.6429	51.4809	51.3127
tau	4.3972	4.4033	4.4092	4.4375	4.4429	4.4680	4.4680	4.4727	4.4583	4.4429	4.4321	4.4208
util living area	0.9904	0.9754	0.9430	0.8603	0.7200	0.5386	0.3946	0.4386	0.6690	0.9053	0.9791	0.9926 (86)
MIT	19.5540	19.8465	20.2056	20.6046	20.8599	20.9700	20.9939	20.9904	20.9235	20.5606	19.9771	19.5009 (87)
Th 2	19.7920	19.7939	19.7957	19.8044	19.8060	19.8135	19.8135	19.8149	19.8106	19.8060	19.8027	19.7993 (88)
util rest of house	0.9873	0.9678	0.9257	0.8212	0.6523	0.4467	0.2903	0.3290	0.5752	0.8686	0.9712	0.9902 (89)
MIT 2	18.5131	18.8011	19.1474	19.5169	19.7237	19.8018	19.8123	19.8127	19.7757	19.4918	18.9395	18.4660 (90)
Living area fraction	19.0716	19.3620	19.7152	20.1006	20.3334	20.4286	20.4464	20.4447	20.3916	20.0653	19.4963	19.0213 (92)
MIT	19.0716	19.3620	19.7152	20.1006	20.3334	20.4286	20.4464	20.4447	20.3916	20.0653	19.4963	19.0213 (93)
Temperature adjustment												0.0000
adjusted MIT	19.0716	19.3620	19.7152	20.1006	20.3334	20.4286	20.4464	20.4447	20.3916	20.0653	19.4963	19.0213 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9848	0.9644	0.9243	0.8318	0.6836	0.4953	0.3464	0.3879	0.6230	0.8777	0.9687	0.9881 (94)
Useful gains	434.8784	530.3736	588.0650	603.1159	529.4792	379.5537	255.2282	267.1202	395.7249	472.1405	438.4152	409.8071 (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	1006.5272	983.6755	897.2974	754.2446	580.4671	389.0522	256.7382	269.6101	421.1322	636.4029	836.0915	1002.9293 (97)
Space heating kWh	425.3067	304.6189	230.0689	108.8126	37.9350	0.0000	0.0000	0.0000	0.0000	122.2113	286.3269	441.2829 (98a)
Space heating requirement - total per year (kWh/year)												1956.5632
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	425.3067	304.6189	230.0689	108.8126	37.9350	0.0000	0.0000	0.0000	0.0000	122.2113	286.3269	441.2829 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1956.5632
Space heating per m2												(98c) / (4) = 39.1313 (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	627.4345	493.9378	506.6023	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9221	0.9588	0.9442	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	578.5487	473.5682	478.3130	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	869.3543	836.3807	781.3729	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	209.3800	269.9325	225.4765	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	52.3450	67.4831	56.3691	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												176.1973 (107)
Energy for space heating												39.1313 (99)
Energy for space cooling												3.5239 (108)
Total												42.6552 (109)
Fabric Energy Efficiency (DFEE)												42.7 (109)

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

1. Overall dwelling characteristics

Full SAP Calculation Printout



	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.0000	2.4000	120.0000
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		120.0000
Dwelling volume			120.0000

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	2 * 10 =	20.0000 (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)	20.0000 / (5) =	0.1667 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4167 (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) =	0.3542 (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	0.4516	0.4427	0.4339	0.3896	0.3807	0.3365	0.3365	0.3276	0.3542	0.3807	0.3984	0.4161 (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	0.6020	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5537	0.5627	0.5725	0.5794	0.5866 (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
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			10.6100	1.1450	12.1489		(27)
Ground floor			50.0000	0.1300	6.5000		(28a)
Brick wall	17.2800	5.0600	12.2200	0.1800	2.1996		(29a)
Weatherboard wall	59.5200	7.4400	52.0800	0.1800	9.3744		(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000		(30)
Total net area of external elements Aum(A, m ²)			176.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 37.6129		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.8700	0.0500	0.5435
E3 Sill	6.6000	0.0500	0.3300
E4 Jamb	22.2000	0.0500	1.1100
E5 Ground floor (normal)	32.0000	0.1600	5.1200
E10 Eaves (insulation at ceiling level)	20.6000	0.0600	1.2360
E12 Gable (insulation at ceiling level)	11.4000	0.0600	0.6840
E16 Corner (normal)	12.0000	0.0900	1.0800
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0900	-0.2160
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.8875 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 47.5004 (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
(38)m	23.8374	23.6806	23.5269	22.8051	22.6701	22.0414	22.0414	21.9250	22.2836	22.6701	22.9433	23.2289 (38)
Heat transfer coeff	71.3377	71.1810	71.0273	70.3055	70.1705	69.5418	69.5418	69.4254	69.7839	70.1705	70.4437	70.7293 (39)
Average = Sum(39)m / 12 =												70.3049

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.4268	1.4236	1.4205	1.4061	1.4034	1.3908	1.3908	1.3885	1.3957	1.4034	1.4089	1.4146 (40)
HLP (average)												1.4061
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.6901 (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	22.7244	22.3869	21.9117	21.0354	20.3792	19.6517	19.2587	19.7306	20.2445	21.0230	21.9173	22.6476 (42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383 (42c)
Average daily hot water use (litres/day)												50.1040 (43)
Daily hot water use	54.6627	53.1639	51.5272	49.4895	47.6720	45.7830	45.3900	47.0234	48.6986	50.6385	52.6942	54.5859 (44)
Energy conte	86.5724	75.7046	79.1954	67.7487	64.1757	56.2956	54.8953	58.2247	60.0502	68.7160	75.0726	85.4684 (45)
Energy content (annual)												Total = Sum(45)m = 832.1197
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)

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Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
WWHRS	73.5866	64.3489	67.3161	57.5864	54.5493	47.8512	46.6610	49.4910	51.0427	58.4086	63.8117	72.6481	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h													
	73.5866	64.3489	67.3161	57.5864	54.5493	47.8512	46.6610	49.4910	51.0427	58.4086	63.8117	72.6481	(64)
12Total per year (kWh/year)													
Electric shower(s)	42.0893	37.5019	40.9507	39.0787	39.8120	37.9768	39.2427	39.8120	39.0787	40.9507	40.1807	42.0893	(64a)
Heat gains from water heating, kWh/month	28.9190	25.4627	27.0667	24.1663	23.5903	21.4570	21.4759	22.3258	22.5304	24.8398	25.9981	28.6844	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	74.4150	82.3880	74.4150	76.8955	74.4150	76.8955	74.4150	74.4150	76.8955	74.4150	76.8955	74.4150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)													
	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)													
	38.8696	37.8910	36.3800	33.5643	31.7074	29.8014	28.8655	30.0077	31.2922	33.3869	36.1085	38.5542	(72)
Total internal gains	308.8700	317.3923	304.0582	295.5266	280.8429	271.6931	261.7804	261.3948	269.0098	276.8203	292.3689	302.0583	(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		1.3200	10.6334	0.6300	0.7000	0.7700	4.2896						(74)
East		5.0600	19.6403	0.6300	0.7000	0.7700	30.3717						(76)
South		4.2300	46.7521	0.6300	0.7000	0.7700	60.4384						(78)
Solar gains	95.0998	166.5938	237.8617	307.5817	353.5265	354.2044	340.1986	305.9091	262.2586	187.0194	114.8019	80.7766	(83)
Total gains	403.9698	483.9860	541.9199	603.1084	634.3694	625.8976	601.9789	567.3039	531.2684	463.8397	407.1708	382.8350	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	48.6730	48.7802	48.8857	49.3876	49.4827	49.9300	49.9300	50.0137	49.7567	49.4827	49.2908	49.0917		
alpha	4.2449	4.2520	4.2590	4.2925	4.2988	4.3287	4.3287	4.3342	4.3171	4.2988	4.2861	4.2728		
util living area	0.9933	0.9851	0.9682	0.9207	0.8226	0.6550	0.4946	0.5415	0.7700	0.9429	0.9863	0.9946		(86)
MIT	19.3874	19.6333	19.9677	20.3948	20.7320	20.9279	20.9830	20.9751	20.8513	20.4007	19.8175	19.3484		(87)
Th 2	19.7429	19.7453	19.7476	19.7587	19.7607	19.7704	19.7704	19.7722	19.7666	19.7607	19.7565	19.7522		(88)
util rest of house	0.9910	0.9801	0.9572	0.8929	0.7621	0.5511	0.3632	0.4074	0.6772	0.9168	0.9808	0.9928		(89)
MIT 2	18.3114	18.5560	18.8849	19.2979	19.5923	19.7403	19.7666	19.7660	19.6934	19.3148	18.7488	18.2797		(90)
Living area fraction														
MIT	18.8888	19.1341	19.4659	19.8865	20.2039	20.3776	20.4194	20.4148	20.3148	19.8975	19.3222	18.8532		(92)
Temperature adjustment												0.0000		
adjusted MIT	18.8888	19.1341	19.4659	19.8865	20.2039	20.3776	20.4194	20.4148	20.3148	19.8975	19.3222	18.8532		(93)

8. Space heating requirement

Utilisation	0.9889	0.9769	0.9542	0.8962	0.7857	0.6047	0.4340	0.4796	0.7217	0.9202	0.9783	0.9910		(94)
Useful gains	399.4882	472.8296	517.0831	540.5021	498.3996	378.4683	261.2505	272.0626	383.4404	426.8356	398.3372	379.3915		(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	1040.7313	1013.1939	920.9351	772.4137	596.7197	401.7822	265.6045	278.7282	433.6907	652.4108	860.9783	1036.4073		(97)
Space heating kWh	477.0849	363.1249	300.4659	166.9764	73.1502	0.0000	0.0000	0.0000	0.0000	167.8280	333.1016	488.8198		(98a)
Space heating requirement - total per year (kWh/year)												2370.5516		
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	477.0849	363.1249	300.4659	166.9764	73.1502	0.0000	0.0000	0.0000	0.0000	167.8280	333.1016	488.8198		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2370.5516		
Space heating per m2												47.4110		(99)

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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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	653.6929	514.6093	527.6329	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8417	0.9053	0.8815	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	550.2173	465.8953	465.0943	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh						705.0469	678.5688	639.4616	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	111.4773	158.2291	129.7293	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	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh						27.8693	39.5573	32.4323	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												99.8589 (107)
Energy for space heating												47.4110 (99)
Energy for space cooling												1.9972 (108)
Total												49.4082 (109)
Fabric Energy Efficiency (TFEE)												49.4 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.0000 (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	1 * 10 = 10.0000 (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) =	10.0000 / (5) = 0.0833 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2833 (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) = 0.2408 (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	0.3071	0.3010	0.2950	0.2649	0.2589	0.2288	0.2288	0.2228	0.2408	0.2589	0.2709	0.2830 (22b)
Effective ac	0.5471	0.5453	0.5435	0.5351	0.5335	0.5262	0.5262	0.5248	0.5290	0.5335	0.5367	0.5400 (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
Door			1.8900	1.2000	2.2680		(26)
Window (Uw = 1.20)			14.8200	1.1450	16.9695		(27)
Ground floor			50.0000	0.1100	5.5000		(28a)
Brick wall	17.2800	6.3200	10.9600	0.1800	1.9728		(29a)
Weatherboard wall	59.5200	10.3900	49.1300	0.1700	8.3521		(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000		(30)
Total net area of external elements Aum(A, m ²)			176.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 40.5624		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.8700	0.0230	0.2500	
E3 Sill				6.6000	0.0200	0.1320	
E4 Jamb				22.2000	0.0150	0.3330	
E5 Ground floor (normal)				32.0000	0.0600	1.9200	
E10 Eaves (insulation at ceiling level)				20.6000	0.0590	1.2154	
E12 Gable (insulation at ceiling level)				11.4000	0.0430	0.4902	
E16 Corner (normal)				12.0000	0.0410	0.4920	
E17 Corner (inverted - internal area greater than external area)				2.4000	-0.0760	-0.1824	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.6502 (36)

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alpha	4.4612	4.4649	4.4686	4.4861	4.4893	4.5047	4.5047	4.5076	4.4988	4.4893	4.4827	4.4758
util living area	0.9747	0.9506	0.9012	0.8026	0.6543	0.4833	0.3506	0.3867	0.5957	0.8450	0.9534	0.9795 (86)
Living	20.0608	20.2492	20.4884	20.7211	20.8619	20.9171	20.9286	20.9272	20.8961	20.7036	20.3349	20.0154
Non living	18.7565	18.9892	19.2764	19.5415	19.6811	19.7294	19.7356	19.7360	19.7148	19.5335	19.1040	18.7033
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5196	20.2492	20.4884	20.7211	20.8619	20.9171	20.9286	20.9272	20.8961	20.7036	20.3349	20.1531 (87)
Th 2	19.8115	19.8126	19.8137	19.8189	19.8199	19.8244	19.8244	19.8253	19.8227	19.8199	19.8179	19.8159 (88)
util rest of house	0.9672	0.9370	0.8755	0.7568	0.5868	0.3992	0.2580	0.2897	0.5062	0.7964	0.9379	0.9734 (89)
MIT 2	19.3909	18.9892	19.2764	19.5415	19.6811	19.7294	19.7356	19.7360	19.7148	19.5335	19.1040	18.9038 (90)
Living area fraction										fLA = Living area / (4) =		0.5366 (91)
MIT	19.9965	19.6653	19.9267	20.1745	20.3147	20.3667	20.3758	20.3752	20.3487	20.1614	19.7645	19.5742 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9965	19.6653	19.9267	20.1745	20.3147	20.3667	20.3758	20.3752	20.3487	20.1614	19.7645	19.5742 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9686	0.9350	0.8782	0.7715	0.6160	0.4386	0.3017	0.3355	0.5474	0.8118	0.9371	0.9719 (94)
Useful gains	553.9322	626.8666	665.8593	642.7589	539.0955	375.3093	248.5885	261.0471	398.7860	522.5145	531.8188	526.4877 (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	1049.7762	986.4246	896.0453	748.6504	571.4989	380.8870	249.3875	262.3442	413.4185	634.2996	841.7580	1023.8927 (97)
Space heating kWh	368.9079	241.6229	171.2584	76.2419	24.1082	0.0000	0.0000	0.0000	0.0000	83.1681	223.1562	370.0693 (98a)
Space heating requirement - total per year (kWh/year)												1558.5329
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	368.9079	241.6229	171.2584	76.2419	24.1082	0.0000	0.0000	0.0000	0.0000	83.1681	223.1562	370.0693 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1558.5329
Space heating per m2										(98c) / (4) =		31.1707 (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 %)												356.3576 (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	368.9079	241.6229	171.2584	76.2419	24.1082	0.0000	0.0000	0.0000	0.0000	83.1681	223.1562	370.0693 (98)
Space heating efficiency (main heating system 1)	356.3576	356.3576	356.3576	356.3576	356.3576	0.0000	0.0000	0.0000	0.0000	356.3576	356.3576	356.3576 (210)
Space heating fuel (main heating system)	103.5218	67.8035	48.0580	21.3948	6.7652	0.0000	0.0000	0.0000	0.0000	23.3384	62.6214	103.8477 (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	204.2200	180.7352	192.4038	170.1900	165.6574	150.0194	148.6317	154.1315	155.3720	172.3524	182.1540	202.1307 (64)
Efficiency of water heater (217)m	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621 (216)
Fuel for water heating, kWh/month	74.9535	66.3341	70.6167	62.4637	60.8002	55.0606	54.5513	56.5699	57.0252	63.2574	66.8548	74.1867 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	13.9681	11.2057	10.0895	7.3920	5.7098	4.6649	5.2087	6.7704	8.7941	11.5383	13.0325	14.3563 (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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												437.3508 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												272.4621
Water heating fuel used												762.6741 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												112.7302 (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												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1312.7551 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	437.3508	16.4900	72.1191 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	762.6741	16.4900	125.7650 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	112.7302	16.4900	18.5892 (250)
Additional standing charges			0.0000 (251)
Total energy cost			216.4733 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 0.8203 (257)
SAP value	86.7026
SAP rating (Section 12)	87 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	437.3508	0.1568	68.5850 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	762.6741	0.1407	107.3390 (264)
Space and water heating			175.9240 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	112.7302	0.1443	16.2704 (268)
Total CO2, kg/year			192.1945 (272)
CO2 emissions per m2			3.8400 (273)
EI value			97.2890
EI rating			97 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	50.0000 (1b)	x 2.4000 (2b)	= 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	120.0000 (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	1 * 10 = 10.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	10.0000 / (5) = 0.0833 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2833 (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) = 0.2408 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.0000	4.0000	3.7000	3.7000	3.3000	3.3000	3.1000	3.2000	3.5000	3.4000	3.8000 (22)
Wind factor	1.0750	1.0000	1.0000	0.9250	0.9250	0.8250	0.8250	0.7750	0.8000	0.8750	0.8500	0.9500 (22a)
Adj infilt rate	0.2589	0.2408	0.2408	0.2228	0.2228	0.1987	0.1987	0.1866	0.1927	0.2107	0.2047	0.2288 (22b)
Effective ac	0.5335	0.5290	0.5290	0.5248	0.5248	0.5197	0.5197	0.5174	0.5186	0.5222	0.5210	0.5262 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.2000	2.2680		(26)
Window (Uw = 1.20)			14.8200	1.1450	16.9695		(27)
Ground floor			50.0000	0.1100	5.5000		(28a)
Brick wall	17.2800	6.3200	10.9600	0.1800	1.9728		(29a)
Weatherboard wall		10.3900	49.1300	0.1700	8.3521		(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000		(30)
Total net area of external elements Aum(A, m2)			176.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 40.5624		(33)

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

250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.8700	0.0230	0.2500
E3 Sill	6.6000	0.0200	0.1320
E4 Jamb	22.2000	0.0150	0.3330
E5 Ground floor (normal)	32.0000	0.0600	1.9200
E10 Eaves (insulation at ceiling level)	20.6000	0.0590	1.2154
E12 Gable (insulation at ceiling level)	11.4000	0.0430	0.4902
E16 Corner (normal)	12.0000	0.0410	0.4920
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0760	-0.1824

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

4.6502 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 45.2126 (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	21.1271	20.9484	20.9484	20.7826	20.7826	20.5816	20.5816	20.4898	20.5350	20.6793	20.6297	20.8364 (38)
Average = Sum(39)m / 12 =	66.3397	66.1610	66.1610	65.9952	65.9952	65.7942	65.7942	65.7023	65.7476	65.8918	65.8423	66.0490 (39)
HLP	1.3268	1.3232	1.3232	1.3199	1.3199	1.3159	1.3159	1.3140	1.3150	1.3178	1.3168	1.3210 (40)
HLP (average)												1.3191
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 (42)
Hot water usage for baths	63.7276	62.7811	61.4483	58.9909	57.1508	55.1104	54.0083	55.3318	56.7728	58.9561	61.4641	63.5121 (42b)
Hot water usage for other uses	33.6193	32.3968	31.1742	29.9517	28.7292	27.5067	27.5067	28.7292	29.9517	31.1742	32.3968	33.6193 (42c)
Average daily hot water use (litres/day)												89.6485 (43)
Daily hot water use	97.3468	95.1779	92.6226	88.9426	85.8800	82.6171	81.5150	84.0610	86.7245	90.1303	93.8609	97.1314 (44)
Energy content (annual)	154.1736	135.5320	142.3574	121.7580	115.6110	101.5874	98.5853	104.0851	106.9400	122.3060	133.7220	152.0843 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1260	20.3298	21.3536	18.2637	17.3416	15.2381	14.7878	15.6128	16.0410	18.3459	20.0583	22.8126 (46)
Water storage loss:												150.0000 (47)
Store volume												1.6000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8640 (55)
Enter (49) or (54) in (55)												
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (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	204.2200	180.7352	192.4038	170.1900	165.6574	150.0194	148.6317	154.1315	155.3720	172.3524	182.1540	202.1307 (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	204.2200	180.7352	192.4038	170.1900	165.6574	150.0194	148.6317	154.1315	155.3720	172.3524	182.1540	202.1307 (64)
Total per year (kWh/year) = Sum(64)m =												2077.9982 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	91.2998	81.2270	87.3710	79.2301	78.4778	72.5234	72.8167	74.6454	74.3032	80.7039	83.2082	90.6051 (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	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9581	14.1739	11.5270	8.7267	6.5233	5.5072	5.9507	7.7350	10.3819	13.1822	15.3856	16.4017 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.7522	222.0325	216.2861	204.0527	188.6103	174.0966	164.4006	162.1202	167.8666	180.1000	195.5424	210.0561 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307 (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)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040 (71)
Water heating gains (Table 5)	122.7148	120.8735	117.4341	110.0419	105.4809	100.7270	97.8720	100.3298	103.1988	108.4729	115.5669	121.7811 (72)
Total internal gains	439.0578	437.7125	425.8799	403.4540	381.2472	360.9635	348.8560	350.8178	362.0801	382.3879	407.1276	428.8716 (73)

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6. Solar gains

[Jan]			Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
North			1.8400	12.7350	0.6300	0.7000	0.7700	7.1613 (74)				
East			7.0700	23.7652	0.6300	0.7000	0.7700	51.3492 (76)				
South			5.9100	53.8987	0.6300	0.7000	0.7700	97.3504 (78)				
Solar gains	155.8608	238.7343	339.2864	450.5017	503.7907	539.9845	513.3344	466.8392	402.5830	287.8562	185.3658	133.1488 (83)
Total gains	594.9187	676.4468	765.1663	853.9557	885.0379	900.9480	862.1904	817.6570	764.6630	670.2441	592.4934	562.0204 (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	52.3400	52.4814	52.4814	52.6133	52.6133	52.7740	52.7740	52.8478	52.8114	52.6958	52.7354	52.5704
alpha	4.4893	4.4988	4.4988	4.5076	4.5076	4.5183	4.5183	4.5232	4.5208	4.5131	4.5157	4.5047
util living area	0.9680	0.9452	0.8868	0.7711	0.6015	0.3977	0.2741	0.2964	0.5330	0.8074	0.9388	0.9737 (86)
Living	20.1437	20.2984	20.5451	20.7644	20.8867	20.9260	20.9308	20.9305	20.9110	20.7579	20.4227	20.1059
Non living	18.8665	19.0578	19.3502	19.5920	19.7074	19.7384	19.7404	19.7419	19.7310	19.5953	19.2179	18.8235
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5620	20.2984	20.5451	20.7644	20.8867	20.9260	20.9308	20.9305	20.9110	20.7579	20.4227	20.2309 (87)
Th 2	19.8199	19.8227	19.8227	19.8253	19.8253	19.8284	19.8284	19.8298	19.8291	19.8269	19.8277	19.8244 (88)
util rest of house	0.9587	0.9301	0.8577	0.7207	0.5294	0.3149	0.1852	0.2032	0.4429	0.7509	0.9189	0.9658 (89)
MIT 2	19.4398	19.0578	19.3502	19.5920	19.7074	19.7384	19.7404	19.7419	19.7310	19.5953	19.2179	19.0039 (90)
Living area fraction	fLA = Living area / (4) =											0.5366 (91)
MIT	20.0420	19.7235	19.9914	20.2211	20.3402	20.3757	20.3792	20.3797	20.3642	20.2192	19.8644	19.6623 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0420	19.7235	19.9914	20.2211	20.3402	20.3757	20.3792	20.3797	20.3642	20.2192	19.8644	19.6623 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9606	0.9286	0.8623	0.7387	0.5618	0.3539	0.2271	0.2471	0.4849	0.7113	0.9197	0.9645 (94)
Useful gains	571.5028	628.1559	659.7849	630.7749	497.2491	318.8412	195.8238	202.0686	370.8085	516.9328	544.8873	542.0565 (95)
Ext temp.	4.7000	5.2000	7.0000	9.4000	12.5000	15.5000	17.4000	17.3000	14.6000	11.1000	7.6000	4.7000 (96)
Heat loss rate W	1017.7814	960.8904	859.5235	714.1402	517.4174	320.7919	196.0116	202.3438	378.9801	600.8798	807.5137	988.2467 (97)
Space heating kWh	332.0313	223.5976	148.6055	60.0230	15.0053	0.0000	0.0000	0.0000	0.0000	62.4566	189.0910	331.9655 (98a)
Space heating requirement - total per year (kWh/year)												1362.7758
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	332.0313	223.5976	148.6055	60.0230	15.0053	0.0000	0.0000	0.0000	0.0000	62.4566	189.0910	331.9655 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1362.7758
Space heating per m ²												(98c) / (4) = 27.2555 (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 %) 356.2198 (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	332.0313	223.5976	148.6055	60.0230	15.0053	0.0000	0.0000	0.0000	0.0000	62.4566	189.0910	331.9655 (98)
Space heating efficiency (main heating system 1)	356.2198	356.2198	356.2198	356.2198	356.2198	0.0000	0.0000	0.0000	0.0000	356.2198	356.2198	356.2198 (210)
Space heating fuel (main heating system)	93.2097	62.7696	41.7174	16.8500	4.2124	0.0000	0.0000	0.0000	0.0000	17.5332	53.0827	93.1912 (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	204.2200	180.7352	192.4038	170.1900	165.6574	150.0194	148.6317	154.1315	155.3720	172.3524	182.1540	202.1307 (64)
Efficiency of water heater (217)m	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235 (216)
Fuel for water heating, kWh/month	74.9367	66.3191	70.6008	62.4497	60.7865	55.0482	54.5391	56.5571	57.0123	63.2431	66.8397	74.1700 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	13.9681	11.2057	10.0895	7.3920	5.7098	4.6649	5.2087	6.7704	8.7941	11.5383	13.0325	14.3563 (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)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												382.5660	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												272.5235	
Water heating fuel used												762.5024	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												112.7302	(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												1257.7985	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	382.5660	25.1600	96.2536	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	762.5024	25.1600	191.8456	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	112.7302	25.1600	28.3629	(250)
Additional standing charges			0.0000	(251)
Total energy cost			316.4621	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	382.5660	0.1573	60.1748	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	762.5024	0.1407	107.3149	(264)
Space and water heating			167.4897	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	112.7302	0.1443	16.2704	(268)
Total CO2, kg/year			183.7601	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	382.5660	1.5823	605.3222	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	762.5024	1.5204	1159.3078	(278)
Space and water heating			1764.6300	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	112.7302	1.5338	172.9093	(282)
Total Primary energy kWh/year			1937.5393	(286)

SAP 10 EPC IMPROVEMENTS

14 Pilgrims View

Current energy efficiency rating: B 87
 Current environmental impact rating: A 97

N Solar water heating			Recommended
U Solar photovoltaic panels			Recommended
V2 Wind turbine			Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.6	-£ 45	-22 kg (12.0%)
U Solar photovoltaic panels	+ 7.0	-£ 182	-98 kg (60.6%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£45	0.44 kg/m ²	B 88 A 98
Solar photovoltaic panels	£182	1.96 kg/m ²	A 95 A 99
Total Savings	£227	2.40 kg/m²	

Potential energy efficiency rating: A 95
 Potential environmental impact rating: A 99

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Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
 Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £316	Potential £271	Saving £45
Electricity			
Space heating	£96	£117	-£20
Water heating	£192	£126	£66
Lighting	£28	£28	£0
Generated (PV)	-£0	-£182	£182
Total cost of fuels	£316	£89	£227
Total cost of uses	£316	£89	£228
Delivered energy	25 kWh/m ²	7 kWh/m ²	18 kWh/m ²
Carbon dioxide emissions	0.2 tonnes	0.1 tonnes	0.1 tonnes
CO2 emissions per m ²	4 kg/m ²	1 kg/m ²	2 kg/m ²
Primary energy	39 kWh/m ²	12 kWh/m ²	27 kWh/m ²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
 CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.0000 (1b)	2.4000 (2b)	120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 120.0000 (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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0833 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.2833	(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) =	0.2408 (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												
Effective ac	0.3071	0.3010	0.2950	0.2649	0.2589	0.2288	0.2288	0.2228	0.2408	0.2589	0.2709	0.2830 (22b)
	0.5471	0.5453	0.5435	0.5351	0.5335	0.5262	0.5262	0.5248	0.5290	0.5335	0.5367	0.5400 (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
Door			1.8900	1.2000	2.2680		(26)
Window (Uw = 1.20)			14.8200	1.1450	16.9695		(27)
Ground floor			50.0000	0.1100	5.5000		(28a)
Brick wall	17.2800	6.3200	10.9600	0.1800	1.9728		(29a)
Weatherboard wall	59.5200	10.3900	49.1300	0.1700	8.3521		(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000		(30)
Total net area of external elements Aum(A, m ²)			176.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 40.5624		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				10.8700	0.0230	0.2500	
E3 Sill				6.6000	0.0200	0.1320	
E4 Jamb				22.2000	0.0150	0.3330	
E5 Ground floor (normal)				32.0000	0.0600	1.9200	
E10 Eaves (insulation at ceiling level)				20.6000	0.0590	1.2154	
E12 Gable (insulation at ceiling level)				11.4000	0.0430	0.4902	
E16 Corner (normal)				12.0000	0.0410	0.4920	
E17 Corner (inverted - internal area greater than external area)				2.4000	-0.0760	-0.1824	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						4.6502 (36)	
Point Thermal bridges						(36a) = 0.0000	
Total fabric heat loss						(33) + (36) + (36a) = 45.2126 (37)	

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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	21.6669	21.5944	21.5233	21.1896	21.1271	20.8364	20.8364	20.7826	20.9484	21.1271	21.2535	21.3855 (38)
Average = Sum(39)m / 12 =	66.8795	66.8070	66.7359	66.4022	66.3397	66.0490	66.0490	65.9952	66.1610	66.3397	66.4660	66.5981 (39) 66.4019

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3376	1.3361	1.3347	1.3280	1.3268	1.3210	1.3210	1.3199	1.3232	1.3268	1.3293	1.3320 (40) 1.3280
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6901 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												63.7276 (42b)
Hot water usage for other uses												33.6193 (42c)
Average daily hot water use (litres/day)												89.6485 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	97.3468	95.1779	92.6226	88.9426	85.8800	82.6171	81.5150	84.0610	86.7245	90.1303	93.8609	97.1314 (44)
Energy content (annual)	154.1736	135.5320	142.3574	121.7580	115.6110	101.5874	98.5853	104.0851	106.9400	122.3060	133.7220	152.0843 (45)
Distribution loss (46)m = 0.15 x (45)m												23.1260
Water storage loss:												23.1260
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss												26.7840 (56)
If cylinder contains dedicated solar storage												26.7840 (57)
Primary loss												23.2624 (57)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month												204.2200 (62)
WWHRS												0.0000 (63a)
PV diverter												-0.0000 (63b)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												578.0867 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												578.0867
Solar input	-0.0000	-16.2908	-56.0731	-75.1725	-95.4182	-87.6062	-86.8464	-77.3183	-54.9831	-28.3779	-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	204.2200	164.4444	134.9350	88.2639	57.4449	49.8064	48.7584	64.7167	94.9860	142.5787	182.1540	202.1307 (64)
Electric shower(s)												0.0000 (64a)
Heat gains from water heating, kWh/month												91.2998 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)

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	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9581	14.1739	11.5270	8.7267	6.5233	5.5072	5.9507	7.7350	10.3819	13.1822	15.3856	16.4017 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.7522	222.0325	216.2861	204.0527	188.6103	174.0966	164.4006	162.1202	167.8666	180.1000	195.5424	210.0561 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307 (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)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040 (71)
Water heating gains (Table 5)	122.7148	120.8735	115.9333	102.5379	91.7235	86.7195	83.8645	87.3229	97.1956	106.9721	115.5669	121.7811 (72)
Total internal gains	439.0578	437.7125	424.3791	395.9500	367.4899	346.9560	334.8485	337.8109	356.0769	380.8871	407.1276	428.8716 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m ²	Table 6a	Specific data	Specific data	factor	W
		W/m ²	or Table 6b	or Table 6c	Table 6d	
North	1.8400	10.6334	0.6300	0.7000	0.7700	5.9795 (74)
East	7.0700	19.6403	0.6300	0.7000	0.7700	42.4364 (76)
South	5.9100	46.7521	0.6300	0.7000	0.7700	84.4423 (78)

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Solar gains	132.8582	232.7364	332.2935	429.6797	493.8493	494.7899	475.2277	427.3381	366.3721	261.2701	160.3826	112.8483 (83)
Total gains	571.9160	670.4489	756.6726	825.6297	861.3392	841.7459	810.0762	765.1490	722.4490	642.1571	567.5102	541.7199 (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	51.9176	51.9739	52.0293	52.2908	52.3400	52.5704	52.5704	52.6133	52.4814	52.3400	52.2405	52.1370	
alpha	4.4612	4.4649	4.4686	4.4861	4.4893	4.5047	4.5047	4.5076	4.4988	4.4893	4.4827	4.4758	
util living area	0.9747	0.9506	0.9018	0.8064	0.6622	0.4907	0.3565	0.3930	0.5998	0.8459	0.9534	0.9795 (86)	
Living	20.0608	20.2492	20.4869	20.7167	20.8585	20.9163	20.9285	20.9269	20.8951	20.7025	20.3349	20.0154	
Non living	18.7565	18.9892	19.2747	19.5371	19.6784	19.7289	19.7356	19.7359	19.7142	19.5324	19.1040	18.7033	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5196	20.2492	20.4869	20.7167	20.8585	20.9163	20.9285	20.9269	20.8951	20.7025	20.3349	20.1531 (87)	
Th 2	19.8115	19.8126	19.8137	19.8189	19.8199	19.8244	19.8244	19.8253	19.8227	19.8199	19.8179	19.8159 (88)	
util rest of house	0.9672	0.9370	0.8762	0.7610	0.5946	0.4056	0.2624	0.2946	0.5100	0.7974	0.9379	0.9734 (89)	
MIT 2	19.3909	18.9892	19.2747	19.5371	19.6784	19.7289	19.7356	19.7359	19.7142	19.5324	19.1040	18.9038 (90)	
Living area fraction										FLA = Living area / (4) =		0.5366 (91)	
MIT	19.9965	19.6653	19.9252	20.1700	20.3117	20.3661	20.3757	20.3750	20.3479	20.1603	19.7645	19.5742 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.9965	19.6653	19.9252	20.1700	20.3117	20.3661	20.3757	20.3750	20.3479	20.1603	19.7645	19.5742 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9686	0.9350	0.8788	0.7754	0.6238	0.4454	0.3068	0.3410	0.5513	0.8127	0.9371	0.9719 (94)
Useful gains	553.9322	626.8666	664.9928	640.1996	537.2687	374.9107	248.5225	260.9442	398.3202	521.8880	531.8188	526.4877 (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	1049.7762	986.4246	895.9419	748.3552	571.2951	380.8420	249.3792	262.3315	413.3662	634.2266	841.7580	1023.8927 (97)
Space heating kWh	368.9079	241.6229	171.8261	77.8720	25.3156	0.0000	0.0000	0.0000	0.0000	83.5800	223.1562	370.0693 (98a)
Space heating requirement - total per year (kWh/year)												1562.3502
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	368.9079	241.6229	171.8261	77.8720	25.3156	0.0000	0.0000	0.0000	0.0000	83.5800	223.1562	370.0693 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1562.3502
Space heating per m2										(98c) / (4) =		31.2470 (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 %)												356.3576 (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	368.9079	241.6229	171.8261	77.8720	25.3156	0.0000	0.0000	0.0000	0.0000	83.5800	223.1562	370.0693 (98)
Space heating efficiency (main heating system 1)	356.3576	356.3576	356.3576	356.3576	356.3576	0.0000	0.0000	0.0000	0.0000	356.3576	356.3576	356.3576 (210)
Space heating fuel (main heating system)	103.5218	67.8035	48.2173	21.8522	7.1040	0.0000	0.0000	0.0000	0.0000	23.4540	62.6214	103.8477 (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	204.2200	164.4444	134.9350	88.2639	57.4449	49.8064	48.7584	64.7167	94.9860	142.5787	182.1540	202.1307 (64)
Efficiency of water heater (217)m	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621	272.4621 (216)
Fuel for water heating, kWh/month	74.9535	60.3550	49.5243	32.3949	21.0836	18.2801	17.8955	23.7525	34.8621	52.3297	66.8548	74.1867 (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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945 (231)
Lighting	13.9681	11.2057	10.0895	7.3920	5.7098	4.6649	5.2087	6.7704	8.7941	11.5383	13.0325	14.3563 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-34.7542	-49.3603	-69.8137	-75.0580	-76.4047	-69.5855	-68.6906	-66.2757	-61.1514	-54.4672	-38.0644	-29.9234 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												438.4220 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												272.4621

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Water heating fuel used	526.4728	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	80.0000	(231)
Electricity for lighting (calculated in Appendix L)	112.7302	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-693.5491	(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	464.0758	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	438.4220	16.4900	72.2958	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	526.4728	16.4900	86.8154	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	112.7302	16.4900	18.5892	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-693.5491	16.4900	-114.3662	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-114.3662	(252)
Total energy cost			76.5261	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.2900	(257)
SAP value		95.2992	
SAP rating (Section 12)		95	(258)
SAP band		A	

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	438.4220	0.1568	68.7352	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	526.4728	0.1468	77.2648	(264)
Space and water heating			146.0000	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	112.7302	0.1443	16.2704	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-693.5491	0.1355	-93.9538	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-93.9538	(269)
Total CO2, kg/year			79.4136	(272)
CO2 emissions per m2			1.5900	(273)
EI value			98.8799	
EI rating			99	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	50.0000	(1b)	x	2.4000 (2b) = 120.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	120.0000 (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)

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Number of blocked chimneys 0 * 20 = 0.0000 (6f)
 Number of intermittent extract fans 1 * 10 = 10.0000 (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) = 10.0000 / (5) = 0.0833 (8)
 Pressure Test Yes
 Pressure Test Method Blower Door
 Measured/design AF50 4.0000 (17)
 Infiltration rate 0.2833 (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) = 0.2408 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.0000	4.0000	3.7000	3.7000	3.3000	3.3000	3.1000	3.2000	3.5000	3.4000	3.8000
Wind factor	1.0750	1.0000	1.0000	0.9250	0.9250	0.8250	0.8250	0.7750	0.8000	0.8750	0.8500	0.9500
Adj infilt rate												
Effective ac	0.2589	0.2408	0.2408	0.2228	0.2228	0.1987	0.1987	0.1866	0.1927	0.2107	0.2047	0.2288
	0.5335	0.5290	0.5290	0.5248	0.5248	0.5197	0.5197	0.5174	0.5186	0.5222	0.5210	0.5262

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
Door			1.8900	1.2000	2.2680		(26)
Window (Uw = 1.20)			14.8200	1.1450	16.9695		(27)
Ground floor			50.0000	0.1100	5.5000		(28a)
Brick wall	17.2800	6.3200	10.9600	0.1800	1.9728		(29a)
Weatherboard wall	59.5200	10.3900	49.1300	0.1700	8.3521		(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000		(30)
Total net area of external elements Aum(A, m2)			176.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 40.5624		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.8700	0.0230	0.2500
E3 Sill	6.6000	0.0200	0.1320
E4 Jamb	22.2000	0.0150	0.3330
E5 Ground floor (normal)	32.0000	0.0600	1.9200
E10 Eaves (insulation at ceiling level)	20.6000	0.0590	1.2154
E12 Gable (insulation at ceiling level)	11.4000	0.0430	0.4902
E16 Corner (normal)	12.0000	0.0410	0.4920
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0760	-0.1824

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.6502 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 45.2126 (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
	21.1271	20.9484	20.9484	20.7826	20.7826	20.5816	20.5816	20.4898	20.5350	20.6793	20.6297	20.8364
Heat transfer coeff	66.3397	66.1610	66.1610	65.9952	65.9952	65.7942	65.7942	65.7023	65.7476	65.8918	65.8423	66.0490
Average = Sum(39)m / 12 =												65.9561

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3268	1.3232	1.3232	1.3199	1.3199	1.3159	1.3159	1.3140	1.3150	1.3178	1.3168	1.3210
HLP (average)												1.3191
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6901 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Hot water usage for baths	63.7276	62.7811	61.4483	58.9909	57.1508	55.1104	54.0083	55.3318	56.7728	58.9561	61.4641	63.5121
Hot water usage for other uses	33.6193	32.3968	31.1742	29.9517	28.7292	27.5067	27.5067	28.7292	29.9517	31.1742	32.3968	33.6193
Average daily hot water use (litres/day)												89.6485

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	97.3468	95.1779	92.6226	88.9426	85.8800	82.6171	81.5150	84.0610	86.7245	90.1303	93.8609	97.1314
Energy conte	154.1736	135.5320	142.3574	121.7580	115.6110	101.5874	98.5853	104.0851	106.9400	122.3060	133.7220	152.0843
Energy content (annual)										Total = Sum(45)m =		1488.7422

Distribution loss (46)m = 0.15 x (45)m
 23.1260 20.3298 21.3536 18.2637 17.3416 15.2381 14.7878 15.6128 16.0410 18.3459 20.0583 22.8126 (46)
 Water storage loss:
 Store volume 150.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day):
 Temperature factor from Table 2b 1.6000 (48)
 Enter (49) or (54) in (55) 0.5400 (49)
 Total storage loss 0.8640 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	25.9200
26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	25.9200
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total heat required for water heating calculated for each month	204.2200	180.7352	191.0081	163.4364	152.8631	137.4127	135.6048	142.0350	149.9691	170.9566	182.1540	202.1307
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
Aperture area of solar collector												3.0000
Zero-loss collector efficiency												0.8000
Collector linear heat loss coefficient												1.8000
Collector 2nd order heat loss coefficient												0.0000
Collector loop efficiency												0.9000
Incidence angle modifier												1.0000
Overshading factor												0.8000

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Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												645.9959 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												645.9959
Solar input	-0.9403	-18.8071	-59.7559	-81.2990	-98.9976	-96.9175	-95.1073	-87.1316	-64.5520	-36.9383	-5.5494	-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	203.2797	161.9281	131.2522	82.1374	53.8655	40.4952	40.4975	54.9035	85.4172	134.0184	176.6046	202.1307 (64)
												Total per year (kWh/year) = Sum(64)m = 1366.5299 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	91.2998	81.2270	86.2544	73.8273	68.2423	62.4380	62.3952	64.9682	69.9809	79.5873	83.2082	90.6051 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061	101.4061 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9581	14.1739	11.5270	8.7267	6.5233	5.5072	5.9507	7.7350	10.3819	13.1822	15.3856	16.4017 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.7522	222.0325	216.2861	204.0527	188.6103	174.0966	164.4006	162.1202	167.8666	180.1000	195.5424	210.0561 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307	46.8307 (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)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040 (71)
Water heating gains (Table 5)	122.7148	120.8735	115.9333	102.5379	91.7235	86.7195	83.8645	87.3229	97.1956	106.9721	115.5669	121.7811 (72)
Total internal gains	439.0578	437.7125	424.3791	395.9500	367.4899	346.9560	334.8485	337.8109	356.0769	380.8871	407.1276	428.8716 (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		1.8400	12.7350	0.6300	0.7000	0.7700	7.1613 (74)					
East		7.0700	23.7652	0.6300	0.7000	0.7700	51.3492 (76)					
South		5.9100	53.8987	0.6300	0.7000	0.7700	97.3504 (78)					
Solar gains	155.8608	238.7343	339.2864	450.5017	503.7907	539.9845	513.3344	466.8392	402.5830	287.8562	185.3658	133.1488 (83)
Total gains	594.9187	676.4468	763.6655	846.4517	871.2806	886.9406	848.1829	804.6501	758.6598	668.7433	592.4934	562.0204 (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)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.3400	52.4814	52.4814	52.6133	52.6133	52.7740	52.7740	52.8478	52.8114	52.6958	52.7354	52.5704
alpha	4.4893	4.4988	4.4988	4.5076	4.5076	4.5183	4.5183	4.5232	4.5208	4.5131	4.5157	4.5047
util living area	0.9680	0.9452	0.8874	0.7751	0.6093	0.4038	0.2786	0.3012	0.5368	0.8083	0.9388	0.9737 (86)
Living	20.1437	20.2984	20.5437	20.7606	20.8844	20.9257	20.9307	20.9304	20.9104	20.7570	20.4227	20.1059
Non living	18.8665	19.0578	19.3487	19.5884	19.7057	19.7383	19.7404	19.7419	19.7307	19.5945	19.2179	18.8235
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5620	20.2984	20.5437	20.7606	20.8844	20.9257	20.9307	20.9304	20.9104	20.7570	20.4227	20.2309 (87)
Th 2	19.8199	19.8227	19.8227	19.8253	19.8253	19.8284	19.8284	19.8298	19.8291	19.8269	19.8277	19.8244 (88)
util rest of house	0.9587	0.9301	0.8584	0.7250	0.5368	0.3198	0.1883	0.2064	0.4462	0.7520	0.9189	0.9658 (89)
MIT 2	19.4398	19.0578	19.3487	19.5884	19.7057	19.7383	19.7404	19.7419	19.7307	19.5945	19.2179	19.0039 (90)
Living area fraction									FLA = Living area / (4) = 0.5366 (91)			
MIT	20.0420	19.7235	19.9900	20.2174	20.3382	20.3754	20.3791	20.3797	20.3637	20.2183	19.8644	19.6623 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0420	19.7235	19.9900	20.2174	20.3382	20.3754	20.3791	20.3797	20.3637	20.2183	19.8644	19.6623 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	571.5028	628.1559	658.9833	628.6484	496.0394	318.6997	195.8081	202.0464	370.5432	516.4280	544.8873	542.0565 (95)
Ext temp.	4.7000	5.2000	7.0000	9.4000	12.5000	15.5000	17.4000	17.3000	14.6000	11.1000	7.6000	4.7000 (96)
Heat loss rate W	1017.7814	960.8904	859.4289	713.8983	517.2835	320.7754	196.0094	202.3407	378.9503	600.8220	807.5137	988.2467 (97)
Space heating kWh	332.0313	223.5976	149.1315	61.3799	15.8056	0.0000	0.0000	0.0000	0.0000	62.7891	189.0910	331.9655 (98a)
Space heating requirement - total per year (kWh/year)												1365.7917
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	332.0313	223.5976	149.1315	61.3799	15.8056	0.0000	0.0000	0.0000	0.0000	62.7891	189.0910	331.9655 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1365.7917
Space heating per m2												(98c) / (4) = 27.3158 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													356.2198 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	332.0313	223.5976	149.1315	61.3799	15.8056	0.0000	0.0000	0.0000	0.0000	62.7891	189.0910	331.9655	(98)
Space heating efficiency (main heating system 1)	356.2198	356.2198	356.2198	356.2198	356.2198	0.0000	0.0000	0.0000	0.0000	356.2198	356.2198	356.2198	(210)
Space heating fuel (main heating system)	93.2097	62.7696	41.8650	17.2309	4.4370	0.0000	0.0000	0.0000	0.0000	17.6265	53.0827	93.1912	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	203.2797	161.9281	131.2522	82.1374	53.8655	40.4952	40.4975	54.9035	85.4172	134.0184	176.6046	202.1307	(64)
Efficiency of water heater (217)m	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235	272.5235	(216)
Fuel for water heating, kWh/month	74.5916	59.4180	48.1618	30.1396	19.7655	14.8593	14.8602	20.1463	31.3430	49.1768	64.8035	74.1700	(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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	13.9681	11.2057	10.0895	7.3920	5.7098	4.6649	5.2087	6.7704	8.7941	11.5383	13.0325	14.3563	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-39.7504	-50.5662	-70.6653	-76.1966	-76.3685	-71.0908	-70.0370	-68.2110	-63.9441	-57.7460	-42.5795	-34.4792	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													383.4126 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													272.5235
Water heating fuel used													501.4356 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
pump for solar water heating													80.0000 (230g)
Total electricity for the above, kWh/year													80.0000 (231)
Electricity for lighting (calculated in Appendix L)													112.7302 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-721.6346 (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													355.9438 (238)

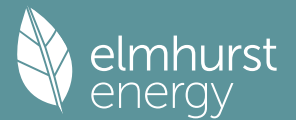
10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	383.4126	25.1600	96.4666	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	501.4356	25.1600	126.1612	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	25.1600	20.1280	(249)
Energy for lighting	112.7302	25.1600	28.3629	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-721.6346	25.1600	-181.5633	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-181.5633	(252)
Total energy cost			89.5554	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	383.4126	0.1573	60.2942	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	501.4356	0.1476	74.0290	(264)
Space and water heating			134.3232	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	112.7302	0.1443	16.2704	(268)
Energy saving/generation technologies				

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PV Unit electricity used in dwelling	-721.6346	0.1358	-98.0073
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-98.0073 (269)
Total CO2, kg/year			63.6833 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	383.4126	1.5821	606.6111 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	501.4356	1.5462	775.3135 (278)
Space and water heating			1381.9246 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)
Energy for lighting	112.7302	1.5338	172.9093 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-721.6346	1.5020	-1083.9007
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1083.9007 (283)
Total Primary energy kWh/year			591.9572 (286)