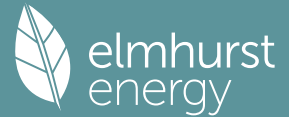


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Property Reference	1325_01		Issued on Date	30/10/2023	
Assessment Reference	1325_01	Prop Type Ref			
Property	Lauren House Annexe, CADOGAN RD, CAMBORNE, TR14 7RX				
SAP Rating	78 C	DER	6.69	TER	13.09
Environmental	95 A	% DER < TER	48.89		
CO ₂ Emissions (t/year)	0.29	DFEE	46.54	TFEE	48.21
Compliance Check	See BREL	% DFEE < TFEE	3.46		
% DPER < TPER	0.02	DPER	69.99	TPER	70.00
Assessor Details	Mr. Martin Richards			Assessor ID	B046-0001
Client	Rainbow, The Rainbow Group				

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	50.3500 (1b)	2.3500 (2b)	118.3225 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3500		118.3225 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 118.3225 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		3.5500 (17)
Infiltration rate		0.1775 (18)
Number of sides sheltered		0 (19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1775 (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	0.2263	0.2219	0.2174	0.1953	0.1908	0.1686	0.1686	0.1642	0.1775	0.1908	0.1997	0.2086 (22b)
	0.5256	0.5246	0.5236	0.5191	0.5182	0.5142	0.5142	0.5135	0.5158	0.5182	0.5199	0.5217 (25)

3. Heat losses and heat loss parameter

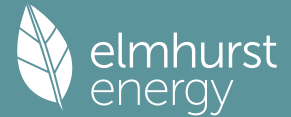
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
WIND 1.4 (Uw = 1.40)			8.3200	1.3258	11.0303		(27)
HG DOOR			2.1000	1.4000	2.9400		(26a)
Heatloss Floor 1			50.3500	0.1400	7.0490	110.0000	5538.5000 (28a)
External Wall 1	77.2680	10.4200	66.8480	0.1500	10.0272	9.0000	601.6320 (29a)
External Roof 1	50.3500		50.3500	0.1300	6.5455	9.0000	453.1500 (30)
Total net area of external elements Aum(A, m ²)			177.9680				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.5920	(33)
Internal Wall 1			65.3300			9.0000	587.9700 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7181.2520 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		142.6267 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.4500	0.0500	0.3725
E3 Sill	7.4500	0.0934	0.6958
E4 Jamb	13.2000	0.0328	0.4330
E5 Ground floor (normal)	32.8800	0.1145	3.7648
E16 Corner (normal)	9.4000	0.0179	0.1683
E10 Eaves (insulation at ceiling level)	24.6800	0.0464	1.1452
E12 Gable (insulation at ceiling level)	8.2000	0.1006	0.8249

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Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 7.4044 (36)
 Total fabric heat loss (33) + (36) + (36a) = 44.9964 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(39)m	20.5231	20.4843	20.4463	20.2675	20.2340	20.0783	20.0783	20.0495	20.1383	20.2340	20.3017	20.3724 (38)
Heat transfer coeff	65.5195	65.4807	65.4426	65.2639	65.2304	65.0747	65.0747	65.0459	65.1347	65.2304	65.2981	65.3688 (39)
Average = Sum(39)m / 12 =												65.2637
HLP	1.3013	1.3005	1.2998	1.2962	1.2955	1.2924	1.2924	1.2919	1.2936	1.2955	1.2969	1.2983 (40)
HLP (average)												1.2962
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												1.7004 (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	22.7988	22.4602	21.9834	21.1042	20.4459	19.7159	19.3217	19.7951	20.3107	21.0917	21.9890	22.7217 (42b)
Hot water usage for other uses	32.0439	30.8787	29.7134	28.5482	27.3830	26.2177	26.2177	27.3830	28.5482	29.7134	30.8787	32.0439 (42c)
Average daily hot water use (litres/day)												50.2689 (43)
Daily hot water use	54.8426	53.3388	51.6968	49.6524	47.8289	45.9337	45.5394	47.1781	48.8589	50.8052	52.8677	54.7656 (44)
Energy conte	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497 (45)
Energy content (annual)												Total = Sum(45)m = 834.8581
Distribution loss (46)m = 0.15 x (45)m	13.0286	11.3931	11.9184	10.1957	9.6580	8.4721	8.2614	8.7625	9.0372	10.3413	11.2980	12.8624 (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	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497 (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	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497 (64)
Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 834.8581 (64)
Electric shower(s)	42.2278	37.6253	41.0854	39.2073	39.9430	38.1017	39.3718	39.9430	39.2073	41.0854	40.3128	42.2278 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												480.3382 (64a)
Heat gains from water heating, kWh/month	39.4370	34.6609	36.6905	32.4024	31.3944	28.3053	28.1557	29.4092	29.8342	33.1946	35.1220	39.0687 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts												
(66)m	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4705	85.7709	77.4705	80.0529	77.4705	80.0529	77.4705	77.4705	80.0529	77.4705	80.0529	77.4705 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.1429	149.6802	145.8064	137.5594	127.1491	117.3649	110.8284	109.2911	113.1650	121.4120	131.8223	141.6065 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164 (71)
Water heating gains (Table 5)	53.0067	51.5788	49.3151	45.0033	42.1967	39.3129	37.8437	39.5285	41.4364	44.6164	48.7805	52.5117 (72)
Total internal gains	330.1263	338.5361	324.0982	314.1217	298.3225	285.2368	274.6488	274.7963	283.1605	295.0050	312.1618	323.0948 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	2.2300	10.6334	0.6300	0.7000	0.7700	7.2468 (74)						
East	1.7300	19.6403	0.6300	0.7000	0.7700	10.3840 (76)						
South	2.7800	46.7521	0.6300	0.7000	0.7700	39.7207 (78)						
West	1.5800	19.6403	0.6300	0.7000	0.7700	9.4837 (80)						
Solar gains	66.8353	117.7668	170.4039	224.8042	262.9172	265.5443	254.1552	225.2683	189.2980	132.7676	80.7952	56.7019 (83)
Total gains	396.9616	456.3029	494.5021	538.9259	561.2397	550.7811	528.8040	500.0646	472.4585	427.7727	392.9570	379.7968 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	30.4458	30.4638	30.4815	30.5650	30.5807	30.6539	30.6539	30.6675	30.6256	30.5807	30.5490	30.5160
alpha	3.0297	3.0309	3.0321	3.0377	3.0387	3.0436	3.0436	3.0445	3.0417	3.0387	3.0366	3.0344

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util living area	0.9700	0.9536	0.9285	0.8735	0.7808	0.6398	0.4996	0.5408	0.7335	0.8923	0.9538	0.9735 (86)
MIT	18.8056	19.0838	19.4838	20.0117	20.4781	20.8013	20.9313	20.9108	20.6810	20.0805	19.3492	18.7441 (87)
Th 2	19.8398	19.8404	19.8410	19.8438	19.8443	19.8468	19.8468	19.8472	19.8458	19.8443	19.8433	19.8422 (88)
util rest of house												
MIT 2	0.9640	0.9446	0.9139	0.8464	0.7314	0.5556	0.3845	0.4260	0.6593	0.8635	0.9432	0.9683 (89)
Living area fraction	17.3165	17.6668	18.1682	18.8176	19.3640	19.7059	19.8150	19.8026	19.5961	18.9153	18.0087	17.2402 (90)
MIT	17.8234	18.1492	18.6160	19.2241	19.7433	20.0788	20.1950	20.1799	19.9654	19.3119	18.4650	17.5222 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8234	18.1492	18.6160	19.2241	19.7433	20.0788	20.1950	20.1799	19.9654	19.3119	18.4650	17.7522 (93)

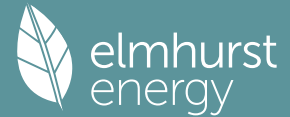
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9495	0.9269	0.8943	0.8291	0.7265	0.5739	0.4210	0.4612	0.6679	0.8472	0.9261	0.9548 (94)
Useful gains	376.9346	422.9478	442.2525	446.8041	407.7379	316.0987	222.6266	230.6082	315.5441	362.3906	363.9090	362.6274 (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												
Space heating kWh	886.0493	867.5649	792.9047	673.7909	524.6655	356.5295	233.9459	245.8644	382.0403	568.2826	742.1160	885.8900 (97)
Space heating requirement - total per year (kWh/year)	378.7813	298.7827	260.8852	163.4305	86.9941	0.0000	0.0000	0.0000	0.0000	153.1837	272.3090	389.3073 (98a)
Solar heating kWh												2003.6738
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh	378.7813	298.7827	260.8852	163.4305	86.9941	0.0000	0.0000	0.0000	0.0000	153.1837	272.3090	389.3073 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2003.6738
Space heating per m2										(98c) / (4) =		39.7949 (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 %)												170.0000 (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	378.7813	298.7827	260.8852	163.4305	86.9941	0.0000	0.0000	0.0000	0.0000	153.1837	272.3090	389.3073 (98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)	222.8125	175.7546	153.4619	96.1356	51.1730	0.0000	0.0000	0.0000	0.0000	90.1081	160.1818	229.0043 (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	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497 (64)
Efficiency of water heater (217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (216)
Fuel for water heating, kWh/month	51.0926	44.6787	46.7388	39.9833	37.8746	33.2240	32.3976	34.3626	35.4399	40.5542	44.3057	50.4410 (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	15.7678	12.6495	11.3895	8.3444	6.4455	5.2660	5.8798	7.6428	9.9272	13.0250	14.7117	16.2061 (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												1178.6317 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.0000
Water heating fuel used												491.0930 (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)												127.2555 (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												2277.3184 (238)

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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	1178.6317	0.1546	182.1909 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	491.0930	0.1416	69.5275 (264)
Energy for instantaneous electric shower(s)	480.3382	0.1391	66.8257 (264a)
Space and water heating			251.7184 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	127.2555	0.1443	18.3669 (268)
Total CO2, kg/year			336.9110 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.6900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1178.6317	1.5723	1853.1412 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	491.0930	1.5235	748.1962 (278)
Energy for instantaneous electric shower(s)	480.3382	1.5143	727.3926 (278a)
Space and water heating			2601.3374 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	127.2555	1.5338	195.1887 (282)
Total Primary energy kWh/year			3523.9187 (286)
Dwelling Primary energy Rate (DPER)			69.9900 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	50.3500 (1b)	x 2.3500 (2b)	= 118.3225 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 118.3225 (5)

2. Ventilation rate

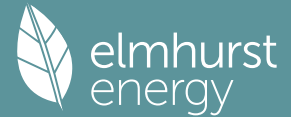
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1690 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4190 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4190 (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 infiltr rate	0.5343	0.5238	0.5133	0.4609	0.4505	0.3981	0.3981	0.3876	0.4190	0.4505	0.4714	0.4924 (22b)
Effective ac	0.6427	0.6372	0.6317	0.6062	0.6015	0.5792	0.5792	0.5751	0.5878	0.6015	0.6111	0.6212 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Semi-glazed door			2.1000	1.0000	2.1000		(26a)
TER Opening Type (Uw = 1.20)			8.3200	1.1450	9.5267		(27)
Heatloss Floor 1			50.3500	0.1300	6.5455		(28a)
External Wall 1	77.2680	10.4200	66.8480	0.1800	12.0326		(29a)
External Roof 1	50.3500		50.3500	0.1100	5.5385		(30)
Total net area of external elements Aum(A, m2)			177.9680				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 35.7434		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							142.6267 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				7.4500	0.0500	0.3725	

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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	28.3658	28.4534	28.5397	28.9524	29.0309	29.4022	29.4022	29.4720	29.2581	29.0309	28.8725	28.7087
alpha	2.8911	2.8969	2.9026	2.9302	2.9354	2.9601	2.9601	2.9648	2.9505	2.9354	2.9248	2.9139
util living area	0.9562	0.9376	0.9094	0.8498	0.7534	0.6082	0.4706	0.5067	0.6967	0.8640	0.9352	0.9603 (86)
MIT	18.8125	19.0882	19.4904	20.0314	20.4910	20.8129	20.9355	20.9183	20.7028	20.1226	19.3965	18.7787 (87)
Th 2	19.7659	19.7692	19.7724	19.7876	19.7905	19.8038	19.8038	19.8063	19.7987	19.7905	19.7847	19.7787 (88)
util rest of house	0.9477	0.9257	0.8914	0.8188	0.7000	0.5220	0.3563	0.3926	0.6181	0.8294	0.9207	0.9526 (89)
MIT 2	17.2795	17.6260	18.1289	18.7973	19.3312	19.6747	19.7752	19.7671	19.5731	18.9227	18.0284	17.2448 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	17.8013	18.1238	18.5924	19.2174	19.7260	20.0622	20.1702	20.1590	19.9577	19.3311	18.4942	17.7670 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8013	18.1238	18.5924	19.2174	19.7260	20.0622	20.1702	20.1590	19.9577	19.3311	18.4942	17.7670 (93)

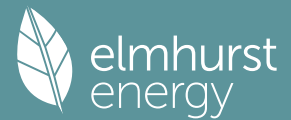
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9292	0.9048	0.8697	0.8016	0.6968	0.5420	0.3930	0.4282	0.6296	0.8136	0.9007	0.9351 (94)
Useful gains	436.9159	478.6289	491.9801	485.8639	436.3056	332.3698	231.6527	240.5276	337.0780	401.4595	416.4788	423.0903 (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	949.4655	927.0845	845.2001	710.8585	551.4874	370.5805	242.2205	254.4250	399.3703	599.9401	787.2191	942.6862 (97)
Space heating kWh	381.3369	301.3622	262.7957	161.9961	85.6952	0.0000	0.0000	0.0000	0.0000	147.6696	266.9330	386.5793 (98a)
Space heating requirement - total per year (kWh/year)												1994.3681
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	381.3369	301.3622	262.7957	161.9961	85.6952	0.0000	0.0000	0.0000	0.0000	147.6696	266.9330	386.5793 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1994.3681
Space heating per m2										(98c) / (4) =		39.6101 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	381.3369	301.3622	262.7957	161.9961	85.6952	0.0000	0.0000	0.0000	0.0000	147.6696	266.9330	386.5793 (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)	413.1495	326.5029	284.7190	175.5104	92.8442	0.0000	0.0000	0.0000	0.0000	159.9887	289.2015	418.8291 (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	192.8575	170.6782	181.7775	161.0723	156.9480	142.3166	141.1769	146.3298	147.4179	163.2960	172.2758	190.9309 (64)
Efficiency of water heater (217)m	85.5590	85.3207	84.8856	84.0726	82.7625	79.8000	79.8000	79.8000	79.8000	83.8349	85.0381	79.8000 (216)
Fuel for water heating, kWh/month	225.4088	200.0431	214.1442	191.5871	189.6367	178.3416	176.9134	183.3707	184.7342	194.7828	202.5866	223.0294 (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	16.0968	12.9135	11.6272	8.5186	6.5800	5.3759	6.0025	7.8022	10.1343	13.2968	15.0187	16.5442 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-40.0121	-53.1432	-72.0667	-76.3811	-78.7630	-72.3859	-71.5771	-69.3269	-64.8355	-58.5776	-42.8555	-35.0004 (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	-33.7102	-69.2599	-134.6901	-198.1286	-258.0455	-257.7758	-254.6349	-217.2543	-161.5676	-97.4407	-44.4693	-26.7730 (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												2160.7455 (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												2364.5786 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												129.9108 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2488.6749 (233)

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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	2252.5600 (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	2160.7455	0.2100	453.7565 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2364.5786	0.2100	496.5615 (264)
Space and water heating			950.3181 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	129.9108	0.1443	18.7501 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-734.9249	0.1358	-99.8190
PV Unit electricity exported	-1753.7500	0.1265	-221.9030
Total			-321.7220 (269)
Total CO2, kg/year			659.2754 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.0900 (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	2160.7455	1.1300	2441.6424 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2364.5786	1.1300	2671.9738 (278)
Space and water heating			5113.6162 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	129.9108	1.5338	199.2615 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-734.9249	1.5020	-1103.8882
PV Unit electricity exported	-1753.7500	0.4645	-814.5879
Total			-1918.4760 (283)
Total Primary energy kWh/year			3524.5024 (286)
Target Primary Energy Rate (TPER)			70.0000 (287)

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

1. Overall dwelling characteristics

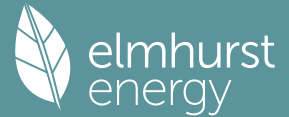
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	50.3500 (1b)	x 2.3500 (2b)	= 118.3225 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 118.3225 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1690 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.5500 (17)
Infiltration rate		0.3465 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3465 (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	0.4418	0.4332	0.4245	0.3812	0.3725	0.3292	0.3292	0.3205	0.3465	0.3725	0.3898	0.4072 (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	0.5976	0.5938	0.5901	0.5727	0.5694	0.5542	0.5542	0.5514	0.5600	0.5694	0.5760	0.5829 (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						
WIND 1.4 (Uw = 1.40)			8.3200	1.3258	11.0303			(27)					
HG DOOR			2.1000	1.4000	2.9400			(26a)					
Heatloss Floor 1			50.3500	0.1400	7.0490	110.0000	5538.5000	(28a)					
External Wall 1	77.2680	10.4200	66.8480	0.1500	10.0272	9.0000	601.6320	(29a)					
External Roof 1	50.3500		50.3500	0.1300	6.5455	9.0000	453.1500	(30)					
Total net area of external elements Aum(A, m2)			177.9680					(31)					
Fabric heat loss, W/K = Sum (A x U)					37.5920			(32)					
Internal Wall 1			65.3300			9.0000	587.9700	(32c)					
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) = 7181.2520 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								142.6267 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				7.4500	0.0500		0.3725						
E3 Sill				7.4500	0.0934		0.6958						
E4 Jamb				13.2000	0.0328		0.4330						
E5 Ground floor (normal)				32.8800	0.1145		3.7648						
E16 Corner (normal)				9.4000	0.0179		0.1683						
E10 Eaves (insulation at ceiling level)				24.6800	0.0464		1.1452						
E12 Gable (insulation at ceiling level)				8.2000	0.1006		0.8249						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								7.4044 (36)					
Point Thermal bridges								0.0000 (36a) =					
Total fabric heat loss								(33) + (36) + (36a) = 44.9964 (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	23.3343	23.1863	23.0413	22.3599	22.2325	21.6390	21.6390	21.5291	21.8676	22.2325	22.4903	22.7600	(38)
Average = Sum(39)m / 12 =	68.3307	68.1827	68.0377	67.3563	67.2288	66.6354	66.6354	66.5255	66.8640	67.2288	67.4867	67.7563	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3571	1.3542	1.3513	1.3378	1.3352	1.3234	1.3234	1.3213	1.3280	1.3352	1.3404	1.3457	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

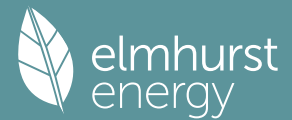
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7004 (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	0.0000 (42a)
Hot water usage for baths	22.7988	22.4602	21.9834	21.1042	20.4459	19.7159	19.3217	19.7951	20.3107	21.0917	21.9890	22.7217	(42b)
Hot water usage for other uses	32.0439	30.8787	29.7134	28.5482	27.3830	26.2177	26.2177	27.3830	28.5482	29.7134	30.8787	32.0439	(42c)
Average daily hot water use (litres/day)													50.2689 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	54.8426	53.3388	51.6968	49.6524	47.8289	45.9337	45.5394	47.1781	48.8589	50.8052	52.8677	54.7656	(44)
Energy content (annual)	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497	(45)
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	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	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	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	0.0000 (59)
Total heat required for water heating calculated for each month	73.8287	64.5607	67.5376	57.7759	54.7288	48.0087	46.8146	49.6539	51.2107	58.6008	64.0217	72.8872	(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	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	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	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	0.0000 (63d)
Output from w/h	73.8287	64.5607	67.5376	57.7759	54.7288	48.0087	46.8146	49.6539	51.2107	58.6008	64.0217	72.8872	(64)
Total per year (kWh/year)													709.6294 (64)
Electric shower(s)	42.2278	37.6253	41.0854	39.2073	39.9430	38.1017	39.3718	39.9430	39.2073	41.0854	40.3128	42.2278	(64a)
Heat gains from water heating, kWh/month	29.0141	25.5465	27.1557	24.2458	23.6679	21.5276	21.5466	22.3992	22.6045	24.9215	26.0836	28.7787	(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	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	77.4705	85.7709	77.4705	80.0529	77.4705	80.0529	77.4705	77.4705	80.0529	77.4705	80.0529	77.4705	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.1429	149.6802	145.8064	137.5594	127.1491	117.3649	110.8284	109.2911	113.1650	121.4120	131.8223	141.6065	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	(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	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	(71)
Water heating gains (Table 5)	38.9975	38.0156	36.4997	33.6747	31.8118	29.8994	28.9605	30.1065	31.3951	33.4967	36.2273	38.6811	(72)
Total internal gains	313.1171	321.9729	308.2827	299.7931	284.9375	275.8233	265.7655	265.3743	273.1191	280.8853	296.6086	306.2643	(73)

Full SAP Calculation Printout



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			2.2300	10.6334	0.6300	0.7000	0.7700	7.2468 (74)				
East			1.7300	19.6403	0.6300	0.7000	0.7700	10.3840 (76)				
South			2.7800	46.7521	0.6300	0.7000	0.7700	39.7207 (78)				
West			1.5800	19.6403	0.6300	0.7000	0.7700	9.4837 (80)				
Solar gains	66.8353	117.7668	170.4039	224.8042	262.9172	265.5443	254.1552	225.2683	189.2980	132.7676	80.7952	56.7019 (83)
Total gains	379.9524	439.7397	478.6866	524.5973	547.8547	541.3676	519.9207	490.6426	462.4172	413.6530	377.4038	362.9662 (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	29.1932	29.2566	29.3189	29.6155	29.6717	29.9359	29.9359	29.9854	29.8336	29.6717	29.5583	29.4407
alpha	2.9462	2.9504	2.9546	2.9744	2.9781	2.9957	2.9957	2.9990	2.9889	2.9781	2.9706	2.9627
util living area	0.9735	0.9586	0.9355	0.8837	0.7957	0.6546	0.5147	0.5566	0.7484	0.9024	0.9589	0.9767 (86)
MIT	18.6483	18.9364	19.3548	19.9230	20.4195	20.7783	20.9213	20.8986	20.6458	20.0005	19.2353	18.6028 (87)
Th 2	19.7964	19.7986	19.8009	19.8114	19.8133	19.8225	19.8225	19.8242	19.8190	19.8133	19.8094	19.8052 (88)
util rest of house	0.9681	0.9502	0.9220	0.8578	0.7470	0.5691	0.3954	0.4382	0.6743	0.8751	0.9492	0.9719 (89)
MIT 2	17.6892	17.9738	18.3849	18.9380	19.3956	19.6997	19.7943	19.7848	19.6021	19.0239	18.2795	17.6503 (90)
Living area fraction									fLA = Living area / (4) =			0.3404 (91)
MIT	18.0157	18.3015	18.7151	19.2733	19.7441	20.0669	20.1779	20.1639	19.9574	19.3563	18.6049	17.9746 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0157	18.3015	18.7151	19.2733	19.7441	20.0669	20.1779	20.1639	19.9574	19.3563	18.6049	17.9746 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9572	0.9365	0.9064	0.8437	0.7438	0.5884	0.4334	0.4747	0.6841	0.8622	0.9361	0.9619 (94)
Useful gains	363.6887	411.8235	433.8597	442.6177	407.4676	318.5214	225.3481	232.9020	316.3450	356.6449	353.2746	349.1241 (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	937.2006	913.7489	831.0855	698.7069	540.7979	364.2885	238.4170	250.3976	391.6505	588.6791	776.4291	933.3134 (97)
Space heating kWh	426.6929	337.2939	295.5360	184.3842	99.1978	0.0000	0.0000	0.0000	0.0000	172.6335	304.6713	434.6369 (98a)
Space heating requirement - total per year (kWh/year)												2255.0463
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	426.6929	337.2939	295.5360	184.3842	99.1978	0.0000	0.0000	0.0000	0.0000	172.6335	304.6713	434.6369 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2255.0463
Space heating per m ²												(98c) / (4) = 44.7874 (99)

8c. Space cooling requirement

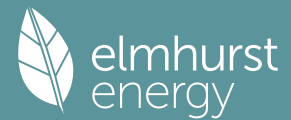
Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	626.3729	493.1021	505.5940	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7354	0.8067	0.7786	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	460.6278	397.8096	393.6610	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	603.1367	579.6758	546.9596	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	102.6065	135.3085	114.0542	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	25.6516	33.8271	28.5135	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												87.9923 (107)
Energy for space heating												44.7874 (99)
Energy for space cooling												1.7476 (108)
Total												46.5350 (109)
Fabric Energy Efficiency (DFEE)												46.5 (109)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.3500 (1b)	x 2.3500 (2b)	= 118.3225 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	118.3225 (5)

Full SAP Calculation Printout



WVHRS	73.8287	64.5607	67.5376	57.7759	54.7288	48.0087	46.8146	49.6539	51.2107	58.6008	64.0217	72.8872 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
	73.8287	64.5607	67.5376	57.7759	54.7288	48.0087	46.8146	49.6539	51.2107	58.6008	64.0217	72.8872 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											709.6294 (64)
Electric shower(s)												710 (64)
	42.2278	37.6253	41.0854	39.2073	39.9430	38.1017	39.3718	39.9430	39.2073	41.0854	40.3128	42.2278 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											480.3382 (64a)
Heat gains from water heating, kWh/month												
	29.0141	25.5465	27.1557	24.2458	23.6679	21.5276	21.5466	22.3992	22.6045	24.9215	26.0836	28.7787 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205	85.0205 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	77.4705	85.7709	77.4705	80.0529	77.4705	80.0529	77.4705	77.4705	80.0529	77.4705	80.0529	77.4705 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	148.1429	149.6802	145.8064	137.5594	127.1491	117.3649	110.8284	109.2911	113.1650	121.4120	131.8223	141.6065 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020	31.5020 (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)												
	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164 (71)
Water heating gains (Table 5)												
	38.9975	38.0156	36.4997	33.6747	31.8118	29.8994	28.9605	30.1065	31.3951	33.4967	36.2273	38.6811 (72)
Total internal gains	313.1171	321.9729	308.2827	299.7931	284.9375	275.8233	265.7655	265.3743	273.1191	280.8853	296.6086	306.2643 (73)

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	2.2300	10.6334	0.6300	0.7000	0.7700	7.2468 (74)						
East	1.7300	19.6403	0.6300	0.7000	0.7700	10.3840 (76)						
South	2.7800	46.7521	0.6300	0.7000	0.7700	39.7207 (78)						
West	1.5800	19.6403	0.6300	0.7000	0.7700	9.4837 (80)						
Solar gains	66.8353	117.7668	170.4039	224.8042	262.9172	265.5443	254.1552	225.2683	189.2980	132.7676	80.7952	56.7019 (83)
Total gains	379.9524	439.7397	478.6866	524.5973	547.8547	541.3676	519.9207	490.6426	462.4172	413.6530	377.4038	362.9662 (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	28.3658	28.4534	28.5397	28.9524	29.0309	29.4022	29.4022	29.4720	29.2581	29.0309	28.8725	28.7087
alpha	2.8911	2.8969	2.9026	2.9302	2.9354	2.9601	2.9601	2.9648	2.9505	2.9354	2.9248	2.9139
util living area	0.9738	0.9592	0.9368	0.8862	0.8002	0.6602	0.5209	0.5625	0.7533	0.9042	0.9594	0.9769 (86)
MIT	18.5721	18.8640	19.2908	19.8787	20.3893	20.7652	20.9154	20.8918	20.6273	19.9635	19.1829	18.5363 (87)
Th 2	19.7659	19.7692	19.7724	19.7876	19.7905	19.8038	19.8038	19.8063	19.7987	19.7905	19.7847	19.7787 (88)
util rest of house												
	0.9684	0.9509	0.9233	0.8603	0.7513	0.5737	0.3991	0.4420	0.6787	0.8771	0.9497	0.9721 (89)
MIT 2	17.5937	17.8828	18.3032	18.8791	19.3513	19.6740	19.7736	19.7644	19.5708	18.9728	18.2115	17.5670 (90)
Living area fraction												
	fLA = Living area / (4) =											0.3404 (91)
MIT	17.9268	18.2168	18.6394	19.2194	19.7047	20.0455	20.1623	20.1482	19.9304	19.3101	18.5421	17.8970 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9268	18.2168	18.6394	19.2194	19.7047	20.0455	20.1623	20.1482	19.9304	19.3101	18.5421	17.8970 (93)

8. Space heating requirement

Utilisation	0.9572	0.9369	0.9073	0.8457	0.7474	0.5928	0.4378	0.4789	0.6880	0.8637	0.9364	0.9618 (94)
Useful gains	363.6998	411.9945	434.3263	443.6686	409.4486	320.8963	227.6128	234.9891	318.1231	357.2794	353.3992	349.1145 (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	958.2868	933.6063	848.4867	710.9938	550.0229	369.4492	241.6845	253.6915	397.5143	598.4917	790.5350	951.7187 (97)
Space heating kWh	442.3727	350.5231	308.1354	192.4741	104.5873	0.0000	0.0000	0.0000	0.0000	179.4619	314.7378	448.3375 (98a)
Space heating requirement - total per year (kWh/year)												2340.6299
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	442.3727	350.5231	308.1354	192.4741	104.5873	0.0000	0.0000	0.0000	0.0000	179.4619	314.7378	448.3375 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2340.6299
											(98c) / (4) =	46.4872 (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	637.7424	502.0525	514.4003	0.0000	0.0000	0.0000	0.0000 (100)

Full SAP Calculation Printout



Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7263	0.7984	0.7702	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	463.1728	400.8592	396.2146	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	603.1367	579.6758	546.9596	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	100.7740	133.0396	112.1543	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)									fc = cooled area / (4) =			1.0000 (105)
Space cooling kWh	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 requirement	0.0000	0.0000	0.0000	0.0000	0.0000	25.1935	33.2599	28.0386	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												86.4920 (107)
Energy for space cooling												46.4872 (99)
Total												1.7178 (108)
Fabric Energy Efficiency (TFEE)												48.2050 (109)
												48.2 (109)

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

1. Overall dwelling characteristics

		Area (m2)	Storey height (m)	Volume (m3)	
Ground floor		50.3500 (1b)	x 2.3500 (2b)	= 118.3225 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3500				(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	118.3225 (5)	

2. Ventilation rate

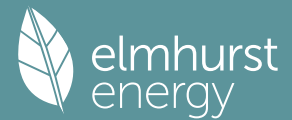
												m3 per hour
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												0 * 10 = 0.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of flueless gas fires												0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												Air changes per hour
Pressure test												0.0000 / (5) = 0.0000 (8)
Pressure Test Method												Yes
Measured/design AP50												Blower Door
Infiltration rate												3.5500 (17)
Number of sides sheltered												0.1775 (18)
												0 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.1775 (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	0.2263	0.2219	0.2174	0.1953	0.1908	0.1686	0.1686	0.1642	0.1775	0.1908	0.1997	0.2086 (22b)
	0.5256	0.5246	0.5236	0.5191	0.5182	0.5142	0.5142	0.5135	0.5158	0.5182	0.5199	0.5217 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
WIND 1.4 (Uw = 1.40)			8.3200	1.3258	11.0303		(27)					
HG DOOR			2.1000	1.4000	2.9400		(26a)					
Heatloss Floor 1			50.3500	0.1400	7.0490	110.0000	5538.5000 (28a)					
External Wall 1	77.2680	10.4200	66.8480	0.1500	10.0272	9.0000	601.6320 (29a)					
External Roof 1	50.3500		50.3500	0.1300	6.5455	9.0000	453.1500 (30)					
Total net area of external elements Aum(A, m2)			177.9680				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.5920		(33)					
Internal Wall 1			65.3300			9.0000	587.9700 (32c)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	7181.2520 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							142.6267 (35)					
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
E2 Other lintels (including other steel lintels)				7.4500	0.0500	0.3725						
E3 Sill				7.4500	0.0934	0.6958						
E4 Jamb				13.2000	0.0328	0.4330						
E5 Ground floor (normal)				32.8800	0.1145	3.7648						
E16 Corner (normal)				9.4000	0.0179	0.1683						
E10 Eaves (insulation at ceiling level)				24.6800	0.0464	1.1452						
E12 Gable (insulation at ceiling level)				8.2000	0.1006	0.8249						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4044 (36)					
Point Thermal bridges							(36a) = 0.0000					
Total fabric heat loss							(33) + (36) + (36a) = 44.9964 (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	20.5231	20.4843	20.4463	20.2675	20.2340	20.0783	20.0783	20.0495	20.1383	20.2340	20.3017	20.3724 (38)

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Average = Sum(39)m / 12 =	65.5195	65.4807	65.4426	65.2639	65.2304	65.0747	65.0747	65.0459	65.1347	65.2304	65.2981	65.3688 (39)
												65.2637
HLP	Jan 1.3013	Feb 1.3005	Mar 1.2998	Apr 1.2962	May 1.2955	Jun 1.2924	Jul 1.2924	Aug 1.2919	Sep 1.2936	Oct 1.2955	Nov 1.2969	Dec 1.2983 (40)
HLP (average)												1.2962
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7004 (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	22.7988	22.4602	21.9834	21.1042	20.4459	19.7159	19.3217	19.7951	20.3107	21.0917	21.9890	22.7217 (42b)
Hot water usage for other uses	32.0439	30.8787	29.7134	28.5482	27.3830	26.2177	26.2177	27.3830	28.5482	29.7134	30.8787	32.0439 (42c)
Average daily hot water use (litres/day)												50.2689 (43)
Daily hot water use	Jan 54.8426	Feb 53.3388	Mar 51.6968	Apr 49.6524	May 47.8289	Jun 45.9337	Jul 45.5394	Aug 47.1781	Sep 48.8589	Oct 50.8052	Nov 52.8677	Dec 54.7656 (44)
Energy conte	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497 (45)
Energy content (annual)												834.8581
Distribution loss (46)m = 0.15 x (45)m	13.0286	11.3931	11.9184	10.1957	9.6580	8.4721	8.2614	8.7625	9.0372	10.3413	11.2980	12.8624 (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	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497 (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	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497 (64)
												834.8581 (64)
Electric shower(s)	42.2278	37.6253	41.0854	39.2073	39.9430	38.1017	39.3718	39.9430	39.2073	41.0854	40.3128	42.2278 (64a)
												480.3382 (64a)
Heat gains from water heating, kWh/month	39.4370	34.6609	36.6905	32.4024	31.3944	28.3053	28.1557	29.4092	29.8342	33.1946	35.1220	39.0687 (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	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0143	16.0002	13.0122	9.8511	7.3638	6.2168	6.7175	8.7317	11.7196	14.8808	17.3680	18.5150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.1089	223.4033	217.6214	205.3125	189.7748	175.1714	165.4155	163.1211	168.9030	181.2119	196.7496	211.3530 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164 (71)
Water heating gains (Table 5)	53.0067	51.5788	49.3151	45.0033	42.1967	39.3129	37.8437	39.5285	41.4364	44.6164	48.7805	52.5117 (72)
Total internal gains	376.0410	374.8933	363.8598	344.0780	323.2463	301.6122	290.8878	292.2923	302.9701	324.6201	346.8093	366.2907 (73)

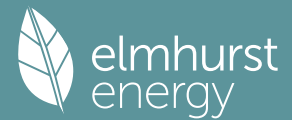
6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
North		2.2300	10.6334	0.6300	0.7000	0.7700	7.2468 (74)					
East		1.7300	19.6403	0.6300	0.7000	0.7700	10.3840 (76)					
South		2.7800	46.7521	0.6300	0.7000	0.7700	39.7207 (78)					
West		1.5800	19.6403	0.6300	0.7000	0.7700	9.4837 (80)					
Solar gains	66.8353	117.7668	170.4039	224.8042	262.9172	265.5443	254.1552	225.2683	189.2980	132.7676	80.7952	56.7019 (83)
Total gains	442.8762	492.6601	534.2637	568.8822	586.1635	567.1565	545.0430	517.5606	492.2681	457.3877	427.6045	422.9926 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	30.4458	30.4638	30.4815	30.5650	30.5807	30.6539	30.6539	30.6675	30.6256	30.5807	30.5490	30.5160
alpha	3.0297	3.0309	3.0321	3.0377	3.0387	3.0436	3.0436	3.0445	3.0417	3.0387	3.0366	3.0344
util living area	0.9605	0.9443	0.9151	0.8593	0.7652	0.6274	0.4874	0.5265	0.7173	0.8765	0.9435	0.9653 (86)
MIT	18.9305	19.1770	19.5759	20.0678	20.5099	20.8120	20.9358	20.9171	20.7014	20.1401	19.4380	18.8635 (87)
Th 2	19.8398	19.8404	19.8410	19.8438	19.8443	19.8468	19.8468	19.8472	19.8458	19.8443	19.8433	19.8422 (88)
util rest of house	0.9530	0.9338	0.8984	0.8304	0.7143	0.5433	0.3741	0.4133	0.6420	0.8450	0.9309	0.9586 (89)
MIT 2	17.4729	17.7821	18.2796	18.8821	19.3966	19.7143	19.8173	19.8062	19.6142	18.9832	18.1178	17.3901 (90)
Living area fraction												0.3404 (91)
												fLA = Living area / (4) =

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MIT	17.9691	18.2569	18.7209	19.2858	19.7756	20.0880	20.1981	20.1844	19.9843	19.3770	18.5672	17.8917 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9691	18.2569	18.7209	19.2858	19.7756	20.0880	20.1981	20.1844	19.9843	19.3770	18.5672	17.8917 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9364	0.9149	0.8784	0.8139	0.7109	0.5622	0.4102	0.4483	0.6521	0.8295	0.9126	0.9430 (94)
Useful gains	414.7162	450.7373	469.3000	462.9905	416.6874	318.8752	223.5927	232.0219	320.9848	379.4018	390.2478	398.8697 (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	895.5915	874.6196	799.7683	677.8159	526.7742	357.1293	234.1446	246.1573	383.2738	572.5292	748.7862	895.0078 (97)
Space heating kWh	357.7712	284.8489	245.8685	154.6742	81.9046	0.0000	0.0000	0.0000	0.0000	143.6868	258.1476	369.1268 (98a)
Space heating requirement - total per year (kWh/year)												1896.0286
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	357.7712	284.8489	245.8685	154.6742	81.9046	0.0000	0.0000	0.0000	0.0000	143.6868	258.1476	369.1268 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1896.0286
Space heating per m2										(98c) / (4) =		37.6570 (99)

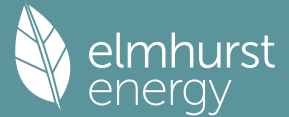
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)												170.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	357.7712	284.8489	245.8685	154.6742	81.9046	0.0000	0.0000	0.0000	0.0000	143.6868	258.1476	369.1268 (98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)	210.4537	167.5582	144.6285	90.9849	48.1792	0.0000	0.0000	0.0000	0.0000	84.5216	151.8515	217.1334 (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	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497 (64)
Efficiency of water heater (217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (216)
Fuel for water heating, kWh/month	51.0926	44.6787	46.7388	39.9833	37.8746	33.2240	32.3976	34.3626	35.4399	40.5542	44.3057	50.4410 (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	15.7678	12.6495	11.3895	8.3444	6.4455	5.2660	5.8798	7.6428	9.9272	13.0250	14.7117	16.2061 (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												1115.3109 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.0000
Water heating fuel used												491.0930 (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)												127.2555 (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												2213.9976 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1115.3109	16.4900	183.9148 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	491.0930	16.4900	80.9812 (247)
Energy for instantaneous electric shower(s)	480.3382	16.4900	79.2078 (247a)

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Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	127.2555	16.4900	20.9844 (250)
Additional standing charges			0.0000 (251)
Total energy cost			365.0882 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.3784 (257)
SAP value		77.6559
SAP rating (Section 12)		78 (258)
SAP band		C

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	1115.3109	0.1546	172.4292 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	491.0930	0.1416	69.5275 (264)
Energy for instantaneous electric shower(s)	480.3382	0.1391	66.8257 (264a)
Space and water heating			241.9567 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	127.2555	0.1443	18.3669 (268)
Total CO2, kg/year			327.1492 (272)
CO2 emissions per m2			6.5000 (273)
EI value			95.4024
EI rating			95 (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	50.3500 (1b)	x 2.3500 (2b)	= 118.3225 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	118.3225 (5)

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure Test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.5500 (17)
Infiltration rate		0.1775 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1775 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	6.4000	6.1000	6.1000	5.5000	5.4000	4.7000	4.6000	4.5000	5.0000	5.8000	5.9000	6.2000 (22)
Wind factor	1.6000	1.5250	1.5250	1.3750	1.3500	1.1750	1.1500	1.1250	1.2500	1.4500	1.4750	1.5500 (22a)
Adj infilt rate												
Effective ac	0.2840	0.2707	0.2707	0.2441	0.2396	0.2086	0.2041	0.1997	0.2219	0.2574	0.2618	0.2751 (22b)
	0.5403	0.5366	0.5366	0.5298	0.5287	0.5217	0.5208	0.5199	0.5246	0.5331	0.5343	0.5378 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
WIND 1.4 (Uw = 1.40)			8.3200	1.3258	11.0303		(27)
HG DOOR			2.1000	1.4000	2.9400		(26a)
Heatloss Floor 1			50.3500	0.1400	7.0490	110.0000	5538.5000 (28a)
External Wall 1	77.2680	10.4200	66.8480	0.1500	10.0272	9.0000	601.6320 (29a)
External Roof 1	50.3500		50.3500	0.1300	6.5455	9.0000	453.1500 (30)
Total net area of external elements Aum(A, m2)			177.9680				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.5920	(33)

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Internal Wall 1 65.3300 9.0000 587.9700 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7181.2520 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 142.6267 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.4500	0.0500	0.3725
E3 Sill	7.4500	0.0934	0.6958
E4 Jamb	13.2000	0.0328	0.4330
E5 Ground floor (normal)	32.8800	0.1145	3.7648
E16 Corner (normal)	9.4000	0.0179	0.1683
E10 Eaves (insulation at ceiling level)	24.6800	0.0464	1.1452
E12 Gable (insulation at ceiling level)	8.2000	0.1006	0.8249
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.4044 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			(33) + (36) + (36a) = 44.9964 (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	21.0979	20.9537	20.9537	20.6861	20.6442	20.3724	20.3367	20.3017	20.4843	20.8165	20.8614	21.0010 (38)
Average = Sum(39)m / 12 =	66.0943	65.9501	65.9501	65.6825	65.6406	65.3688	65.3331	65.2981	65.4807	65.8129	65.8578	65.9974 (39)
HLP	1.3127	1.3098	1.3098	1.3045	1.3037	1.2983	1.2976	1.2969	1.3005	1.3071	1.3080	1.3108 (40)
HLP (average)												1.3050
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7004 (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 22.7988 22.4602 21.9834 21.1042 20.4459 19.7159 19.3217 19.7951 20.3107 21.0917 21.9890 22.7217 (42b)

Hot water usage for other uses 32.0439 30.8787 29.7134 28.5482 27.3830 26.2177 26.2177 27.3830 28.5482 29.7134 30.8787 32.0439 (42c)

Average daily hot water use (litres/day) 66.0943 65.9501 65.9501 65.6825 65.6406 65.3688 65.3331 65.2981 65.4807 65.8129 65.8578 65.9974 (39)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	54.8426	53.3388	51.6968	49.6524	47.8289	45.9337	45.5394	47.1781	48.8589	50.8052	52.8677	54.7656 (44)
Energy content (annual)	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497 (45)
Distribution loss (46)m = 0.15 x (45)m	13.0286	11.3931	11.9184	10.1957	9.6580	8.4721	8.2614	8.7625	9.0372	10.3413	11.2980	12.8624 (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	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497 (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	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497 (64)
Electric shower(s)	42.2278	37.6253	41.0854	39.2073	39.9430	38.1017	39.3718	39.9430	39.2073	41.0854	40.3128	42.2278 (64a)
Heat gains from water heating, kWh/month	39.4370	34.6609	36.6905	32.4024	31.3944	28.3053	28.1557	29.4092	29.8342	33.1946	35.1220	39.0687 (65)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 480.3382 (64a)

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

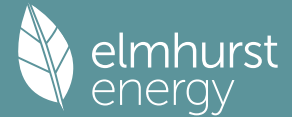
Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0143	16.0002	13.0122	9.8511	7.3638	6.2168	6.7175	8.7317	11.7196	14.8808	17.3680	18.5150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.1089	223.4033	217.6214	205.3125	189.7748	175.1714	165.4155	163.1211	168.9030	181.2119	196.7496	211.3530 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164 (71)
Water heating gains (Table 5)	53.0067	51.5788	49.3151	45.0033	42.1967	39.3129	37.8437	39.5285	41.4364	44.6164	48.7805	52.5117 (72)
Total internal gains	376.0410	374.8933	363.8598	344.0780	323.2463	301.6122	290.8878	292.2923	302.9701	324.6201	346.8093	366.2907 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	2.2300	14.1491	0.6300	0.7000	0.7700	9.6428 (74)						
East	1.7300	26.5119	0.6300	0.7000	0.7700	14.0171 (76)						
South	2.7800	58.6702	0.6300	0.7000	0.7700	49.8465 (78)						
West	1.5800	26.5119	0.6300	0.7000	0.7700	12.8018 (80)						
Solar gains	86.3082	132.7902	188.3747	257.0013	284.6566	313.9832	273.8270	259.9895	221.3321	153.1837	100.5655	70.4632 (83)

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Total gains 462.3491 507.6835 552.2346 601.0793 607.9030 615.5955 564.7148 552.2818 524.3022 477.8038 447.3747 436.7539 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	30.1810	30.2470	30.2470	30.3702	30.3896	30.5160	30.5327	30.5490	30.4638	30.3101	30.2894	30.2253
alpha	3.0121	3.0165	3.0165	3.0247	3.0260	3.0344	3.0355	3.0366	3.0309	3.0207	3.0193	3.0150
util living area	0.9401	0.9234	0.8946	0.8449	0.7650	0.6440	0.5663	0.5519	0.6815	0.8321	0.9101	0.9430 (86)
MIT	19.3639	19.5154	19.7765	20.1130	20.4893	20.7703	20.8776	20.8924	20.7480	20.3576	19.8573	19.3990 (87)
Th 2	19.8309	19.8331	19.8331	19.8373	19.8379	19.8422	19.8427	19.8433	19.8404	19.8353	19.8346	19.8324 (88)
util rest of house	0.9275	0.9079	0.8734	0.8140	0.7156	0.5698	0.4694	0.4501	0.6017	0.7880	0.8882	0.9305 (89)
MIT 2	18.0144	18.2018	18.5217	18.9284	19.3663	19.6665	19.7687	19.7819	19.6524	19.2314	18.6336	18.0615 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.4738	18.6489	18.9488	19.3316	19.7486	20.0423	20.1462	20.1599	20.0254	19.6148	19.0501	18.5168 (92)
Temperature adjustment												
adjusted MIT	18.4738	18.6489	18.9488	19.3316	19.7486	20.0423	20.1462	20.1599	20.0254	19.6148	19.0501	18.5168 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9085	0.8880	0.8538	0.7984	0.7114	0.5836	0.4964	0.4796	0.6156	0.7782	0.8697	0.9119 (94)
Useful gains	420.0387	450.8208	471.5199	479.8832	432.4493	359.2587	280.3254	264.8881	322.7569	371.8380	389.0630	398.2827 (95)
Ext temp.	6.4000	6.6000	7.5000	8.9000	11.4000	13.8000	15.5000	15.8000	14.3000	11.8000	9.2000	6.9000 (96)
Heat loss rate W	798.0076	794.6285	755.0518	685.1760	548.0086	408.0494	303.5497	284.6952	374.9019	514.3139	648.7075	766.6797 (97)
Space heating kWh	281.2089	231.0388	210.9477	147.8108	85.9761	0.0000	0.0000	0.0000	0.0000	106.0021	186.9440	274.0874 (98a)
Space heating requirement - total per year (kWh/year)	1524.0158											
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	281.2089	231.0388	210.9477	147.8108	85.9761	0.0000	0.0000	0.0000	0.0000	106.0021	186.9440	274.0874 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1524.0158											
Space heating per m2	(98c) / (4) = 30.2684 (99)											

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 %)												170.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	281.2089	231.0388	210.9477	147.8108	85.9761	0.0000	0.0000	0.0000	0.0000	106.0021	186.9440	274.0874 (98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)	165.4170	135.9052	124.0869	86.9475	50.5742	0.0000	0.0000	0.0000	0.0000	62.3542	109.9671	161.2279 (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	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497 (64)
Efficiency of water heater (217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (216)
Fuel for water heating, kWh/month	51.0926	44.6787	46.7388	39.9833	37.8746	33.2240	32.3976	34.3626	35.4399	40.5542	44.3057	50.4410 (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	15.7678	12.6495	11.3895	8.3444	6.4455	5.2660	5.8798	7.6428	9.9272	13.0250	14.7117	16.2061 (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												896.4799 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.0000
Water heating fuel used												491.0930 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												0.0000 (231)
Total electricity for the above, kWh/year												127.2555 (232)
Electricity for lighting (calculated in Appendix L)												

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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	1995.1666 (238)

10a. Fuel costs - using BEDF prices (528)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	896.4799	21.5100	192.8328 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	491.0930	21.5100	105.6341 (247)
Energy for instantaneous electric shower(s)	480.3382	21.5100	103.3208 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	127.2555	21.5100	27.3727 (250)
Additional standing charges			0.0000 (251)
Total energy cost			429.1603 (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	896.4799	0.1541	138.1677 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	491.0930	0.1416	69.5275 (264)
Energy for instantaneous electric shower(s)	480.3382	0.1391	66.8257 (264a)
Space and water heating			207.6952 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	127.2555	0.1443	18.3669 (268)
Total CO2, kg/year			292.8878 (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	896.4799	1.5706	1408.0156 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	491.0930	1.5235	748.1962 (278)
Energy for instantaneous electric shower(s)	480.3382	1.5143	727.3926 (278a)
Space and water heating			2156.2118 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	127.2555	1.5338	195.1887 (282)
Total Primary energy kWh/year			3078.7931 (286)

SAP 10 EPC IMPROVEMENTS

1325_01

Current energy efficiency rating: C 78
 Current environmental impact rating: A 95

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	-£ 41	-25 kg (8.5%)
U Solar photovoltaic panels	+ 11.0	-£ 242	-257 kg (96.0%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£41	0.49 kg/m ²	C 79 A 96
Solar photovoltaic panels	£242	5.11 kg/m ²	B 90 A 99
Total Savings	£284	5.60 kg/m²	

Potential energy efficiency rating: B 90
 Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 528 TEST (04 Oct 2023)
 Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South West England):

	Current	Potential	Saving
Electricity	£429	£388	£41
Space heating	£193	£210	-£17
Water heating	£209	£150	£59
Lighting	£27	£27	£0
Generated (PV)	-£0	-£242	£242
Total cost of fuels	£429	£146	£283
Total cost of uses	£429	£145	£284
Delivered energy	40 kWh/m ²	-4 kWh/m ²	43 kWh/m ²
Carbon dioxide emissions	0.3 tonnes	0.0 tonnes	0.3 tonnes
CO2 emissions per m ²	6 kg/m ²	0 kg/m ²	6 kg/m ²
Primary energy	61 kWh/m ²	20 kWh/m ²	41 kWh/m ²

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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	50.3500 (1b)	x 2.3500 (2b)	= 118.3225 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 118.3225 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		3.5500 (17)
Infiltration rate		0.1775 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1775 (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	0.2263	0.2219	0.2174	0.1953	0.1908	0.1686	0.1686	0.1642	0.1775	0.1908	0.1997	0.2086 (22b)
	0.5256	0.5246	0.5236	0.5191	0.5182	0.5142	0.5142	0.5135	0.5158	0.5182	0.5199	0.5217 (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
WIND 1.4 (Uw = 1.40)			8.3200	1.3258	11.0303		(27)
HG DOOR			2.1000	1.4000	2.9400		(26a)
Heatloss Floor 1			50.3500	0.1400	7.0490	110.0000	5538.5000 (28a)
External Wall 1	77.2680	10.4200	66.8480	0.1500	10.0272	9.0000	601.6320 (29a)
External Roof 1	50.3500		50.3500	0.1300	6.5455	9.0000	453.1500 (30)
Total net area of external elements Aum(A, m ²)			177.9680				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.5920	(33)
Internal Wall 1			65.3300			9.0000	587.9700 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7181.2520 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		142.6267 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.4500	0.0500	0.3725
E3 Sill	7.4500	0.0934	0.6958
E4 Jamb	13.2000	0.0328	0.4330
E5 Ground floor (normal)	32.8800	0.1145	3.7648
E16 Corner (normal)	9.4000	0.0179	0.1683
E10 Eaves (insulation at ceiling level)	24.6800	0.0464	1.1452
E12 Gable (insulation at ceiling level)	8.2000	0.1006	0.8249

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.4044 (36)
Point Thermal bridges		(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.9964 (37)

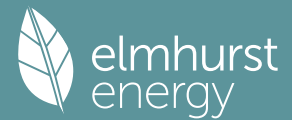
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	20.5231	20.4843	20.4463	20.2675	20.2340	20.0783	20.0783	20.0495	20.1383	20.2340	20.3017	20.3724 (38)
Heat transfer coeff	65.5195	65.4807	65.4426	65.2639	65.2304	65.0747	65.0747	65.0459	65.1347	65.2304	65.2981	65.3688 (39)
Average = Sum(39)m / 12 =												65.2637

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3013	1.3005	1.2998	1.2962	1.2955	1.2924	1.2924	1.2919	1.2936	1.2955	1.2969	1.2983 (40)
HLP (average)												1.2962
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7004 (42)
Hot water usage for mixer showers	

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Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for other uses	22.7988	22.4602	21.9834	21.1042	20.4459	19.7159	19.3217	19.7951	20.3107	21.0917	21.9890	22.7217	(42b)
Average daily hot water use (litres/day)	32.0439	30.8787	29.7134	28.5482	27.3830	26.2177	26.2177	27.3830	28.5482	29.7134	30.8787	32.0439	(42c)
												50.2689	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	54.8426	53.3388	51.6968	49.6524	47.8289	45.9337	45.5394	47.1781	48.8589	50.8052	52.8677	54.7656	(44)
Distribution loss (46)m = 0.15 x (45)m	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497	(45)
Water storage loss:	13.0286	11.3931	11.9184	10.1957	9.6580	8.4721	8.2614	8.7625	9.0372	10.3413	11.2980	12.8624	(46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497	(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)
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													397.6547 (H24)
Heat delivered to space heating													0.0000 (H29)
Solar input													397.6547
Solar input	-0.0000	-17.0811	-45.0922	-52.4790	-58.0263	-51.5895	-50.7274	-49.7234	-41.6471	-27.7008	-3.5880	-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	86.8573	58.8727	34.3638	15.4927	6.3606	4.8913	4.3485	8.6930	18.6008	41.2414	71.7317	85.7497	(64)
Electric shower(s)	42.2278	37.6253	41.0854	39.2073	39.9430	38.1017	39.3718	39.9430	39.2073	41.0854	40.3128	42.2278	(64a)
Heat gains from water heating, kWh/month	39.4370	34.6609	36.6905	32.4024	31.3944	28.3053	28.1557	29.4092	29.8342	33.1946	35.1220	39.0687	(65)
													437.2034 (64)
													480.3382 (64a)
													480.3382 (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	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0143	16.0002	13.0122	9.8511	7.3638	6.2168	6.7175	8.7317	11.7196	14.8808	17.3680	18.5150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.1089	223.4033	217.6214	205.3125	189.7748	175.1714	165.4155	163.1211	168.9030	181.2119	196.7496	211.3530	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	(71)
Water heating gains (Table 5)	53.0067	51.5788	49.3151	45.0033	42.1967	39.3129	37.8437	39.5285	41.4364	44.6164	48.7805	52.5117	(72)
Total internal gains	376.0410	374.8933	363.8598	344.0780	323.2463	301.6122	290.8878	292.2923	302.9701	324.6201	346.8093	366.2907	(73)

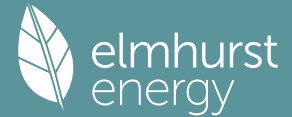
6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
North			2.2300	10.6334	0.6300	0.7000	0.7700	7.2468 (74)					
East			1.7300	19.6403	0.6300	0.7000	0.7700	10.3840 (76)					
South			2.7800	46.7521	0.6300	0.7000	0.7700	39.7207 (78)					
West			1.5800	19.6403	0.6300	0.7000	0.7700	9.4837 (80)					
Solar gains	66.8353	117.7668	170.4039	224.8042	262.9172	265.5443	254.1552	225.2683	189.2980	132.7676	80.7952	56.7019	(83)
Total gains	442.8762	492.6601	534.2637	568.8822	586.1635	567.1565	545.0430	517.5606	492.2681	457.3877	427.6045	422.9926	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.4458	30.4638	30.4815	30.5650	30.5807	30.6539	30.6539	30.6675	30.6256	30.5807	30.5490	30.5160	
alpha	3.0297	3.0309	3.0321	3.0377	3.0387	3.0436	3.0436	3.0445	3.0417	3.0387	3.0366	3.0344	
util living area	0.9605	0.9443	0.9151	0.8593	0.7652	0.6274	0.4874	0.5265	0.7173	0.8765	0.9435	0.9653	(86)
MIT	18.9305	19.1770	19.5759	20.0678	20.5099	20.8120	20.9358	20.9171	20.7014	20.1401	19.4380	18.8635	(87)
Th 2	19.8398	19.8404	19.8410	19.8438	19.8443	19.8468	19.8468	19.8472	19.8458	19.8443	19.8433	19.8422	(88)
util rest of house	0.9530	0.9338	0.8984	0.8304	0.7143	0.5433	0.3741	0.4133	0.6420	0.8450	0.9309	0.9586	(89)
MIT 2	17.4729	17.7821	18.2796	18.8821	19.3966	19.7143	19.8173	19.8062	19.6142	18.9832	18.1178	17.3901	(90)
Living area fraction													0.3404 (91)
													fLA = Living area / (4) =

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MIT	17.9691	18.2569	18.7209	19.2858	19.7756	20.0880	20.1981	20.1844	19.9843	19.3770	18.5672	17.8917 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9691	18.2569	18.7209	19.2858	19.7756	20.0880	20.1981	20.1844	19.9843	19.3770	18.5672	17.8917 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9364	0.9149	0.8784	0.8139	0.7109	0.5622	0.4102	0.4483	0.6521	0.8295	0.9126	0.9430 (94)
Useful gains	414.7162	450.7373	469.3000	462.9905	416.6874	318.8752	223.5927	232.0219	320.9848	379.4018	390.2478	398.8697 (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	895.5915	874.6196	799.7683	677.8159	526.7742	357.1293	234.1446	246.1573	383.2738	572.5292	748.7862	895.0078 (97)
Space heating kWh	357.7712	284.8489	245.8685	154.6742	81.9046	0.0000	0.0000	0.0000	0.0000	143.6868	258.1476	369.1268 (98a)
Space heating requirement - total per year (kWh/year)												1896.0286
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	357.7712	284.8489	245.8685	154.6742	81.9046	0.0000	0.0000	0.0000	0.0000	143.6868	258.1476	369.1268 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1896.0286
Space heating per m2										(98c) / (4) =		37.6570 (99)

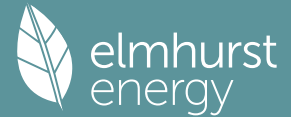
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)												170.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	357.7712	284.8489	245.8685	154.6742	81.9046	0.0000	0.0000	0.0000	0.0000	143.6868	258.1476	369.1268 (98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)	210.4537	167.5582	144.6285	90.9849	48.1792	0.0000	0.0000	0.0000	0.0000	84.5216	151.8515	217.1334 (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	86.8573	58.8727	34.3638	15.4927	6.3606	4.8913	4.3485	8.6930	18.6008	41.2414	71.7317	85.7497 (64)
Efficiency of water heater (217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (216)
Fuel for water heating, kWh/month	51.0926	34.6310	20.2140	9.1133	3.7415	2.8772	2.5580	5.1135	10.9416	24.2596	42.1951	50.4410 (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	15.7678	12.6495	11.3895	8.3444	6.4455	5.2660	5.8798	7.6428	9.9272	13.0250	14.7117	16.2061 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-36.5576	-53.3709	-77.7737	-86.4062	-89.0773	-75.2865	-74.6917	-70.9245	-63.7377	-59.4549	-40.5643	-31.4349 (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	-13.5289	-30.2091	-64.5725	-104.3658	-146.6055	-156.4272	-153.9598	-128.8495	-92.7254	-47.3910	-18.8455	-10.4789 (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												1115.3109 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.0000
Water heating fuel used												257.1785 (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)												127.2555 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1727.2394 (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												332.8437 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1115.3109	16.4900	183.9148 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	257.1785	16.4900	42.4087 (247)

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Energy for instantaneous electric shower(s)	480.3382	16.4900	79.2078 (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	127.2555	16.4900	20.9844 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-759.2803	16.4900	-125.2053
PV Unit electricity exported	-967.9591	5.5900	-54.1089
Total			-179.3142 (252)
Total energy cost			160.3935 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.6056 (257)
SAP value		90.1836
SAP rating (Section 12)		90 (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	1115.3109	0.1546	172.4292 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	257.1785	0.1524	39.1883 (264)
Energy for instantaneous electric shower(s)	480.3382	0.1391	66.8257 (264a)
Space and water heating			211.6175 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	127.2555	0.1443	18.3669 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-759.2803	0.1355	-102.8916
PV Unit electricity exported	-967.9591	0.1232	-119.2892
Total			-222.1808 (269)
Total CO2, kg/year			85.7262 (272)
CO2 emissions per m2			1.7000 (273)
EI value			98.7952
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	50.3500 (1b)	x 2.3500 (2b)	= 118.3225 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	118.3225 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5500 (17)
Infiltration rate	0.1775 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1775 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	6.4000	6.1000	6.1000	5.5000	5.4000	4.7000	4.6000	4.5000	5.0000	5.8000	5.9000	6.2000 (22)
Wind factor	1.6000	1.5250	1.5250	1.3750	1.3500	1.1750	1.1500	1.1250	1.2500	1.4500	1.4750	1.5500 (22a)
Adj infilt rate	0.2840	0.2707	0.2707	0.2441	0.2396	0.2086	0.2041	0.1997	0.2219	0.2574	0.2618	0.2751 (22b)
Effective ac	0.5403	0.5366	0.5366	0.5298	0.5287	0.5217	0.5208	0.5199	0.5246	0.5331	0.5343	0.5378 (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						
WIND 1.4 (Uw = 1.40)			8.3200	1.3258	11.0303			(27)					
HC DOOR			2.1000	1.4000	2.9400			(26a)					
Heatloss Floor 1			50.3500	0.1400	7.0490	110.0000	5538.5000	(28a)					
External Wall 1	77.2680	10.4200	66.8480	0.1500	10.0272	9.0000	601.6320	(29a)					
External Roof 1	50.3500		50.3500	0.1300	6.5455	9.0000	453.1500	(30)					
Total net area of external elements Aum(A, m2)			177.9680					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.5920		(33)					
Internal Wall 1			65.3300			9.0000	587.9700	(32c)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7181.2520	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							142.6267	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				7.4500	0.0500	0.3725							
E3 Sill				7.4500	0.0934	0.6958							
E4 Jamb				13.2000	0.0328	0.4330							
E5 Ground floor (normal)				32.8800	0.1145	3.7648							
E16 Corner (normal)				9.4000	0.0179	0.1683							
E10 Eaves (insulation at ceiling level)				24.6800	0.0464	1.1452							
E12 Gable (insulation at ceiling level)				8.2000	0.1006	0.8249							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4044	(36)					
Point Thermal bridges							0.0000						
Total fabric heat loss							(33) + (36) + (36a) =	44.9964 (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	21.0979	20.9537	20.9537	20.6861	20.6442	20.3724	20.3367	20.3017	20.4843	20.8165	20.8614	21.0010	(38)
Average = Sum(39)m / 12 =	66.0943	65.9501	65.9501	65.6825	65.6406	65.3688	65.3331	65.2981	65.4807	65.8129	65.8578	65.9974	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3127	1.3098	1.3098	1.3045	1.3037	1.2983	1.2976	1.2969	1.3005	1.3071	1.3080	1.3108	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

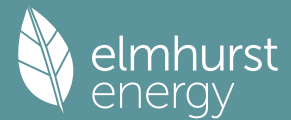
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7004	(42)
Hot water usage for mixer showers														(42a)
Hot water usage for baths														(42b)
Hot water usage for other uses														(42c)
Average daily hot water use (litres/day)														(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	54.8426	53.3388	51.6968	49.6524	47.8289	45.9337	45.5394	47.1781	48.8589	50.8052	52.8677	54.7656	(44)	
Energy content (annual)	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497	(45)	
Distribution loss (46)m = 0.15 x (45)m													834.8581	(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	0.0000	(56)
If cylinder contains dedicated solar storage														(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month														
WWHS	86.8573	75.9538	79.4560	67.9716	64.3868	56.4808	55.0760	58.4163	60.2479	68.9421	75.3197	85.7497	(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)	
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													463.6492	(H24)
Heat delivered to space heating													0.0000	(H29)
Solar input													463.6492	
Solar input	-10.1276	-24.2312	-51.8834	-57.8407	-60.1247	-54.9849	-52.1949	-53.3328	-47.6254	-35.5318	-13.8687	-1.9030	(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	76.7298	51.7226	27.5726	10.1310	4.2622	1.4959	2.8810	5.0835	12.6224	33.4103	61.4509	83.8467	(64)	
Electric shower(s)	42.2278	37.6253	41.0854	39.2073	39.9430	38.1017	39.3718	39.9430	39.2073	41.0854	40.3128	42.2278	(64a)	
Heat gains from water heating, kWh/month	39.4370	34.6609	36.6905	32.4024	31.3944	28.3053	28.1557	29.4092	29.8342	33.1946	35.1220	39.0687	(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	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	102.0246	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0143	16.0002	13.0122	9.8511	7.3638	6.2168	6.7175	8.7317	11.7196	14.8808	17.3680	18.5150	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

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Cooking gains	221.1089	223.4033	217.6214	205.3125	189.7748	175.1714	165.4155	163.1211	168.9030	181.2119	196.7496	211.3530 (68)
(calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029	46.9029 (69)
Losses e.g. evaporation	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
(negative values) (Table 5)												
Water heating gains	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164	-68.0164 (71)
(Table 5)												
Total internal gains	53.0067	51.5788	49.3151	45.0033	42.1967	39.3129	37.8437	39.5285	41.4364	44.6164	48.7805	52.5117 (72)
	376.0410	374.8933	363.8598	344.0780	323.2463	301.6122	290.8878	292.2923	302.9701	324.6201	346.8093	366.2907 (73)

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	2.2300	14.1491	0.6300	0.7000	0.7700	9.6428 (74)
East	1.7300	26.5119	0.6300	0.7000	0.7700	14.0171 (76)
South	2.7800	58.6702	0.6300	0.7000	0.7700	49.8465 (78)
West	1.5800	26.5119	0.6300	0.7000	0.7700	12.8018 (80)

Solar gains	86.3082	132.7902	188.3747	257.0013	284.6566	313.9832	273.8270	259.9895	221.3321	153.1837	100.5655	70.4632 (83)
Total gains	462.3491	507.6835	552.2346	601.0793	607.9030	615.5955	564.7148	552.2818	524.3022	477.8038	447.3747	436.7539 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	30.1810	30.2470	30.2470	30.3702	30.3896	30.5160	30.5327	30.5490	30.4638	30.3101	30.2894	30.2253
alpha	3.0121	3.0165	3.0165	3.0247	3.0260	3.0344	3.0355	3.0366	3.0309	3.0207	3.0193	3.0150
util living area	0.9401	0.9234	0.8946	0.8449	0.7650	0.6440	0.5663	0.5519	0.6815	0.8321	0.9101	0.9430 (86)
MIT	19.3639	19.5154	19.7765	20.1130	20.4893	20.7703	20.8776	20.8924	20.7480	20.3576	19.8573	19.3990 (87)
Th 2	19.8309	19.8331	19.8331	19.8373	19.8379	19.8422	19.8427	19.8433	19.8404	19.8353	19.8346	19.8324 (88)
util rest of house	0.9275	0.9079	0.8734	0.8140	0.7156	0.5698	0.4694	0.4501	0.6017	0.7880	0.8882	0.9305 (89)
MIT 2	18.0144	18.2018	18.5217	18.9284	19.3663	19.6665	19.7687	19.7819	19.6524	19.2314	18.6336	18.0615 (90)
Living area fraction										FLA = Living area / (4) =		
MIT	18.4738	18.6489	18.9488	19.3316	19.7486	20.0423	20.1462	20.1599	20.0254	19.6148	19.0501	18.5168 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4738	18.6489	18.9488	19.3316	19.7486	20.0423	20.1462	20.1599	20.0254	19.6148	19.0501	18.5168 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	420.0387	450.8208	471.5199	479.8832	432.4493	359.2587	280.3254	264.8881	322.7569	371.8380	389.0630	398.2827 (95)
Ext temp.	6.4000	6.6000	7.5000	8.9000	11.4000	13.8000	15.5000	15.8000	14.3000	11.8000	9.2000	6.9000 (96)
Heat loss rate W	798.0076	794.6285	755.0518	685.1760	548.0086	408.0494	303.5497	284.6952	374.9019	514.3139	648.7075	766.6797 (97)
Space heating kWh	281.2089	231.0388	210.9477	147.8108	85.9761	0.0000	0.0000	0.0000	0.0000	106.0021	186.9440	274.0874 (98a)
Space heating requirement - total per year (kWh/year)												1524.0158
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	281.2089	231.0388	210.9477	147.8108	85.9761	0.0000	0.0000	0.0000	0.0000	106.0021	186.9440	274.0874 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1524.0158
Space heating per m ²										(98c) / (4) =		30.2684 (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 %)		170.0000 (206)
Efficiency of main space heating system 2 (in %)		0.0000 (207)
Efficiency of secondary/supplementary heating system, %		0.0000 (208)

Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	281.2089	231.0388	210.9477	147.8108	85.9761	0.0000	0.0000	0.0000	0.0000	106.0021	186.9440	274.0874 (98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)	165.4170	135.9052	124.0869	86.9475	50.5742	0.0000	0.0000	0.0000	0.0000	62.3542	109.9671	161.2279 (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	76.7298	51.7226	27.5726	10.1310	4.2622	1.4959	2.8810	5.0835	12.6224	33.4103	61.4509	83.8467 (64)
Efficiency of water heater (217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (216)
Fuel for water heating, kWh/month	45.1352	30.4250	16.2192	5.9594	2.5072	0.8799	1.6947	2.9903	7.4250	19.6531	36.1476	49.3216 (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	15.7678	12.6495	11.3895	8.3444	6.4455	5.2660	5.8798	7.6428	9.9272	13.0250	14.7117	16.2061 (232)

