

Full SAP Calculation Printout



Property Reference	4907-CA16-6920-010				Issued on Date	09/04/2024
Assessment Reference	Plot 010	Prop Type Ref	Mountford-Det-Opp			
Property	Plot 010, Mountford-Det-Opp					
SAP Rating	89 B	DER	11.32	TER	11.84	
Environmental	90 B	% DER < TER				4.39
CO ₂ Emissions (t/year)	0.9	DFEE	38.96	TFEE	39.88	
Compliance Check	See BREL	% DFEE < TFEE				2.32
% DPER < TPER	1.40	DPER	61.04	TPER	61.91	
Assessor Details	Miss Megan Chiswell				Assessor ID	CA16-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0800 (1b)	x 2.3100 (2b)	= 104.1348 (1b) - (3b)
First floor	45.0800 (1c)	x 2.6100 (2c)	= 117.6588 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 221.7936 (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	4.5000 (17)
Infiltration rate	0.2250 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1913 (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	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			1.9800	1.1000	2.1780		(26)
Half-Glazed Door			1.9800	1.2000	2.3760		(26a)
Window (Uw = 1.30)			12.5900	1.2357	15.5580		(27)
French Door (Uw = 1.40)			3.0900	1.3258	4.0966		(27)
FP McCann System			45.0800	0.1100	4.9588	75.0000	3381.0000 (28a)
100mm Knauf Supafil 34	134.3652	19.6400	114.7252	0.2400	27.5340	60.0000	6883.5116 (29a)
Plane Ceiling-500mm Loft Roll	45.0800		45.0800	0.0900	4.0572	9.0000	405.7200 (30)
Total net area of external elements Aum(A, m ²)			224.5252				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.7586		(33)
Timber GF			53.8700			9.0000	484.8300 (32c)
Timber 1F			94.8800			9.0000	853.9200 (32c)
Masonry GF			26.0500			75.0000	1953.7499 (32c)
Internal Floor			45.0800			12.6000	568.0080 (32d)
Internal Ceiling			45.0800			9.0000	405.7200 (32e)

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Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.7100	0.0420	0.5758
E3 Sill	10.3500	0.0090	0.0931
E4 Jamb	34.8000	0.0090	0.3132
E5 Ground floor (normal)	11.1800	0.0600	0.6708
E5 Ground floor (normal)	16.1300	0.0480	0.7742
E6 Intermediate floor within a dwelling	27.3100	0.0030	0.0819
E10 Eaves (insulation at ceiling level)	16.1300	0.0310	0.5000
E12 Gable (insulation at ceiling level)	11.1800	0.0440	0.4919
E16 Corner (normal)	19.6800	0.0290	0.5707
E4 Jamb	4.2000	0.0090	0.0378

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$
(38)m
Heat transfer coeff
Average = $\text{Sum}(39)\text{m} / 12 =$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254
HLP (average)												
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6279 (42)
Hot water usage for mixer showers	68.2811	67.2549	65.7597	62.8987	60.7874	58.4329	57.0946	58.5786	60.2053	62.7333	65.6557	68.0195	(42a)
Hot water usage for baths	29.4863	29.0484	28.4317	27.2947	26.4433	25.4992	24.9893	25.6017	26.2684	27.2786	28.4390	29.3866	(42b)
Hot water usage for other uses	41.5424	40.0317	38.5211	37.0105	35.4998	33.9892	33.9892	35.4998	37.0105	38.5211	40.0317	41.5424	(42c)
Average daily hot water use (litres/day)													128.0571 (43)
Daily hot water use	139.3098	136.3351	132.7125	127.2039	122.7306	117.9214	116.0731	119.6801	123.4841	128.5330	134.1265	138.9485	(44)
Energy conte	220.6326	194.1393	203.9742	174.1358	165.2189	144.9981	140.3804	148.1889	152.2683	174.4180	191.0877	217.5597	(45)
Energy content (annual)										Total = Sum(45)m =		2127.0020	
Distribution loss (46)m = $0.15 \times (45)\text{m}$	33.0949	29.1209	30.5961	26.1204	24.7828	21.7497	21.0571	22.2283	22.8402	26.1627	28.6632	32.6340	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
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	14.2861	12.8912	14.2461	13.7307	14.1531	13.6608	14.0935	14.1122	13.6782	14.1752	13.7714	14.2787	(61)
Total heat required for water heating calculated for each month	234.9187	207.0306	218.2203	187.8665	179.3720	158.6589	154.4739	162.3011	165.9465	188.5932	204.8591	231.8384	(62)
WWHRS	-60.1336	-53.1827	-55.6898	-46.1134	-42.9760	-36.7749	-34.4706	-36.6560	-38.0487	-44.8552	-50.8156	-59.0201	(63a)
FV 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	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1735.3425	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													0.0000 (64a)
Heat gains from water heating, kWh/month	76.9319	67.7741	71.3829	61.3328	58.4736	51.6271	50.1998	52.8009	54.0488	61.5378	66.9795	75.9083	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.0223	137.3104	124.0223	128.1564	124.0223	128.1564	124.0223	124.0223	128.1564	124.0223	128.1564	124.0223	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.3718	241.8557	235.5963	222.2707	205.4496	189.6401	179.0784	176.5944	182.8539	196.1794	213.0006	228.8101	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	(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)	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	(71)
Water heating gains (Table 5)	103.4030	100.8544	95.9448	85.1845	78.5935	71.7042	67.4729	70.9689	75.0677	82.7121	93.0271	102.0273	(72)
Total internal gains	532.2157	545.4391	520.9820	501.0302	473.4840	451.9193	432.9922	434.0042	448.4966	468.3324	499.6027	520.2782	(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	3.2900	10.6334	0.4700	0.0000	0.7700	12.6607 (74)
South	2.2200	46.7521	0.4700	0.0000	0.7700	37.5615 (78)
West	7.0800	19.6403	0.4700	0.0000	0.7700	50.3233 (80)
South	3.0900	46.7521	0.4000	0.0000	0.7700	44.4949 (78)

Full SAP Calculation Printout



Solar gains	145.0403	257.0253	374.4206	495.9603	580.3470	585.8945	560.8965	497.2295	416.8093	290.5613	175.6305	122.8422 (83)
Total gains	677.2560	802.4644	895.4025	996.9904	1053.8309	1037.8138	993.8886	931.2337	865.3059	758.8937	675.2332	643.1204 (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	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914
alpha	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261
util living area	0.9800	0.9627	0.9320	0.8618	0.7429	0.5799	0.4364	0.4814	0.6982	0.8958	0.9654	0.9834 (86)
MIT	19.3186	19.5954	19.9613	20.3989	20.7377	20.9224	20.9792	20.9699	20.8435	20.3876	19.7627	19.2509 (87)
Th 2	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802 (88)
util rest of house	0.9757	0.9549	0.9176	0.8330	0.6915	0.5021	0.3408	0.3829	0.6248	0.8674	0.9568	0.9797 (89)
MIT 2	18.0331	18.3813	18.8370	19.3652	19.7470	19.9282	19.9712	19.9661	19.8629	19.3657	18.5969	17.9475 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.2815	18.6159	19.0543	19.5649	19.9384	20.1203	20.1659	20.1600	20.0523	19.5632	18.8222	18.1994 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.2815	18.6159	19.0543	19.5649	19.9384	20.1203	20.1659	20.1600	20.0523	19.5632	18.8222	18.1994 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9657	0.9412	0.9015	0.8194	0.6892	0.5133	0.3586	0.4009	0.6304	0.8533	0.9437	0.9707 (94)
Useful gains	654.0386	755.2959	807.2064	816.9740	726.3331	532.7296	356.4400	373.2878	545.4944	647.5442	637.2068	624.3012 (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	1418.6188	1391.6719	1273.8069	1082.1102	835.9034	560.1147	361.8151	381.5098	603.9499	909.4428	1189.3805	1420.4326 (97)
Space heating kWh	568.8476	427.6446	347.1507	190.8981	81.5203	0.0000	0.0000	0.0000	0.0000	194.8525	397.5650	592.3218 (98a)
Space heating requirement - total per year (kWh/year)	2800.8007											
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	568.8476	427.6446	347.1507	190.8981	81.5203	0.0000	0.0000	0.0000	0.0000	194.8525	397.5650	592.3218 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2800.8007											
Space heating per m2	(98c) / (4) = 31.0648 (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 %)	92.5000 (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	568.8476	427.6446	347.1507	190.8981	81.5203	0.0000	0.0000	0.0000	0.0000	194.8525	397.5650	592.3218 (98)
Space heating efficiency (main heating system 1)	92.5000	92.5000	92.5000	92.5000	92.5000	0.0000	0.0000	0.0000	0.0000	92.5000	92.5000	92.5000 (210)
Space heating fuel (main heating system)	614.9704	462.3185	375.2981	206.3763	88.1301	0.0000	0.0000	0.0000	0.0000	210.6514	429.8000	640.3478 (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	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184 (64)
Efficiency of water heater	88.5945	88.5438	88.4507	88.2675	87.9283	87.3000	87.3000	87.3000	87.3000	88.2703	88.5186	87.3000 (216)
Fuel for water heating, kWh/month	197.2865	173.7534	183.7525	160.5948	155.1218	139.6151	137.4608	143.9234	146.5038	162.8384	174.0239	195.0320 (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	10.4327	9.4230	10.4327	10.0961	10.4327	10.0961	10.4327	10.4327	10.0961	10.4327	10.0961	10.4327 (231)
Lighting	24.6520	19.7768	17.8068	13.0460	10.0771	8.2331	9.1927	11.9490	15.5206	20.3638	23.0009	25.3372 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-10.5143	-17.6159	-30.5313	-40.5865	-48.7808	-47.3839	-46.4648	-40.9699	-32.2312	-22.2090	-12.3481	-8.7103 (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	-2.3134	-5.8082	-14.2792	-25.8706	-38.3436	-40.2001	-39.1571	-30.5906	-19.2472	-9.1150	-3.2762	-1.7426 (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	3027.8926 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	87.3000											
Water heating fuel used	1969.9064 (219)											
Space cooling fuel	0.0000 (221)											

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 6.1260, total flow = 45.0000, SFP = 0.1361)

Full SAP Calculation Printout



mechanical ventilation fans (SFP = 0.1361)	36.8361 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	122.8361 (231)
Electricity for lighting (calculated in Appendix L)	198.9560 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-588.2895 (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	4731.3016 (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	3027.8926	0.2100	635.8575 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1969.9064	0.2100	413.6803 (264)
Space and water heating			1049.5378 (265)
Pumps, fans and electric keep-hot	122.8361	0.1387	17.0389 (267)
Energy for lighting	198.9560	0.1443	28.7155 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-358.3459	0.1315	-47.1158
PV Unit electricity exported	-229.9437	0.1215	-27.9410
Total			-75.0568 (269)
Total CO2, kg/year			1020.2354 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3200 (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	3027.8926	1.1300	3421.5187 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1969.9064	1.1300	2225.9942 (278)
Space and water heating			5647.5129 (279)
Pumps, fans and electric keep-hot	122.8361	1.5128	185.8264 (281)
Energy for lighting	198.9560	1.5338	305.1654 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-358.3459	1.4858	-532.4143
PV Unit electricity exported	-229.9437	0.4458	-102.5108
Total			-634.9251 (283)
Total Primary energy kWh/year			5503.5797 (286)
Dwelling Primary energy Rate (DPER)			61.0400 (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	45.0800 (1b)	x 2.3100 (2b)	= 104.1348 (1b) - (3b)
First floor	45.0800 (1c)	x 2.6100 (2c)	= 117.6588 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.7936 (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	3 * 10 = 30.0000 (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) =	30.0000 / (5) = 0.1353 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3853 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3275 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4175	0.4093	0.4012	0.3602	0.3520	0.3111	0.3111	0.3029	0.3275	0.3520	0.3684	0.3848 (22b)
	0.5872	0.5838	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5536	0.5620	0.5679	0.5740 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.9800	1.0000	1.9800		(26)
TER Semi-glazed door			1.9800	1.0000	1.9800		(26a)
TER Opening Type (Uw = 1.20)			15.6800	1.1450	17.9542		(27)
FP McCann System			45.0800	0.1300	5.8604		(28a)
100mm Knauf Supafil 34	134.3652	19.6400	114.7252	0.1800	20.6505		(29a)
Plane Ceiling-500mm Loft Roll	45.0800		45.0800	0.1100	4.9588		(30)
Total net area of external elements Aum (A, m2)			224.5252				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	53.3839	(33)

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

165.6661 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.7100	0.0500	0.6855
E3 Sill	10.3500	0.0500	0.5175
E4 Jamb	34.8000	0.0500	1.7400
E5 Ground floor (normal)	11.1800	0.1600	1.7888
E5 Ground floor (normal)	16.1300	0.1600	2.5808
E6 Intermediate floor within a dwelling	27.3100	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.1300	0.0600	0.9678
E12 Gable (insulation at ceiling level)	11.1800	0.0600	0.6708
E16 Corner (normal)	19.6800	0.0900	1.7712
E4 Jamb	4.2000	0.0500	0.2100

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

10.9324 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 64.3163 (37)

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

(38)m	Jan 42.9757	Feb 42.7279	Mar 42.4851	Apr 41.3445	May 41.1312	Jun 40.1378	Jul 40.1378	Aug 39.9538	Sep 40.5204	Oct 41.1312	Nov 41.5628	Dec 42.0142 (38)
Heat transfer coeff	107.2920	107.0443	106.8014	105.6609	105.4475	104.4541	104.4541	104.2701	104.8367	105.4475	105.8792	106.3305 (39)
Average = Sum(39)m / 12 =												105.6599

HLP	Jan 1.1900	Feb 1.1873	Mar 1.1846	Apr 1.1719	May 1.1696	Jun 1.1585	Jul 1.1585	Aug 1.1565	Sep 1.1628	Oct 1.1696	Nov 1.1743	Dec 1.1794 (40)
HLP (average)												1.1719
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

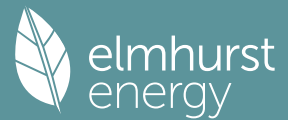
Assumed occupancy													2.6279 (42)
Hot water usage for mixer showers													
68.2811	67.2549	65.7597	62.8987	60.7874	58.4329	57.0946	58.5786	60.2053	62.7333	65.6557	68.0195	(42a)	
Hot water usage for baths													
29.4863	29.0484	28.4317	27.2947	26.4433	25.4992	24.9893	25.6017	26.2684	27.2786	28.4390	29.3866	(42b)	
Hot water usage for other uses													
41.5424	40.0317	38.5211	37.0105	35.4998	33.9892	33.9892	35.4998	37.0105	38.5211	40.0317	41.5424	(42c)	
Average daily hot water use (litres/day)													128.0571 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	139.3098	136.3351	132.7125	127.2039	122.7306	117.9214	116.0731	119.6801	123.4841	128.5330	134.1265	138.9485 (44)
Energy content (annual)	220.6326	194.1393	203.9742	174.1358	165.2189	144.9981	140.3804	148.1889	152.2683	174.4180	191.0877	217.5597 (45)
Distribution loss (46)m = 0.15 x (45)m	33.0949	29.1209	30.5961	26.1204	24.7828	21.7497	21.0571	22.2283	22.8402	26.1627	28.6632	32.6340 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	271.5915	240.1667	254.9331	223.4508	216.1778	194.3131	191.3393	199.1478	201.5834	225.3770	240.4028	268.5186 (62)
WWHRS	-31.2153	-27.6070	-28.9085	-23.9374	-22.3088	-19.0898	-17.8936	-19.0281	-19.7510	-23.2843	-26.3782	-30.6372 (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	240.3763	212.5597	226.0246	199.5135	193.8691	175.2234	173.4457	180.1198	181.8324	202.0927	214.0245	237.8814 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2436.9629 (64)
												2437 (64)

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	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.0223	137.3104	124.0223	128.1564	124.0223	128.1564	124.0223	124.0223	128.1564	124.0223	128.1564	124.0223 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.3718	241.8557	235.5963	222.2707	205.4496	189.6401	179.0784	176.5944	182.8539	196.1794	213.0006	228.8101 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395 (69)

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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)											
	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	(71)
Water heating gains (Table 5)												
	115.7259	113.1818	108.2811	97.5402	90.9610	84.0842	79.8605	83.3502	87.4416	95.0722	105.3687	(72)
Total internal gains												
	544.5386	557.7665	533.3183	513.3858	485.8515	464.2992	445.3797	446.3855	460.8705	480.6925	511.9442	(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					3.2900	10.6334	0.6300	0.7000			0.7700	10.6915 (74)
South					5.3100	46.7521	0.6300	0.7000			0.7700	75.8695 (78)
West					7.0800	19.6403	0.6300	0.7000			0.7700	42.4964 (80)
Solar gains	129.0574	227.8187	329.9040	434.3268	506.2408	510.3174	488.8507	434.6475	366.3121	256.9851	156.1086	109.4182 (83)
Total gains	673.5960	785.5853	863.2223	947.7126	992.0923	974.6167	934.2305	881.0330	827.1825	737.6777	668.0528	642.0217 (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	38.6703	38.7598	38.8479	39.2673	39.3468	39.7210	39.7210	39.7910	39.5760	39.3468	39.1863	39.0200
alpha	3.5780	3.5840	3.5899	3.6178	3.6231	3.6481	3.6481	3.6527	3.6384	3.6231	3.6124	3.6013
util living area	0.9809	0.9665	0.9417	0.8831	0.7791	0.6200	0.4724	0.5158	0.7290	0.9074	0.9677	0.9838 (86)
MIT	19.1843	19.4511	19.8173	20.2879	20.6649	20.8961	20.9705	20.9592	20.8055	20.3105	19.6700	19.1413 (87)
Th 2	19.9280	19.9302	19.9324	19.9425	19.9444	19.9533	19.9533	19.9550	19.9499	19.9444	19.9406	19.9366 (88)
util rest of house	0.9767	0.9593	0.9288	0.8566	0.7293	0.5389	0.3683	0.4102	0.6554	0.8806	0.9594	0.9802 (89)
MIT 2	17.8292	18.1671	18.6269	19.2081	19.6424	19.8828	19.9405	19.9357	19.8023	19.2493	18.4545	17.7803 (90)
Living area fraction												0.1932 (91)
MIT	18.0910	18.4152	18.8569	19.4168	19.8400	20.0786	20.1395	20.1335	19.9961	19.4544	18.6894	18.0433 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0910	18.4152	18.8569	19.4168	19.8400	20.0786	20.1395	20.1335	19.9961	19.4544	18.6894	18.0433 (93)

8. Space heating requirement

Utilisation	0.9665	0.9455	0.9121	0.8411	0.7238	0.5492	0.3875	0.4291	0.6590	0.8653	0.9461	0.9710 (94)
Useful gains	651.0137	742.7377	787.3633	797.0737	718.0301	535.2784	362.0187	378.0411	545.0977	638.2973	632.0285	623.3743 (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	1479.6669	1446.7231	1319.7374	1111.2094	858.3405	572.2592	369.7155	389.2911	618.1327	933.6718	1227.0719	1471.9623 (97)
Space heating kWh	616.5180	473.0782	396.0863	226.1777	104.3909	0.0000	0.0000	0.0000	0.0000	219.7586	428.4313	631.3495 (98a)
Space heating requirement - total per year (kWh/year)												3095.7905
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	616.5180	473.0782	396.0863	226.1777	104.3909	0.0000	0.0000	0.0000	0.0000	219.7586	428.4313	631.3495 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3095.7905
Space heating per m2										(98c) / (4) =		34.3366 (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 %)												92.4000 (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	616.5180	473.0782	396.0863	226.1777	104.3909	0.0000	0.0000	0.0000	0.0000	219.7586	428.4313	631.3495 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	667.2272	511.9894	428.6649	244.7811	112.9772	0.0000	0.0000	0.0000	0.0000	237.8340	463.6702	683.2787 (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	240.3763	212.5597	226.0246	199.5135	193.8691	175.2234	173.4457	180.1198	181.8324	202.0927	214.0245	237.8814 (64)
Efficiency of water heater (217)m	86.3071	86.0432	85.5704	84.6509	83.1141	80.3000	80.3000	80.3000	80.3000	84.5614	85.8375	86.3686 (216)
Fuel for water heating, kWh/month	278.5129	247.0385	264.1388	235.6896	233.2565	218.2109	215.9971	224.3086	226.4413	238.9892	249.3370	275.4259 (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	25.7694	20.6732	18.6139	13.6373	10.5339	8.6063	9.6093	12.4906	16.2240	21.2868	24.0434	26.4856 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-41.6350	-58.4209	-83.5795	-93.5086	-100.4260	-93.5692	-92.3841	-87.3948	-78.5548	-66.5551	-45.6631	-36.0261 (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)

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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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-24.3710	-51.1706	-101.5366	-152.2689	-201.1297	-202.0353	-199.6842	-169.1907	-124.1512	-73.1333	-32.5217	-19.2817 (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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												3350.4226 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2907.3462 (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)												207.9737 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2228.1920 (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												4323.5505 (238)

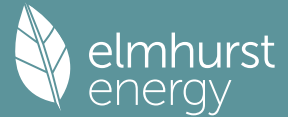
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3350.4226	0.2100	703.5888 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2907.3462	0.2100	610.5427 (264)
Space and water heating			1314.1314 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	207.9737	0.1443	30.0170 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-877.7171	0.1347	-118.2232
PV Unit electricity exported	-1350.4749	0.1259	-170.0760
Total			-288.2992 (269)
Total CO2, kg/year			1067.7785 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8400 (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	3350.4226	1.1300	3785.9776 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2907.3462	1.1300	3285.3012 (278)
Space and water heating			7071.2787 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	207.9737	1.5338	318.9970 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-877.7171	1.4978	-1314.6553
PV Unit electricity exported	-1350.4749	0.4623	-624.2982
Total			-1938.9536 (283)
Total Primary energy kWh/year			5581.4230 (286)
Target Primary Energy Rate (TPER)			61.9100 (287)

Full SAP Calculation Printout



Property Reference	4907-CA16-6920-010				Issued on Date	09/04/2024		
Assessment Reference	Plot 010			Prop Type Ref	Mountford-Det-Opp			
Property	Plot 010, Mountford-Det-Opp							
SAP Rating	89 B		DER	11.32		TER	11.84	
Environmental	90 B		% DER < TER				4.39	
CO ₂ Emissions (t/year)	0.9		DFEE	38.96		TFEE	39.88	
Compliance Check	See BREL		% DFEE < TFEE				2.32	
% DPER < TPER	1.40		DPER	61.04		TPER	61.91	
Assessor Details	Miss Megan Chiswell					Assessor ID	CA16-0001	
Client								

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0800 (1b)	x 2.3100 (2b)	= 104.1348 (1b) - (3b)
First floor	45.0800 (1c)	x 2.6100 (2c)	= 117.6588 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 221.7936 (5)

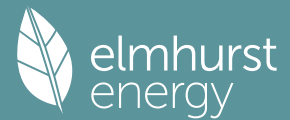
2. Ventilation rate

	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	3 * 10 = 30.0000 (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) = 30.0000 / (5) = 0.1353 (8)											
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	4.5000 (17)											
Infiltration rate	0.3603 (18)											
Number of sides sheltered	2 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3062 (21)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3904	0.3828	0.3751	0.3368	0.3292	0.2909	0.2909	0.2833	0.3062	0.3292	0.3445	0.3598 (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	0.5762	0.5733	0.5704	0.5567	0.5542	0.5423	0.5423	0.5401	0.5469	0.5542	0.5593	0.5647 (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
Solid Door			1.9800	1.1000	2.1780		(26)
Half-Glazed Door			1.9800	1.2000	2.3760		(26a)
Window (Uw = 1.30)			12.5900	1.2357	15.5580		(27)
French Door (Uw = 1.40)			3.0900	1.3258	4.0966		(27)
FP McCann System			45.0800	0.1100	4.9588	75.0000	3381.0000 (28a)
100mm Knauf Supafil 34	134.3652	19.6400	114.7252	0.2400	27.5340	60.0000	6883.5116 (29a)
Plane Ceiling-500mm Loft Roll	45.0800		45.0800	0.0900	4.0572	9.0000	405.7200 (30)
Total net area of external elements Aum(A, m ²)			224.5252				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.7586		(33)
Timber GF			53.8700			9.0000	484.8300 (32c)
Timber 1F			94.8800			9.0000	853.9200 (32c)
Masonry GF			26.0500			75.0000	1953.7499 (32c)
Internal Floor			45.0800			12.6000	568.0080 (32d)
Internal Ceiling			45.0800			9.0000	405.7200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14936.4595 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							165.6661 (35)

Full SAP Calculation Printout



List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.7100	0.0420	0.5758
E3 Sill	10.3500	0.0090	0.0931
E4 Jamb	34.8000	0.0090	0.3132
E5 Ground floor (normal)	11.1800	0.0600	0.6708
E5 Ground floor (normal)	16.1300	0.0480	0.7742
E6 Intermediate floor within a dwelling	27.3100	0.0030	0.0819
E10 Eaves (insulation at ceiling level)	16.1300	0.0310	0.5000
E12 Gable (insulation at ceiling level)	11.1800	0.0440	0.4919
E16 Corner (normal)	19.6800	0.0290	0.5707
E4 Jamb	4.2000	0.0090	0.0378
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.1096 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 64.8682 (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	42.1745	41.9579	41.7456	40.7483	40.5617	39.6930	39.6930	39.5322	40.0276	40.5617	40.9391	41.3338 (38)
Average = Sum(39)m / 12 =	107.0428	106.8262	106.6138	105.6165	105.4299	104.5613	104.5613	104.4004	104.8958	105.4299	105.8074	106.2020 (39)
												105.6156
HLP	1.1873	1.1849	1.1825	1.1714	1.1694	1.1597	1.1597	1.1579	1.1634	1.1694	1.1736	1.1779 (40)
HLP (average)												1.1714
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6279 (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	29.4863	29.0484	28.4317	27.2947	26.4433	25.4992	24.9893	25.6017	26.2684	27.2786	28.4390	29.3866 (42b)
Hot water usage for other uses	41.5424	40.0317	38.5211	37.0105	35.4998	33.9892	33.9892	35.4998	37.0105	38.5211	40.0317	41.5424 (42c)
Average daily hot water use (litres/day)												65.1043 (43)
Daily hot water use	71.0287	69.0801	66.9528	64.3052	61.9431	59.4884	58.9785	61.1015	63.2789	65.7997	68.4708	70.9290 (44)
Energy conte	112.4921	98.3692	102.9040	88.0306	83.3874	73.1480	71.3294	75.6564	78.0292	89.2896	97.5492	111.0577 (45)
Energy content (annual)										Total = Sum(45)m =		1081.2426
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	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	95.6183	83.6138	87.4684	74.8260	70.8793	62.1758	60.6300	64.3080	66.3248	75.8961	82.9168	94.3990 (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	95.6183	83.6138	87.4684	74.8260	70.8793	62.1758	60.6300	64.3080	66.3248	75.8961	82.9168	94.3990 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		919.0562 (64)
Electric shower(s)	54.6818	48.7219	53.2024	50.7704	51.7231	49.3388	50.9835	51.7231	50.7704	53.2024	52.2020	54.6818 (64a)
												622.0018 (64a)
Heat gains from water heating, kWh/month	37.5750	33.0839	35.1677	31.3991	30.6506	27.8787	27.9034	29.0078	29.2738	32.2746	33.7797	37.2702 (65)

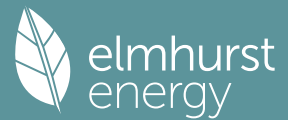
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.0223	137.3104	124.0223	128.1564	124.0223	128.1564	124.0223	124.0223	128.1564	124.0223	128.1564	124.0223 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.3718	241.8557	235.5963	222.2707	205.4496	189.6401	179.0784	176.5944	182.8539	196.1794	213.0006	228.8101 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395 (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)	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162 (71)
Water heating gains (Table 5)	50.5040	49.2320	47.2684	43.6099	41.1970	38.7204	37.5045	38.9889	40.6581	43.3799	46.9163	50.0943 (72)
Total internal gains	476.3167	490.8168	469.3056	456.4556	433.0875	418.9354	403.0238	402.0243	414.0869	426.0002	450.4918	465.3453 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	g Specific data or Table 6b	FF Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d		Gains W
North				3.2900	10.6334	0.4700		0.0000		0.7700		12.6607 (74)
South				2.2200	46.7521	0.4700		0.0000		0.7700		37.5615 (78)
West				7.0800	19.6403	0.4700		0.0000		0.7700		50.3233 (80)
South				3.0900	46.7521	0.4000		0.0000		0.7700		44.4949 (78)
Solar gains	145.0403	257.0253	374.4206	495.9603	580.3470	585.8945	560.8965	497.2295	416.8093	290.5613	175.6305	122.8422 (83)

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Total gains 621.3570 747.8421 843.7262 952.4158 1013.4345 1004.8299 963.9203 899.2537 830.8962 716.5615 626.1223 588.1875 (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	38.7604	38.8390	38.9163	39.2838	39.3533	39.6802	39.6802	39.7414	39.5537	39.3533	39.2129	39.0672
alpha	3.5840	3.5893	3.5944	3.6189	3.6236	3.6453	3.6453	3.6494	3.6369	3.6236	3.6142	3.6045
util living area	0.9851	0.9709	0.9451	0.8817	0.7706	0.6064	0.4599	0.5074	0.7273	0.9138	0.9733	0.9876 (86)
MIT	19.1116	19.4025	19.7961	20.2932	20.6780	20.9032	20.9729	20.9612	20.8069	20.2873	19.6116	19.0625 (87)
Th 2	19.9302	19.9321	19.9340	19.9429	19.9446	19.9524	19.9524	19.9538	19.9494	19.9446	19.9412	19.9377 (88)
util rest of house	0.9817	0.9645	0.9328	0.8550	0.7200	0.5257	0.3578	0.4028	0.6535	0.8884	0.9663	0.9849 (89)
MIT 2	18.2224	18.5104	18.8962	19.3753	19.7194	19.9015	19.9432	19.9396	19.8353	19.3820	18.7263	18.1792 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.3942	18.6827	19.0701	19.5526	19.9046	20.0950	20.1422	20.1370	20.0230	19.5569	18.8974	18.3499 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.3942	18.6827	19.0701	19.5526	19.9046	20.0950	20.1422	20.1370	20.0230	19.5569	18.8974	18.3499 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9751	0.9547	0.9203	0.8436	0.7179	0.5373	0.3769	0.4219	0.6592	0.8769	0.9570	0.9790 (94)
Useful gains	605.8843	713.9804	776.4618	803.4161	727.5322	539.9184	363.3128	379.4367	547.7423	628.3760	599.2286	575.8478 (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	1508.6816	1472.3575	1340.1452	1125.0951	865.0125	574.5689	370.3745	390.1447	621.3020	944.3295	1248.2493	1502.7479 (97)
Space heating kWh	671.6812	509.6294	419.3805	231.6089	102.2854	0.0000	0.0000	0.0000	0.0000	235.0694	467.2949	689.6136 (98a)
Space heating requirement - total per year (kWh/year)	3326.5634											
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	671.6812	509.6294	419.3805	231.6089	102.2854	0.0000	0.0000	0.0000	0.0000	235.0694	467.2949	689.6136 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3326.5634											
Space heating per m2	(98c) / (4) = 36.8962 (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	982.8758	773.7533	793.4430	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8338	0.8928	0.8667	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	819.5381	690.7872	687.7017	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1123.3819	1078.0578	1004.9345	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	218.7675	288.1293	236.0212	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	54.6919	72.0323	59.0053	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	185.7295 (107)											
Energy for space heating	36.8962 (99)											
Energy for space cooling	2.0600 (108)											
Total	38.9562 (109)											
Fabric Energy Efficiency (DFEE)	39.0 (109)											

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

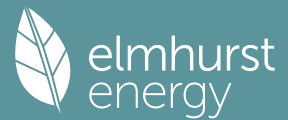
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	45.0800 (1b)	x 2.3100 (2b)	= 104.1348 (1b) - (3b)
First floor	45.0800 (1c)	x 2.6100 (2c)	= 117.6588 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 221.7936 (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)

Full SAP Calculation Printout



Number of intermittent extract fans 3 * 10 = 30.0000 (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) = 30.0000 / (5) = 0.1353 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3853 (18)
Number of sides sheltered 2 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3275 (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	0.4175	0.4093	0.4012	0.3602	0.3520	0.3111	0.3111	0.3029	0.3275	0.3520	0.3684	0.3848 (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	0.5872	0.5838	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5536	0.5620	0.5679	0.5740 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.9800	1.0000	1.9800		(26)
TER Semi-glazed door			1.9800	1.0000	1.9800		(26a)
TER Opening Type (Uw = 1.20)			15.6800	1.1450	17.9542		(27)
FP McCann System			45.0800	0.1300	5.8604		(28a)
100mm Knauf Supafil 34	134.3652	19.6400	114.7252	0.1800	20.6505		(29a)
Plane Ceiling-500mm Loft Roll	45.0800		45.0800	0.1100	4.9588		(30)
Total net area of external elements Aum(A, m2)			224.5252				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 53.3839		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							165.6661 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.7100	0.0500	0.6855
E3 Sill	10.3500	0.0500	0.5175
E4 Jamb	34.8000	0.0500	1.7400
E5 Ground floor (normal)	11.1800	0.1600	1.7888
E5 Ground floor (normal)	16.1300	0.1600	2.5808
E6 Intermediate floor within a dwelling	27.3100	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.1300	0.0600	0.9678
E12 Gable (insulation at ceiling level)	11.1800	0.0600	0.6708
E16 Corner (normal)	19.6800	0.0900	1.7712
E4 Jamb	4.2000	0.0500	0.2100

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

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 64.3163 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.9757	42.7279	42.4851	41.3445	41.1312	40.1378	40.1378	39.9538	40.5204	41.1312	41.5628	42.0142 (38)
Heat transfer coeff	107.2920	107.0443	106.8014	105.6609	105.4475	104.4541	104.4541	104.2701	104.8367	105.4475	105.8792	106.3305 (39)
Average = Sum(39)m / 12 =												105.6599

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1900	1.1873	1.1846	1.1719	1.1696	1.1585	1.1585	1.1565	1.1628	1.1696	1.1743	1.1794 (40)
HLP (average)												1.1719
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6279 (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 29.4863 29.0484 28.4317 27.2947 26.4433 25.4992 24.9893 25.6017 26.2684 27.2786 28.4390 29.3866 (42b)
Hot water usage for other uses 41.5424 40.0317 38.5211 37.0105 35.4998 33.9892 33.9892 35.4998 37.0105 38.5211 40.0317 41.5424 (42c)
Average daily hot water use (litres/day) 65.1043 (43)
Daily hot water use 71.0287 69.0801 66.9528 64.3052 61.9431 59.4884 58.9785 61.1015 63.2789 65.7997 68.4708 70.9290 (44)
Energy conte 112.4921 98.3692 102.9040 88.0306 83.3874 73.1480 71.3294 75.6564 78.0292 89.2896 97.5492 111.0577 (45)
Energy content (annual) Total = Sum(45)m = 1081.2426
Distribution loss (46)m = 0.15 x (45)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (46)
Water storage loss: 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)
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 (57)
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 (59)
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 (61)
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 95.6183 83.6138 87.4684 74.8260 70.8793 62.1758 60.6300 64.3080 66.3248 75.8961 82.9168 94.3990 (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 95.6183 83.6138 87.4684 74.8260 70.8793 62.1758 60.6300 64.3080 66.3248 75.8961 82.9168 94.3990 (64)
Total per year (kWh/year) = Sum(64)m = 919.0562 (64)
Electric shower(s) 54.6818 48.7219 53.2024 50.7704 51.7231 49.3388 50.9835 51.7231 50.7704 53.2024 52.2020 54.6818 (64a)

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Heat gains from water heating, kWh/month
37.5750 33.0839 35.1677 31.3991 30.6506 27.8787 27.9034 29.0078 29.2738 32.2746 33.7797 37.2702 (65)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 622.0018 (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	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.0223	137.3104	124.0223	128.1564	124.0223	128.1564	124.0223	124.0223	128.1564	124.0223	128.1564	124.0223	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.3718	241.8557	235.5963	222.2707	205.4496	189.6401	179.0784	176.5944	182.8539	196.1794	213.0006	228.8101	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	(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)	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	(71)
Water heating gains (Table 5)	50.5040	49.2320	47.2684	43.6099	41.1970	38.7204	37.5045	38.9889	40.6581	43.3799	46.9163	50.0943	(72)
Total internal gains	476.3167	490.8168	469.3056	456.4556	433.0875	418.9354	403.0238	402.0243	414.0869	426.0002	450.4918	465.3453	(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					3.2900	10.6334		0.6300	0.7000	0.7700		10.6915 (74)	
South					5.3100	46.7521		0.6300	0.7000	0.7700		75.8695 (78)	
West					7.0800	19.6403		0.6300	0.7000	0.7700		42.4964 (80)	
Solar gains	129.0574	227.8187	329.9040	434.3268	506.2408	510.3174	488.8507	434.6475	366.3121	256.9851	156.1086	109.4182	(83)
Total gains	605.3742	718.6355	799.2097	890.7823	939.3283	929.2528	891.8745	836.6718	780.3990	682.9854	606.6004	574.7635	(84)

7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	tau	38.6703	38.7598	38.8479	39.2673	39.3468	39.7210	39.7210	39.7910	39.5760	39.3468	39.1863	39.0200
alpha	3.5780	3.5840	3.5899	3.6178	3.6231	3.6481	3.6481	3.6527	3.6384	3.6231	3.6124	3.6013	21.0000 (85)
util living area	0.9863	0.9742	0.9527	0.8989	0.8002	0.6419	0.4920	0.5386	0.7537	0.9236	0.9757	0.9885	(86)
MIT	19.0820	19.3560	19.7345	20.2296	20.6306	20.8835	20.9664	20.9531	20.7815	20.2484	19.5820	19.0392	(87)
Th 2	19.9280	19.9302	19.9324	19.9425	19.9444	19.9533	19.9533	19.9550	19.9499	19.9444	19.9406	19.9366	(88)
util rest of house	0.9832	0.9684	0.9418	0.8749	0.7524	0.5603	0.3847	0.4301	0.6818	0.9004	0.9692	0.9859	(89)
MIT 2	18.1916	18.4636	18.8362	19.3179	19.6821	19.8909	19.9418	19.9375	19.8186	19.3468	18.6971	18.1553	(90)
Living area fraction	MIT	18.3637	18.6360	19.0098	19.4940	19.8653	20.0827	20.1397	20.1337	20.0047	19.5210	18.8680	0.1932 (91)
Temperature adjustment	adjusted MIT	18.3637	18.6360	19.0098	19.4940	19.8653	20.0827	20.1397	20.1337	20.0047	19.5210	18.8680	18.3261 (92)
adjusted MIT	18.3637	18.6360	19.0098	19.4940	19.8653	20.0827	20.1397	20.1337	20.0047	19.5210	18.8680	18.3261	0.0000 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9768	0.9592	0.9298	0.8629	0.7484	0.5711	0.4046	0.4497	0.6860	0.8888	0.9605	0.9804	(94)
Useful gains	591.3524	689.2958	743.1442	768.6364	702.9629	530.6746	360.8767	376.2130	535.3531	607.0377	582.6200	563.4700	(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	1508.9196	1470.3598	1336.0598	1119.3721	861.0123	572.6924	369.7410	389.3137	619.0279	940.6949	1245.9911	1502.0367	(97)
Space heating kWh	682.6700	524.8750	441.1292	252.5297	117.5888	0.0000	0.0000	0.0000	0.0000	248.2410	477.6272	698.2936	(98a)
Space heating requirement - total per year (kWh/year)												3442.9544	
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	682.6700	524.8750	441.1292	252.5297	117.5888	0.0000	0.0000	0.0000	0.0000	248.2410	477.6272	698.2936	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3442.9544	
Space heating per m ²												38.1872	(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	981.8686	772.9604	792.4531	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8051	0.8711	0.8437	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	790.4591	673.3084	668.5623	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1035.0451	993.8484	931.7868	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	176.1019	238.4818	195.8390	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	44.0255	59.6205	48.9597	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												152.6057	(107)
Energy for space heating												38.1872	(99)

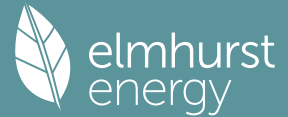
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Energy for space cooling
Total
Fabric Energy Efficiency (TFEE)

1.6926 (108)
39.8798 (109)
39.9 (109)

Full SAP Calculation Printout



Property Reference	4907-CA16-6920-010				Issued on Date	09/04/2024
Assessment Reference	Plot 010	Prop Type Ref	Mountford-Det-Opp			
Property	Plot 010, Mountford-Det-Opp					
SAP Rating	89 B	DER	11.32	TER	11.84	
Environmental	90 B	% DER < TER				4.39
CO ₂ Emissions (t/year)	0.9	DFEE	38.96	TFEE	39.88	
Compliance Check	See BREL	% DFEE < TFEE				2.32
% DPER < TPER	1.40	DPER	61.04	TPER	61.91	
Assessor Details	Miss Megan Chiswell				Assessor ID	CA16-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0800 (1b)	x 2.3100 (2b)	= 104.1348 (1b) - (3b)
First floor	45.0800 (1c)	x 2.6100 (2c)	= 117.6588 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 221.7936 (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	4.5000 (17)
Infiltration rate	0.2250 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1913 (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	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			1.9800	1.1000	2.1780		(26)
Half-Glazed Door			1.9800	1.2000	2.3760		(26a)
Window (Uw = 1.30)			12.5900	1.2357	15.5580		(27)
French Door (Uw = 1.40)			3.0900	1.3258	4.0966		(27)
FP McCann System			45.0800	0.1100	4.9588	75.0000	3381.0000 (28a)
100mm Knauf Supafil 34	134.3652	19.6400	114.7252	0.2400	27.5340	60.0000	6883.5116 (29a)
Plane Ceiling-500mm Loft Roll	45.0800		45.0800	0.0900	4.0572	9.0000	405.7200 (30)
Total net area of external elements Aum(A, m ²)			224.5252				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.7586		(33)
Timber GF			53.8700			9.0000	484.8300 (32c)
Timber 1F			94.8800			9.0000	853.9200 (32c)
Masonry GF			26.0500			75.0000	1953.7499 (32c)
Internal Floor			45.0800			12.6000	568.0080 (32d)
Internal Ceiling			45.0800			9.0000	405.7200 (32e)

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Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.7100	0.0420	0.5758
E3 Sill	10.3500	0.0090	0.0931
E4 Jamb	34.8000	0.0090	0.3132
E5 Ground floor (normal)	11.1800	0.0600	0.6708
E5 Ground floor (normal)	16.1300	0.0480	0.7742
E6 Intermediate floor within a dwelling	27.3100	0.0030	0.0819
E10 Eaves (insulation at ceiling level)	16.1300	0.0310	0.5000
E12 Gable (insulation at ceiling level)	11.1800	0.0440	0.4919
E16 Corner (normal)	19.6800	0.0290	0.5707
E4 Jamb	4.2000	0.0090	0.0378

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m
Heat transfer coeff
Average = Sum(39)m / 12 =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254
HLP (average)												
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6279 (42)
Hot water usage for mixer showers	68.2811	67.2549	65.7597	62.8987	60.7874	58.4329	57.0946	58.5786	60.2053	62.7333	65.6557	68.0195	(42a)
Hot water usage for baths	29.4863	29.0484	28.4317	27.2947	26.4433	25.4992	24.9893	25.6017	26.2684	27.2786	28.4390	29.3866	(42b)
Hot water usage for other uses	41.5424	40.0317	38.5211	37.0105	35.4998	33.9892	33.9892	35.4998	37.0105	38.5211	40.0317	41.5424	(42c)
Average daily hot water use (litres/day)													128.0571 (43)
Daily hot water use	139.3098	136.3351	132.7125	127.2039	122.7306	117.9214	116.0731	119.6801	123.4841	128.5330	134.1265	138.9485	(44)
Energy conte	220.6326	194.1393	203.9742	174.1358	165.2189	144.9981	140.3804	148.1889	152.2683	174.4180	191.0877	217.5597	(45)
Energy content (annual)										Total = Sum(45)m =		2127.0020	
Distribution loss (46)m = 0.15 x (45)m	33.0949	29.1209	30.5961	26.1204	24.7828	21.7497	21.0571	22.2283	22.8402	26.1627	28.6632	32.6340	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
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	14.2861	12.8912	14.2461	13.7307	14.1531	13.6608	14.0935	14.1122	13.6782	14.1752	13.7714	14.2787	(61)
Total heat required for water heating calculated for each month	234.9187	207.0306	218.2203	187.8665	179.3720	158.6589	154.4739	162.3011	165.9465	188.5932	204.8591	231.8384	(62)
WWHRS	-60.1336	-53.1827	-55.6898	-46.1134	-42.9760	-36.7749	-34.4706	-36.6560	-38.0487	-44.8552	-50.8156	-59.0201	(63a)
FV 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	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1735.3425	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	76.9319	67.7741	71.3829	61.3328	58.4736	51.6271	50.1998	52.8009	54.0488	61.5378	66.9795	75.9083	(65)

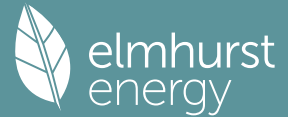
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.0223	137.3104	124.0223	128.1564	124.0223	128.1564	124.0223	124.0223	128.1564	124.0223	128.1564	124.0223	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.3718	241.8557	235.5963	222.2707	205.4496	189.6401	179.0784	176.5944	182.8539	196.1794	213.0006	228.8101	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	(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)	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	(71)
Water heating gains (Table 5)	103.4030	100.8544	95.9448	85.1845	78.5935	71.7042	67.4729	70.9689	75.0677	82.7121	93.0271	102.0273	(72)
Total internal gains	532.2157	545.4391	520.9820	501.0302	473.4840	451.9193	432.9922	434.0042	448.4966	468.3324	499.6027	520.2782	(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	3.2900	10.6334	0.4700	0.0000	0.7700	12.6607 (74)
South	2.2200	46.7521	0.4700	0.0000	0.7700	37.5615 (78)
West	7.0800	19.6403	0.4700	0.0000	0.7700	50.3233 (80)
South	3.0900	46.7521	0.4000	0.0000	0.7700	44.4949 (78)

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Solar gains	145.0403	257.0253	374.4206	495.9603	580.3470	585.8945	560.8965	497.2295	416.8093	290.5613	175.6305	122.8422 (83)
Total gains	677.2560	802.4644	895.4025	996.9904	1053.8309	1037.8138	993.8886	931.2337	865.3059	758.8937	675.2332	643.1204 (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	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914
alpha	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261
util living area	0.9800	0.9627	0.9320	0.8618	0.7429	0.5799	0.4364	0.4814	0.6982	0.8958	0.9654	0.9834 (86)
MIT	19.3186	19.5954	19.9613	20.3989	20.7377	20.9224	20.9792	20.9699	20.8435	20.3876	19.7627	19.2509 (87)
Th 2	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802 (88)
util rest of house	0.9757	0.9549	0.9176	0.8330	0.6915	0.5021	0.3408	0.3829	0.6248	0.8674	0.9568	0.9797 (89)
MIT 2	18.0331	18.3813	18.8370	19.3652	19.7470	19.9282	19.9712	19.9661	19.8629	19.3657	18.5969	17.9475 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.2815	18.6159	19.0543	19.5649	19.9384	20.1203	20.1659	20.1600	20.0523	19.5632	18.8222	18.1994 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.2815	18.6159	19.0543	19.5649	19.9384	20.1203	20.1659	20.1600	20.0523	19.5632	18.8222	18.1994 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9657	0.9412	0.9015	0.8194	0.6892	0.5133	0.3586	0.4009	0.6304	0.8533	0.9437	0.9707 (94)
Useful gains	654.0386	755.2959	807.2064	816.9740	726.3331	532.7296	356.4400	373.2878	545.4944	647.5442	637.2068	624.3012 (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	1418.6188	1391.6719	1273.8069	1082.1102	835.9034	560.1147	361.8151	381.5098	603.9499	909.4428	1189.3805	1420.4326 (97)
Space heating kWh	568.8476	427.6446	347.1507	190.8981	81.5203	0.0000	0.0000	0.0000	0.0000	194.8525	397.5650	592.3218 (98a)
Space heating requirement - total per year (kWh/year)	2800.8007											
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	568.8476	427.6446	347.1507	190.8981	81.5203	0.0000	0.0000	0.0000	0.0000	194.8525	397.5650	592.3218 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2800.8007											
Space heating per m2	(98c) / (4) = 31.0648 (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 %)	92.5000 (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	568.8476	427.6446	347.1507	190.8981	81.5203	0.0000	0.0000	0.0000	0.0000	194.8525	397.5650	592.3218 (98)
Space heating efficiency (main heating system 1)	92.5000	92.5000	92.5000	92.5000	92.5000	0.0000	0.0000	0.0000	0.0000	92.5000	92.5000	92.5000 (210)
Space heating fuel (main heating system)	614.9704	462.3185	375.2981	206.3763	88.1301	0.0000	0.0000	0.0000	0.0000	210.6514	429.8000	640.3478 (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	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184 (64)
Water heating requirement	88.5945	88.5438	88.4507	88.2675	87.9283	87.3000	87.3000	87.3000	87.3000	88.2703	88.5186	87.3000 (216)
Efficiency of water heater (217)m	197.2865	173.7534	183.7525	160.5948	155.1218	139.6151	137.4608	143.9234	146.5038	162.8384	174.0239	195.0320 (219)
Fuel for water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Space cooling fuel requirement (221)m	10.4327	9.4230	10.4327	10.0961	10.4327	10.0961	10.4327	10.4327	10.0961	10.4327	10.0961	10.4327 (231)
Pumps and Fa	24.6520	19.7768	17.8068	13.0460	10.0771	8.2331	9.1927	11.9490	15.5206	20.3638	23.0009	25.3372 (232)
Lighting	-10.5143	-17.6159	-30.5313	-40.5865	-48.7808	-47.3839	-46.4648	-40.9699	-32.2312	-22.2090	-12.3481	-8.7103 (233a)
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 (234a)
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 (235a)
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	-2.3134	-5.8082	-14.2792	-25.8706	-38.3436	-40.2001	-39.1571	-30.5906	-19.2472	-9.1150	-3.2762	-1.7426 (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	3027.8926 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	87.3000											
Water heating fuel used	1969.9064 (219)											
Space cooling fuel	0.0000 (221)											

Electricity for pumps and fans:
(MEVDcentralised, Database: total watage = 6.1260, total flow = 45.0000, SFP = 0.1361)

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mechanical ventilation fans (SFP = 0.1361)	36.8361 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	122.8361 (231)
Electricity for lighting (calculated in Appendix L)	198.9560 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-588.2895 (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	4731.3016 (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	3027.8926	0.2100	635.8575 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1969.9064	0.2100	413.6803 (264)
Space and water heating			1049.5378 (265)
Pumps, fans and electric keep-hot	122.8361	0.1387	17.0389 (267)
Energy for lighting	198.9560	0.1443	28.7155 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-358.3459	0.1315	-47.1158
PV Unit electricity exported	-229.9437	0.1215	-27.9410
Total			-75.0568 (269)
Total CO2, kg/year			1020.2354 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3200 (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	3027.8926	1.1300	3421.5187 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1969.9064	1.1300	2225.9942 (278)
Space and water heating			5647.5129 (279)
Pumps, fans and electric keep-hot	122.8361	1.5128	185.8264 (281)
Energy for lighting	198.9560	1.5338	305.1654 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-358.3459	1.4858	-532.4143
PV Unit electricity exported	-229.9437	0.4458	-102.5108
Total			-634.9251 (283)
Total Primary energy kWh/year			5503.5797 (286)
Dwelling Primary energy Rate (DPER)			61.0400 (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	45.0800 (1b)	x 2.3100 (2b)	= 104.1348 (1b) - (3b)
First floor	45.0800 (1c)	x 2.6100 (2c)	= 117.6588 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.7936 (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	3 * 10 = 30.0000 (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) =	30.0000 / (5) = 0.1353 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3853 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3275 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4175	0.4093	0.4012	0.3602	0.3520	0.3111	0.3111	0.3029	0.3275	0.3520	0.3684	0.3848 (22b)
	0.5872	0.5838	0.5805	0.5649	0.5620	0.5484	0.5484	0.5459	0.5536	0.5620	0.5679	0.5740 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.9800	1.0000	1.9800		(26)
TER Semi-glazed door			1.9800	1.0000	1.9800		(26a)
TER Opening Type (Uw = 1.20)			15.6800	1.1450	17.9542		(27)
FP McCann System			45.0800	0.1300	5.8604		(28a)
100mm Knauf Supafil 34	134.3652	19.6400	114.7252	0.1800	20.6505		(29a)
Plane Ceiling-500mm Loft Roll	45.0800		45.0800	0.1100	4.9588		(30)
Total net area of external elements Aum (A, m2)			224.5252				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	53.3839	(33)

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

165.6661 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.7100	0.0500	0.6855
E3 Sill	10.3500	0.0500	0.5175
E4 Jamb	34.8000	0.0500	1.7400
E5 Ground floor (normal)	11.1800	0.1600	1.7888
E5 Ground floor (normal)	16.1300	0.1600	2.5808
E6 Intermediate floor within a dwelling	27.3100	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.1300	0.0600	0.9678
E12 Gable (insulation at ceiling level)	11.1800	0.0600	0.6708
E16 Corner (normal)	19.6800	0.0900	1.7712
E4 Jamb	4.2000	0.0500	0.2100

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

10.9324 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 64.3163 (37)

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

(38)m	Jan 42.9757	Feb 42.7279	Mar 42.4851	Apr 41.3445	May 41.1312	Jun 40.1378	Jul 40.1378	Aug 39.9538	Sep 40.5204	Oct 41.1312	Nov 41.5628	Dec 42.0142 (38)
Heat transfer coeff	107.2920	107.0443	106.8014	105.6609	105.4475	104.4541	104.4541	104.2701	104.8367	105.4475	105.8792	106.3305 (39)
Average = Sum(39)m / 12 =												105.6599

HLP	Jan 1.1900	Feb 1.1873	Mar 1.1846	Apr 1.1719	May 1.1696	Jun 1.1585	Jul 1.1585	Aug 1.1565	Sep 1.1628	Oct 1.1696	Nov 1.1743	Dec 1.1794 (40)
HLP (average)												1.1719
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

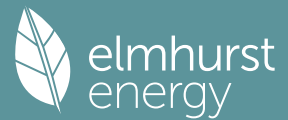
Assumed occupancy													2.6279 (42)
Hot water usage for mixer showers													
68.2811	67.2549	65.7597	62.8987	60.7874	58.4329	57.0946	58.5786	60.2053	62.7333	65.6557	68.0195	(42a)	
Hot water usage for baths													
29.4863	29.0484	28.4317	27.2947	26.4433	25.4992	24.9893	25.6017	26.2684	27.2786	28.4390	29.3866	(42b)	
Hot water usage for other uses													
41.5424	40.0317	38.5211	37.0105	35.4998	33.9892	33.9892	35.4998	37.0105	38.5211	40.0317	41.5424	(42c)	
Average daily hot water use (litres/day)													128.0571 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	139.3098	136.3351	132.7125	127.2039	122.7306	117.9214	116.0731	119.6801	123.4841	128.5330	134.1265	138.9485 (44)
Energy content (annual)	220.6326	194.1393	203.9742	174.1358	165.2189	144.9981	140.3804	148.1889	152.2683	174.4180	191.0877	217.5597 (45)
Distribution loss (46)m = 0.15 x (45)m	33.0949	29.1209	30.5961	26.1204	24.7828	21.7497	21.0571	22.2283	22.8402	26.1627	28.6632	32.6340 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	271.5915	240.1667	254.9331	223.4508	216.1778	194.3131	191.3393	199.1478	201.5834	225.3770	240.4028	268.5186 (62)
WWHRS	-31.2153	-27.6070	-28.9085	-23.9374	-22.3088	-19.0898	-17.8936	-19.0281	-19.7510	-23.2843	-26.3782	-30.6372 (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	240.3763	212.5597	226.0246	199.5135	193.8691	175.2234	173.4457	180.1198	181.8324	202.0927	214.0245	237.8814 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2436.9629 (64)
												2437 (64)

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	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.0223	137.3104	124.0223	128.1564	124.0223	128.1564	124.0223	124.0223	128.1564	124.0223	128.1564	124.0223 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.3718	241.8557	235.5963	222.2707	205.4496	189.6401	179.0784	176.5944	182.8539	196.1794	213.0006	228.8101 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395	36.1395 (69)

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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)											
	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	(71)
Water heating gains (Table 5)												
	115.7259	113.1818	108.2811	97.5402	90.9610	84.0842	79.8605	83.3502	87.4416	95.0722	105.3687	114.3526 (72)
Total internal gains												
	544.5386	557.7665	533.3183	513.3858	485.8515	464.2992	445.3797	446.3855	460.8705	480.6925	511.9442	532.6036 (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				3.2900	10.6334	0.6300	0.7000		0.7700		10.6915 (74)	
South				5.3100	46.7521	0.6300	0.7000		0.7700		75.8695 (78)	
West				7.0800	19.6403	0.6300	0.7000		0.7700		42.4964 (80)	
Solar gains	129.0574	227.8187	329.9040	434.3268	506.2408	510.3174	488.8507	434.6475	366.3121	256.9851	156.1086	109.4182 (83)
Total gains	673.5960	785.5853	863.2223	947.7126	992.0923	974.6167	934.2305	881.0330	827.1825	737.6777	668.0528	642.0217 (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	38.6703	38.7598	38.8479	39.2673	39.3468	39.7210	39.7210	39.7910	39.5760	39.3468	39.1863	39.0200
alpha	3.5780	3.5840	3.5899	3.6178	3.6231	3.6481	3.6481	3.6527	3.6384	3.6231	3.6124	3.6013
util living area	0.9809	0.9665	0.9417	0.8831	0.7791	0.6200	0.4724	0.5158	0.7290	0.9074	0.9677	0.9838 (86)
MIT	19.1843	19.4511	19.8173	20.2879	20.6649	20.8961	20.9705	20.9592	20.8055	20.3105	19.6700	19.1413 (87)
Th 2	19.9280	19.9302	19.9324	19.9425	19.9444	19.9533	19.9533	19.9550	19.9499	19.9444	19.9406	19.9366 (88)
util rest of house	0.9767	0.9593	0.9288	0.8566	0.7293	0.5389	0.3683	0.4102	0.6554	0.8806	0.9594	0.9802 (89)
MIT 2	17.8292	18.1671	18.6269	19.2081	19.6424	19.8828	19.9405	19.9357	19.8023	19.2493	18.4545	17.7803 (90)
Living area fraction												0.1932 (91)
MIT	18.0910	18.4152	18.8569	19.4168	19.8400	20.0786	20.1395	20.1335	19.9961	19.4544	18.6894	18.0433 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0910	18.4152	18.8569	19.4168	19.8400	20.0786	20.1395	20.1335	19.9961	19.4544	18.6894	18.0433 (93)

8. Space heating requirement

Utilisation	0.9665	0.9455	0.9121	0.8411	0.7238	0.5492	0.3875	0.4291	0.6590	0.8653	0.9461	0.9710 (94)
Useful gains	651.0137	742.7377	787.3633	797.0737	718.0301	535.2784	362.0187	378.0411	545.0977	638.2973	632.0285	623.3743 (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	1479.6669	1446.7231	1319.7374	1111.2094	858.3405	572.2592	369.7155	389.2911	618.1327	933.6718	1227.0719	1471.9623 (97)
Space heating kWh	616.5180	473.0782	396.0863	226.1777	104.3909	0.0000	0.0000	0.0000	0.0000	219.7586	428.4313	631.3495 (98a)
Space heating requirement - total per year (kWh/year)												3095.7905
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	616.5180	473.0782	396.0863	226.1777	104.3909	0.0000	0.0000	0.0000	0.0000	219.7586	428.4313	631.3495 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3095.7905
Space heating per m2										(98c) / (4) =		34.3366 (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 %)												92.4000 (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	616.5180	473.0782	396.0863	226.1777	104.3909	0.0000	0.0000	0.0000	0.0000	219.7586	428.4313	631.3495 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	667.2272	511.9894	428.6649	244.7811	112.9772	0.0000	0.0000	0.0000	0.0000	237.8340	463.6702	683.2787 (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	240.3763	212.5597	226.0246	199.5135	193.8691	175.2234	173.4457	180.1198	181.8324	202.0927	214.0245	237.8814 (64)
Efficiency of water heater (217)m	86.3071	86.0432	85.5704	84.6509	83.1141	80.3000	80.3000	80.3000	80.3000	84.5614	85.8375	86.3686 (216)
Fuel for water heating, kWh/month	278.5129	247.0385	264.1388	235.6896	233.2565	218.2109	215.9971	224.3086	226.4413	238.9892	249.3370	275.4259 (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	25.7694	20.6732	18.6139	13.6373	10.5339	8.6063	9.6093	12.4906	16.2240	21.2868	24.0434	26.4856 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-41.6350	-58.4209	-83.5795	-93.5086	-100.4260	-93.5692	-92.3841	-87.3948	-78.5548	-66.5551	-45.6631	-36.0261 (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)

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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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-24.3710	-51.1706	-101.5366	-152.2689	-201.1297	-202.0353	-199.6842	-169.1907	-124.1512	-73.1333	-32.5217	-19.2817 (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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												3350.4226 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2907.3462 (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)												207.9737 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2228.1920 (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												4323.5505 (238)

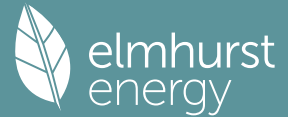
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3350.4226	0.2100	703.5888 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2907.3462	0.2100	610.5427 (264)
Space and water heating			1314.1314 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	207.9737	0.1443	30.0170 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-877.7171	0.1347	-118.2232
PV Unit electricity exported	-1350.4749	0.1259	-170.0760
Total			-288.2992 (269)
Total CO2, kg/year			1067.7785 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8400 (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	3350.4226	1.1300	3785.9776 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2907.3462	1.1300	3285.3012 (278)
Space and water heating			7071.2787 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	207.9737	1.5338	318.9970 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-877.7171	1.4978	-1314.6553
PV Unit electricity exported	-1350.4749	0.4623	-624.2982
Total			-1938.9536 (283)
Total Primary energy kWh/year			5581.4230 (286)
Target Primary Energy Rate (TPER)			61.9100 (287)

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Property Reference	4907-CA16-6920-010				Issued on Date	09/04/2024
Assessment Reference	Plot 010	Prop Type Ref	Mountford-Det-Opp			
Property	Plot 010, Mountford-Det-Opp					
SAP Rating	89 B	DER	11.32	TER	11.84	
Environmental	90 B	% DER < TER				4.39
CO ₂ Emissions (t/year)	0.9	DFEE	38.96	TFEE	39.88	
Compliance Check	See BREL	% DFEE < TFEE				2.32
% DPER < TPER	1.40	DPER	61.04	TPER	61.91	
Assessor Details	Miss Megan Chiswell				Assessor ID	CA16-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0800 (1b)	x 2.3100 (2b)	= 104.1348 (1b) - (3b)
First floor	45.0800 (1c)	x 2.6100 (2c)	= 117.6588 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.7936 (5)

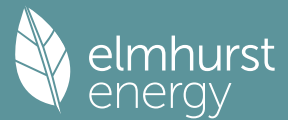
2. Ventilation rate

	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	4.5000 (17)
Infiltration rate	0.2250 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1913 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.2438 0.2391 0.2343 0.2104 0.2056 0.1817 0.1817 0.1769 0.1913 0.2056 0.2152 0.2247 (22b)
Mechanical extract ventilation - decentralised	
If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
Effective ac	0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 0.5000 (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
Solid Door			1.9800	1.1000	2.1780		(26)
Half-Glazed Door			1.9800	1.2000	2.3760		(26a)
Window (Uw = 1.30)			12.5900	1.2357	15.5580		(27)
French Door (Uw = 1.40)			3.0900	1.3258	4.0966		(27)
FP McCann System			45.0800	0.1100	4.9588	75.0000	3381.0000 (28a)
100mm Knauf Supafil 34	134.3652	19.6400	114.7252	0.2400	27.5340	60.0000	6883.5116 (29a)
Plane Ceiling-500mm Loft Roll	45.0800		45.0800	0.0900	4.0572	9.0000	405.7200 (30)
Total net area of external elements Aum (A, m ²)			224.5252				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.7586		(33)
Timber GF			53.8700			9.0000	484.8300 (32c)
Timber 1F			94.8800			9.0000	853.9200 (32c)
Masonry GF			26.0500			75.0000	1953.7499 (32c)
Internal Floor			45.0800			12.6000	568.0080 (32d)
Internal Ceiling			45.0800			9.0000	405.7200 (32e)

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Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
List of Thermal Bridges

(28)...(30) + (32) + (32a)...(32e) = 14936.4595 (34)
165.6661 (35)

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.7100	0.0420	0.5758
E3 Sill	10.3500	0.0090	0.0931
E4 Jamb	34.8000	0.0090	0.3132
E5 Ground floor (normal)	11.1800	0.0600	0.6708
E5 Ground floor (normal)	16.1300	0.0480	0.7742
E6 Intermediate floor within a dwelling	27.3100	0.0030	0.0819
E10 Eaves (insulation at ceiling level)	16.1300	0.0310	0.5000
E12 Gable (insulation at ceiling level)	11.1800	0.0440	0.4919
E16 Corner (normal)	19.6800	0.0290	0.5707
E4 Jamb	4.2000	0.0090	0.0378

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

Point Thermal bridges
Total fabric heat loss

(36a) = 4.1096 (36)
(33) + (36) + (36a) = 64.8682 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	(38)
Heat transfer coeff	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	(39)
Average = Sum(39)m / 12 =												101.4642	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	(40)
HLP (average)												1.1254	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6279 (42)
Hot water usage for mixer showers													
68.2811	67.2549	65.7597	62.8987	60.7874	58.4329	57.0946	58.5786	60.2053	62.7333	65.6557	68.0195	(42a)	
Hot water usage for baths													
29.4863	29.0484	28.4317	27.2947	26.4433	25.4992	24.9893	25.6017	26.2684	27.2786	28.4390	29.3866	(42b)	
Hot water usage for other uses													
41.5424	40.0317	38.5211	37.0105	35.4998	33.9892	33.9892	35.4998	37.0105	38.5211	40.0317	41.5424	(42c)	
Average daily hot water use (litres/day)												128.0571	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.3098	136.3351	132.7125	127.2039	122.7306	117.9214	116.0731	119.6801	123.4841	128.5330	134.1265	138.9485	(44)
Energy content	220.6326	194.1393	203.9742	174.1358	165.2189	144.9981	140.3804	148.1889	152.2683	174.4180	191.0877	217.5597	(45)
Energy content (annual)										Total = Sum(45)m =		2127.0020	
Distribution loss (46)m = 0.15 x (45)m													
33.0949	29.1209	30.5961	26.1204	24.7828	21.7497	21.0571	22.2283	22.8402	26.1627	28.6632	32.6340	(46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	14.2861	12.8912	14.2461	13.7307	14.1531	13.6608	14.0935	14.1122	13.6782	14.1752	13.7714	14.2787	(61)
Total heat required for water heating calculated for each month													
234.9187	207.0306	218.2203	187.8665	179.3720	158.6589	154.4739	162.3011	165.9465	188.5932	204.8591	231.8384	(62)	
WWHRS	-60.1336	-53.1827	-55.6898	-46.1134	-42.9760	-36.7749	-34.4706	-36.6560	-38.0487	-44.8552	-50.8156	-59.0201	(63a)
FV 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	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184	(64)
								Total per year (kWh/year) = Sum(64)m =				1735.3425	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
Heat gains from water heating, kWh/month													
76.9319	67.7741	71.3829	61.3328	58.4736	51.6271	50.1998	52.8009	54.0488	61.5378	66.9795	75.9083	(65)	

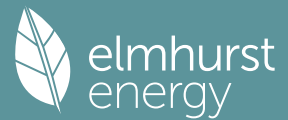
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1643	25.0153	20.3438	15.4016	11.5128	9.7196	10.5024	13.6514	18.3229	23.2651	27.1538	28.9471 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	357.2713	360.9787	351.6363	331.7474	306.6412	283.0449	267.2811	263.5738	272.9162	292.8051	317.9113	341.5076 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953 (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)	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162 (71)
Water heating gains (Table 5)	103.4030	100.8544	95.9448	85.1845	78.5935	71.7042	67.4729	70.9689	75.0677	82.7121	93.0271	102.0273 (72)
Total internal gains	597.7921	595.8017	576.8783	541.2868	505.7009	470.4222	451.2099	454.1475	472.2603	507.7358	547.0457	581.4353 (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	3.2900	10.6334	0.4700	0.0000	0.7700	12.6607 (74)
South	2.2200	46.7521	0.4700	0.0000	0.7700	37.5615 (78)
West	7.0800	19.6403	0.4700	0.0000	0.7700	50.3233 (80)
South	3.0900	46.7521	0.4000	0.0000	0.7700	44.4949 (78)

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Solar gains	145.0403	257.0253	374.4206	495.9603	580.3470	585.8945	560.8965	497.2295	416.8093	290.5613	175.6305	122.8422 (83)
Total gains	742.8324	852.8271	951.2988	1037.2471	1086.0479	1056.3167	1012.1064	951.3770	889.0696	798.2970	722.6762	704.2775 (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	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914
alpha	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261
util living area	0.9735	0.9555	0.9202	0.8493	0.7298	0.5718	0.4292	0.4724	0.6859	0.8825	0.9578	0.9779 (86)
MIT	19.4155	19.6645	20.0280	20.4342	20.7537	20.9260	20.9803	20.9717	20.8527	20.4278	19.8285	19.3427 (87)
Th 2	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802 (88)
util rest of house	0.9679	0.9465	0.9040	0.8189	0.6778	0.4945	0.3349	0.3752	0.6122	0.8516	0.9477	0.9732 (89)
MIT 2	18.1549	18.4669	18.9173	19.4049	19.7625	19.9308	19.9717	19.9670	19.8706	19.4110	18.6781	18.0633 (90)
Living area fraction									fLA = Living area / (4) =			0.1932 (91)
MIT	18.3984	18.6983	19.1319	19.6038	19.9540	20.1231	20.1666	20.1611	20.0604	19.6075	18.9004	18.3105 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3984	18.6983	19.1319	19.6038	19.9540	20.1231	20.1666	20.1611	20.0604	19.6075	18.9004	18.3105 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9562	0.9318	0.8877	0.8061	0.6764	0.5058	0.3525	0.3930	0.6185	0.8382	0.9335	0.9626 (94)
Useful gains	710.2908	794.6712	844.4233	836.1706	734.5779	534.2971	356.8035	373.9190	549.8667	669.1255	674.5914	677.9085 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.0000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1430.4852	1400.0329	1281.6886	1086.0526	837.4846	560.3940	361.8790	381.6206	604.7634	913.9339	1197.3132	1431.7099 (97)
Space heating kWh	535.8246	406.8031	325.3254	179.9150	76.5626	0.0000	0.0000	0.0000	0.0000	182.1375	376.3597	560.8283 (98a)
Space heating requirement - total per year (kWh/year)												2643.7561
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	535.8246	406.8031	325.3254	179.9150	76.5626	0.0000	0.0000	0.0000	0.0000	182.1375	376.3597	560.8283 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2643.7561
Space heating per m2										(98c) / (4) =		29.3229 (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 %)												92.5000 (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	535.8246	406.8031	325.3254	179.9150	76.5626	0.0000	0.0000	0.0000	0.0000	182.1375	376.3597	560.8283 (98)
Space heating efficiency (main heating system 1)	92.5000	92.5000	92.5000	92.5000	92.5000	0.0000	0.0000	0.0000	0.0000	92.5000	92.5000	92.5000 (210)
Space heating fuel (main heating system)	579.2698	439.7871	351.7031	194.5027	82.7703	0.0000	0.0000	0.0000	0.0000	196.9054	406.8753	606.3008 (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	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184 (64)
Efficiency of water heater	88.5757	88.5269	88.4263	88.2428	87.9037	87.3000	87.3000	87.3000	87.3000	88.2421	88.4995	87.3000 (216)
Fuel for water heating, kWh/month	197.3283	173.7865	183.8032	160.6399	155.1653	139.6151	137.4608	143.9234	146.5038	162.8905	174.0616	195.0686 (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	10.4327	9.4230	10.4327	10.0961	10.4327	10.0961	10.4327	10.4327	10.0961	10.4327	10.0961	10.4327 (231)
Lighting	24.6520	19.7768	17.8068	13.0460	10.0771	8.2331	9.1927	11.9490	15.5206	20.3638	23.0009	25.3372 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-10.5143	-17.6159	-30.5313	-40.5865	-48.7808	-47.3839	-46.4648	-40.9699	-32.2312	-22.2090	-12.3481	-8.7103 (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	-2.3134	-5.8082	-14.2792	-25.8706	-38.3436	-40.2001	-39.1571	-30.5906	-19.2472	-9.1150	-3.2762	-1.7426 (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												2858.1147 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.3000
Water heating fuel used												1970.2470 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:												
(MEVDe decentralised, Database: total watage = 6.1260, total flow = 45.0000, SFP = 0.1361)												
mechanical ventilation fans (SFP = 0.1361)												36.8361 (230a)

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central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	122.8361 (231)
Electricity for lighting (calculated in Appendix L)	198.9560 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-588.2895 (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	4561.8643 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2858.1147	3.6400	104.0354 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1970.2470	3.6400	71.7170 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	122.8361	16.4900	20.2557 (249)
Energy for lighting	198.9560	16.4900	32.8079 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-358.3459	16.4900	-59.0912
PV Unit electricity exported	-229.9437	5.5900	-12.8539
Total			-71.9451 (252)
Total energy cost			248.8708 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 0.6629 (257)
SAP value	89.2549
SAP rating (Section 12)	89 (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	2858.1147	0.2100	600.2041 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1970.2470	0.2100	413.7519 (264)
Space and water heating			1013.9560 (265)
Pumps, fans and electric keep-hot	122.8361	0.1387	17.0389 (267)
Energy for lighting	198.9560	0.1443	28.7155 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-358.3459	0.1315	-47.1158
PV Unit electricity exported	-229.9437	0.1215	-27.9410
Total			-75.0568 (269)
Total CO2, kg/year			984.6535 (272)
CO2 emissions per m2			10.9200 (273)
EI value			90.2380
EI rating			90 (274)
EI band			B

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

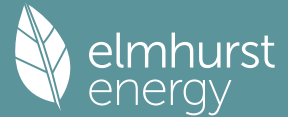
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	45.0800 (1b)	x 2.3100 (2b)	= 104.1348 (1b) - (3b)
First floor	45.0800 (1c)	x 2.6100 (2c)	= 117.6588 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.7936 (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)

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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) =
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
0.0000 / (5) = 0.0000 (8)
Yes
Blower Door
4.5000 (17)
0.2250 (18)
2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1913 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2008	0.1913	0.1913	0.1769	0.1769	0.1578	0.1626	0.1530	0.1578	0.1673	0.1673	0.1817 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			1.9800	1.1000	2.1780		(26)
Half-Glazed Door			1.9800	1.2000	2.3760		(26a)
Window (Uw = 1.30)			12.5900	1.2357	15.5580		(27)
French Door (Uw = 1.40)			3.0900	1.3258	4.0966		(27)
FP McCann System			45.0800	0.1100	4.9588	75.0000	3381.0000 (28a)
100mm Knauf Supafil 34	134.3652	19.6400	114.7252	0.2400	27.5340	60.0000	6883.5116 (29a)
Plane Ceiling-500mm Loft Roll	45.0800		45.0800	0.0900	4.0572	9.0000	405.7200 (30)
Total net area of external elements Aum(A, m2)			224.5252				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		60.7586		(33)
Timber GF			53.8700			9.0000	484.8300 (32c)
Timber 1F			94.8800			9.0000	853.9200 (32c)
Masonry GF			26.0500			75.0000	1953.7499 (32c)
Internal Floor			45.0800			12.6000	568.0080 (32d)
Internal Ceiling			45.0800			9.0000	405.7200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14936.4595 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 165.6661 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.7100	0.0420	0.5758
E3 Sill	10.3500	0.0090	0.0931
E4 Jamb	34.8000	0.0090	0.3132
E5 Ground floor (normal)	11.1800	0.0600	0.6708
E5 Ground floor (normal)	16.1300	0.0480	0.7742
E6 Intermediate floor within a dwelling	27.3100	0.0030	0.0819
E10 Eaves (insulation at ceiling level)	16.1300	0.0310	0.5000
E12 Gable (insulation at ceiling level)	11.1800	0.0440	0.4919
E16 Corner (normal)	19.6800	0.0290	0.5707
E4 Jamb	4.2000	0.0090	0.0378

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.1096 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 64.8682 (37)

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

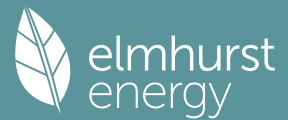
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959 (38)
Heat transfer coeff	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642 (39)
Average = Sum(39)m / 12 =												101.4642

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254 (40)
HLP (average)												1.1254
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6279 (42)
Hot water usage for mixer showers	68.2811	67.2549	65.7597	62.8987	60.7874	58.4329	57.0946	58.5786	60.2053	62.7333	65.6557	68.0195 (42a)
Hot water usage for baths	29.4863	29.0484	28.4317	27.2947	26.4433	25.4992	24.9893	25.6017	26.2684	27.2786	28.4390	29.3866 (42b)
Hot water usage for other uses	41.5424	40.0317	38.5211	37.0105	35.4998	33.9892	33.9892	35.4998	37.0105	38.5211	40.0317	41.5424 (42c)
Average daily hot water use (litres/day)												128.0571 (43)
Daily hot water use	139.3098	136.3351	132.7125	127.2039	122.7306	117.9214	116.0731	119.6801	123.4841	128.5330	134.1265	138.9485 (44)
Energy conte	220.6326	194.1393	203.9742	174.1358	165.2189	144.9981	140.3804	148.1889	152.2683	174.4180	191.0877	217.5597 (45)
Energy content (annual)										Total = Sum(45)m =		2127.0020
Distribution loss (46)m = 0.15 x (45)m	33.0949	29.1209	30.5961	26.1204	24.7828	21.7497	21.0571	22.2283	22.8402	26.1627	28.6632	32.6340 (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	14.2861	12.8912	14.2461	13.7307	14.1531	13.6608	14.0935	14.1122	13.6782	14.1752	13.7714	14.2787 (61)
Total heat required for water heating calculated for each month	234.9187	207.0306	218.2203	187.8665	179.3720	158.6589	154.4739	162.3011	165.9465	188.5932	204.8591	231.8384 (62)
WWHRS	-60.1336	-53.1827	-55.6898	-46.1134	-42.9760	-36.7749	-34.4706	-36.6560	-38.0487	-44.8552	-50.8156	-59.0201 (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)

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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	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184 (64)
	Total per year (kWh/year) = Sum(64)m =											1735.3425 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	76.9319	67.7741	71.3829	61.3328	58.4736	51.6271	50.1998	52.8009	54.0488	61.5378	66.9795	75.9083 (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	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1643	25.0153	20.3438	15.4016	11.5128	9.7196	10.5024	13.6514	18.3229	23.2651	27.1538	28.9471	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	357.2713	360.9787	351.6363	331.7474	306.6412	283.0449	267.2811	263.5738	272.9162	292.8051	317.9113	341.5076	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	(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)	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	(71)
Water heating gains (Table 5)	103.4030	100.8544	95.9448	85.1845	78.5935	71.7042	67.4729	70.9689	75.0677	82.7121	93.0271	102.0273	(72)
Total internal gains	597.7921	595.8017	576.8783	541.2868	505.7009	470.4222	451.2099	454.1475	472.2603	507.7358	547.0457	581.4353	(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					3.2900	11.9814	0.4700	0.0000			0.7700	14.2657 (74)				
South					2.2200	50.9848	0.4700	0.0000			0.7700	40.9621 (78)				
West					7.0800	22.3313	0.4700	0.0000			0.7700	57.2185 (80)				
South					3.0900	50.9848	0.4000	0.0000			0.7700	48.5233 (78)				
Solar gains					160.9696	256.9576	370.6912	507.9198	580.8115	628.3257	594.6829	537.7815	447.9336	310.3983	199.7405	134.9896 (83)
Total gains					758.7616	852.7593	947.5694	1049.2066	1086.5124	1098.7478	1045.8928	991.9290	920.1938	818.1340	746.7862	716.4249 (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	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	
alpha	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	
util living area	0.9672	0.9495	0.9070	0.8154	0.6618	0.4474	0.2983	0.3239	0.5899	0.8443	0.9441	0.9724	(86)
MIT	19.5654	19.7719	20.1510	20.5584	20.8489	20.9743	20.9959	20.9944	20.9256	20.5709	19.9984	19.5047	(87)
Th 2	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	(88)
util rest of house	0.9601	0.9390	0.8876	0.7782	0.5988	0.3619	0.2014	0.2224	0.5030	0.8033	0.9302	0.9663	(89)
MIT 2	18.3447	18.6021	19.0688	19.5484	19.8594	19.9672	19.9793	19.9788	19.9337	19.5760	18.8898	18.2689	(90)
Living area fraction	fLA = Living area / (4) =												0.1932 (91)
MIT	18.5806	18.8281	19.2779	19.7436	20.0506	20.1618	20.1757	20.1750	20.1254	19.7683	19.1040	18.5077	(92)
Temperature adjustment													0.0000
adjusted MIT	18.5806	18.8281	19.2779	19.7436	20.0506	20.1618	20.1757	20.1750	20.1254	19.7683	19.1040	18.5077	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9472	0.9238	0.8715	0.7686	0.6034	0.3775	0.2202	0.2420	0.5161	0.7935	0.9150	0.9544	(94)
Ext temp.	718.6904	787.7664	825.8260	806.3872	655.5927	414.8218	230.2534	240.0443	474.8811	649.1715	683.2981	683.7538	(95)
Heat loss rate W	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Space heating kWh	1367.7954	1342.1818	1205.1825	998.7691	715.3825	422.2732	230.9003	240.9819	499.7497	828.7865	1126.6615	1360.3985	(97)
Space heating requirement - total per year (kWh/year)	482.9341	372.5672	282.2413	138.5150	44.4836	0.0000	0.0000	0.0000	0.0000	133.6335	319.2216	503.4237	(98a)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	482.9341	372.5672	282.2413	138.5150	44.4836	0.0000	0.0000	0.0000	0.0000	133.6335	319.2216	503.4237	(98c)
Space heating per m2	(98c) / (4) =												25.2553 (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 %)													92.5000 (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	
482.9341	372.5672	282.2413	138.5150	44.4836	0.0000	0.0000	0.0000	0.0000	0.0000	133.6335	319.2216	503.4237	(98)
Space heating efficiency (main heating system 1)													

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Space heating fuel (main heating system)	92.5000	92.5000	92.5000	92.5000	92.5000	0.0000	0.0000	0.0000	0.0000	92.5000	92.5000	92.5000	(210)
Space heating efficiency (main heating system 2)	522.0909	402.7753	305.1257	149.7459	48.0904	0.0000	0.0000	0.0000	0.0000	144.4687	345.1045	544.2419	(211)
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	(212)
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	(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	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184	(64)
Efficiency of water heater (217)m	88.5418	88.4964	88.3712	88.1320	87.7120	87.3000	87.3000	87.3000	87.3000	88.1109	88.4394	87.3000	(216)
Fuel for water heating, kWh/month	197.4040	173.8465	183.9180	160.8418	155.5043	139.6151	137.4608	143.9234	146.5038	163.1331	174.1797	195.1442	(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	10.4327	9.4230	10.4327	10.0961	10.4327	10.0961	10.4327	10.4327	10.0961	10.4327	10.0961	10.4327	(231)
Lighting	24.6520	19.7768	17.8068	13.0460	10.0771	8.2331	9.1927	11.9490	15.5206	20.3638	23.0009	25.3372	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.8762	-18.0834	-30.9445	-41.9188	-49.2691	-50.0516	-48.7479	-43.8270	-34.6552	-24.0241	-14.2086	-9.7625	(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)	-2.8221	-6.0709	-14.6223	-27.4820	-39.0993	-44.8841	-43.1131	-34.8826	-22.0143	-10.4497	-4.1350	-2.0963	(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												2461.6432	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												1971.4747	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 6.1260, total flow = 45.0000, SFP = 0.1361)													
mechanical ventilation fans (SFP = 0.1361)												36.8361	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												122.8361	(231)
Electricity for lighting (calculated in Appendix L)												198.9560	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-629.0409	(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												4125.8692	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2461.6432	6.1900	152.3757	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1971.4747	6.1900	122.0343	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	122.8361	25.1600	30.9056	(249)
Energy for lighting	198.9560	25.1600	50.0573	(250)
Additional standing charges			102.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-377.3690	25.1600	-94.9460	
PV Unit electricity exported	-251.6719	5.8100	-14.6221	
Total			-109.5682	(252)
Total energy cost			347.8047	(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	2461.6432	0.2100	516.9451	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1971.4747	0.2100	414.0097	(264)
Space and water heating			930.9548	(265)
Pumps, fans and electric keep-hot	122.8361	0.1387	17.0389	(267)
Energy for lighting	198.9560	0.1443	28.7155	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-377.3690	0.1315	-49.6194	
PV Unit electricity exported	-251.6719	0.1210	-30.4577	
Total			-80.0771	(269)
Total CO2, kg/year			896.6320	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
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Space heating - main system 1	2461.6432	1.1300	2781.6569 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1971.4747	1.1300	2227.7665 (278)
Space and water heating			5009.4233 (279)
Pumps, fans and electric keep-hot	122.8361	1.5128	185.8264 (281)
Energy for lighting	198.9560	1.5338	305.1654 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-377.3690	1.4858	-560.6827
PV Unit electricity exported	-251.6719	0.4439	-111.7180
Total			-672.4007 (283)
Total Primary energy kWh/year			4828.0145 (286)

SAP 10 EPC IMPROVEMENTS

Plot 010

Current energy efficiency rating: B 89
Current environmental impact rating: B 90

N Solar water heating SAP increase too small
U Solar photovoltaic panels Already installed
V2 Wind turbine Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.4 -£ 23 -134 kg (14.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 89
Potential environmental impact rating: B 90

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

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

	Current	Potential	Saving
Electricity	£81	£81	£0
Mains gas	£376	£376	£0
Space heating	£285	£285	£0
Water heating	£122	£122	£0
Lighting	£50	£50	£0
Generated (PV)	-£110	-£110	£0
Total cost of fuels	£347	£347	£0
Total cost of uses	£347	£347	£0
Delivered energy	46 kWh/m²	46 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	10 kg/m²	10 kg/m²	0 kg/m²
Primary energy	54 kWh/m²	54 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

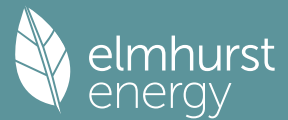
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	45.0800 (1b)	x 2.3100 (2b)	= 104.1348 (1b) - (3b)
First floor	45.0800 (1c)	x 2.6100 (2c)	= 117.6588 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 221.7936 (5)

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)

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Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.5000 (17)
Infiltration rate		0.2250 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1913 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
Solid Door			1.9800	1.1000	2.1780		(26)
Half-Glazed Door			1.9800	1.2000	2.3760		(26a)
Window (Uw = 1.30)			12.5900	1.2357	15.5580		(27)
French Door (Uw = 1.40)			3.0900	1.3258	4.0966		(27)
FP McCann System			45.0800	0.1100	4.9588	75.0000	3381.0000 (28a)
100mm Knauf Supafil 34	134.3652	19.6400	114.7252	0.2400	27.5340	60.0000	6883.5116 (29a)
Plane Ceiling-500mm Loft Roll	45.0800		45.0800	0.0900	4.0572	9.0000	405.7200 (30)
Total net area of external elements Aum(A, m2)			224.5252				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.7586		(33)
Timber GF			53.8700			9.0000	484.8300 (32c)
Timber 1F			94.8800			9.0000	853.9200 (32c)
Masonry GF			26.0500			75.0000	1953.7499 (32c)
Internal Floor			45.0800			12.6000	568.0080 (32d)
Internal Ceiling			45.0800			9.0000	405.7200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14936.4595 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 165.6661 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.7100	0.0420	0.5758
E3 Sill	10.3500	0.0090	0.0931
E4 Jamb	34.8000	0.0090	0.3132
E5 Ground floor (normal)	11.1800	0.0600	0.6708
E5 Ground floor (normal)	16.1300	0.0480	0.7742
E6 Intermediate floor within a dwelling	27.3100	0.0030	0.0819
E10 Eaves (insulation at ceiling level)	16.1300	0.0310	0.5000
E12 Gable (insulation at ceiling level)	11.1800	0.0440	0.4919
E16 Corner (normal)	19.6800	0.0290	0.5707
E4 Jamb	4.2000	0.0090	0.0378

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.1096 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 64.8682 (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	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959 (38)
Average = Sum(39)m / 12 =	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6279 (42)
Hot water usage for mixer showers													
	68.2811	67.2549	65.7597	62.8987	60.7874	58.4329	57.0946	58.5786	60.2053	62.7333	65.6557	68.0195	(42a)
Hot water usage for baths													
	29.4863	29.0484	28.4317	27.2947	26.4433	25.4992	24.9893	25.6017	26.2684	27.2786	28.4390	29.3866	(42b)
Hot water usage for other uses													
	41.5424	40.0317	38.5211	37.0105	35.4998	33.9892	33.9892	35.4998	37.0105	38.5211	40.0317	41.5424	(42c)
Average daily hot water use (litres/day)													128.0571 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.3098	136.3351	132.7125	127.2039	122.7306	117.9214	116.0731	119.6801	123.4841	128.5330	134.1265	138.9485	(44)
Energy content (annual)	220.6326	194.1393	203.9742	174.1358	165.2189	144.9981	140.3804	148.1889	152.2683	174.4180	191.0877	217.5597	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 2127.0020
	33.0949	29.1209	30.5961	26.1204	24.7828	21.7497	21.0571	22.2283	22.8402	26.1627	28.6632	32.6340	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
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	14.2861	12.8912	14.2461	13.7307	14.1531	13.6608	14.0935	14.1122	13.6782	14.1752	13.7714	14.2787	(61)
Total heat required for water heating calculated for each month													
	234.9187	207.0306	218.2203	187.8665	179.3720	158.6589	154.4739	162.3011	165.9465	188.5932	204.8591	231.8384	(62)
WWHRS	-60.1336	-53.1827	-55.6898	-46.1134	-42.9760	-36.7749	-34.4706	-36.6560	-38.0487	-44.8552	-50.8156	-59.0201	(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													
	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184	(64)
													Total per year (kWh/year) = Sum(64)m = 1735.3425 (64)

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Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	76.9319	67.7741	71.3829	61.3328	58.4736	51.6271	50.1998	52.8009	54.0488	61.5378	66.9795	75.9083 (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	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1643	25.0153	20.3438	15.4016	11.5128	9.7196	10.5024	13.6514	18.3229	23.2651	27.1538	28.9471	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	357.2713	360.9787	351.6363	331.7474	306.6412	283.0449	267.2811	263.5738	272.9162	292.8051	317.9113	341.5076	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	(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)	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	(71)
Water heating gains (Table 5)	103.4030	100.8544	95.9448	85.1845	78.5935	71.7042	67.4729	70.9689	75.0677	82.7121	93.0271	102.0273	(72)
Total internal gains	597.7921	595.8017	576.8783	541.2868	505.7009	470.4222	451.2099	454.1475	472.2603	507.7358	547.0457	581.4353	(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					3.2900	10.6334	0.4700	0.0000			0.7700	12.6607 (74)	
South					2.2200	46.7521	0.4700	0.0000			0.7700	37.5615 (78)	
West					7.0800	19.6403	0.4700	0.0000			0.7700	50.3233 (80)	
South					3.0900	46.7521	0.4000	0.0000			0.7700	44.4949 (78)	

Solar gains	145.0403	257.0253	374.4206	495.9603	580.3470	585.8945	560.8965	497.2295	416.8093	290.5613	175.6305	122.8422 (83)	
Total gains	742.8324	852.8271	951.2988	1037.2471	1086.0479	1056.3167	1012.1064	951.3770	889.0696	798.2970	722.6762	704.2775 (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	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	
alpha	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	
util living area	0.9735	0.9555	0.9202	0.8493	0.7298	0.5718	0.4292	0.4724	0.6859	0.8825	0.9578	0.9779	(86)
MIT	19.4155	19.6645	20.0280	20.4342	20.7537	20.9260	20.9803	20.9717	20.8527	20.4278	19.8285	19.3427	(87)
Th 2	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	(88)
util rest of house	0.9679	0.9465	0.9040	0.8189	0.6778	0.4945	0.3349	0.3752	0.6122	0.8516	0.9477	0.9732	(89)
MIT 2	18.1549	18.4669	18.9173	19.4049	19.7625	19.9308	19.9717	19.9670	19.8706	19.4110	18.6781	18.0633	(90)
Living area fraction	18.3984	18.6983	19.1319	19.6038	19.9540	20.1231	20.1666	20.1611	20.0604	19.6075	18.9004	18.3105	(91)
MIT	18.3984	18.6983	19.1319	19.6038	19.9540	20.1231	20.1666	20.1611	20.0604	19.6075	18.9004	18.3105	(92)
Temperature adjustment	18.3984	18.6983	19.1319	19.6038	19.9540	20.1231	20.1666	20.1611	20.0604	19.6075	18.9004	18.3105	(93)
adjusted MIT	18.3984	18.6983	19.1319	19.6038	19.9540	20.1231	20.1666	20.1611	20.0604	19.6075	18.9004	18.3105	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9562	0.9318	0.8877	0.8061	0.6764	0.5058	0.3525	0.3930	0.6185	0.8382	0.9335	0.9626	(94)
Ext temp.	710.2908	794.6712	844.4233	836.1706	734.5779	534.2971	356.8035	373.9190	549.8667	669.1255	674.5914	677.9085	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	1430.4852	1400.0329	1281.6886	1086.0526	837.4846	560.3940	361.8790	381.6206	604.7634	913.9339	1197.3132	1431.7099	(97)
Space heating requirement - total per year (kWh/year)	535.8246	406.8031	325.3254	179.9150	76.5626	0.0000	0.0000	0.0000	0.0000	182.1375	376.3597	560.8283	(98a)
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)	535.8246	406.8031	325.3254	179.9150	76.5626	0.0000	0.0000	0.0000	0.0000	182.1375	376.3597	560.8283	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	535.8246	406.8031	325.3254	179.9150	76.5626	0.0000	0.0000	0.0000	0.0000	182.1375	376.3597	560.8283	(98c)
Space heating per m ²	(98c) / (4) =												29.3229 (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 %)													92.5000 (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 efficiency (main heating system 1)	535.8246	406.8031	325.3254	179.9150	76.5626	0.0000	0.0000	0.0000	0.0000	182.1375	376.3597	560.8283	(98)
Space heating fuel (main heating system)	92.5000	92.5000	92.5000	92.5000	92.5000	0.0000	0.0000	0.0000	0.0000	92.5000	92.5000	92.5000	(210)
Space heating efficiency (main heating system 2)	579.2698	439.7871	351.7031	194.5027	82.7703	0.0000	0.0000	0.0000	0.0000	196.9054	406.8753	606.3008	(211)

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Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
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	(213)
	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	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184 (64)
Efficiency of water heater (217)m	88.5757	88.5269	88.4263	88.2428	87.9037	87.3000	87.3000	87.3000	87.3000	88.2421	88.4995	87.3000 (216)
Fuel for water heating, kWh/month	197.3283	173.7865	183.8032	160.6399	155.1653	139.6151	137.4608	143.9234	146.5038	162.8905	174.0616	195.0686 (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	(221)
Pumps and Fa	10.4327	9.4230	10.4327	10.0961	10.4327	10.0961	10.4327	10.4327	10.0961	10.4327	10.0961	10.4327 (231)
Lighting	24.6520	19.7768	17.8068	13.0460	10.0771	8.2331	9.1927	11.9490	15.5206	20.3638	23.0009	25.3372 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-10.5143	-17.6159	-30.5313	-40.5865	-48.7808	-47.3839	-46.4648	-40.9699	-32.2312	-22.2090	-12.3481	-8.7103 (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	(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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-2.3134	-5.8082	-14.2792	-25.8706	-38.3436	-40.2001	-39.1571	-30.5906	-19.2472	-9.1150	-3.2762	-1.7426 (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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2858.1147 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.3000
Water heating fuel used												1970.2470 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 6.1260, total flow = 45.0000, SFP = 0.1361)												
mechanical ventilation fans (SFP = 0.1361)												36.8361 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												122.8361 (231)
Electricity for lighting (calculated in Appendix L)												198.9560 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-588.2895 (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												4561.8643 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2858.1147	3.6400	104.0354 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1970.2470	3.6400	71.7170 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	122.8361	16.4900	20.2557 (249)
Energy for lighting	198.9560	16.4900	32.8079 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-358.3459	16.4900	-59.0912
PV Unit electricity exported	-229.9437	5.5900	-12.8539
Total			-71.9451 (252)
Total energy cost			248.8708 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		0.6629 (257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	89.2549
SAP rating (Section 12)		89 (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	2858.1147	0.2100	600.2041 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1970.2470	0.2100	413.7519 (264)
Space and water heating			1013.9560 (265)
Pumps, fans and electric keep-hot	122.8361	0.1387	17.0389 (267)
Energy for lighting	198.9560	0.1443	28.7155 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-358.3459	0.1315	-47.1158
PV Unit electricity exported	-229.9437	0.1215	-27.9410
Total			-75.0568 (269)
Total CO2, kg/year			984.6535 (272)
CO2 emissions per m2			10.9200 (273)

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EI value 90.2380
EI rating 90 (274)
EI band B

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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0800 (1b)	x 2.3100 (2b)	= 104.1348 (1b) - (3b)
First floor	45.0800 (1c)	x 2.6100 (2c)	= 117.6588 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 221.7936 (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	4.5000 (17)
Infiltration rate	0.2250 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1913 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.2008	0.1913	0.1913	0.1769	0.1769	0.1578	0.1626	0.1530	0.1578	0.1673	0.1673	0.1817 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

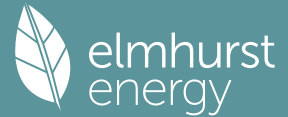
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			1.9800	1.1000	2.1780		(26)
Half-Glazed Door			1.9800	1.2000	2.3760		(26a)
Window (Uw = 1.30)			12.5900	1.2357	15.5580		(27)
French Door (Uw = 1.40)			3.0900	1.3258	4.0966		(27)
FP McCann System			45.0800	0.1100	4.9588	75.0000	3381.0000 (28a)
100mm Knauf Supafil 34	134.3652	19.6400	114.7252	0.2400	27.5340	60.0000	6883.5116 (29a)
Plane Ceiling-500mm Loft Roll	45.0800		45.0800	0.0900	4.0572	9.0000	405.7200 (30)
Total net area of external elements Aum(A, m ²)			224.5252				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 60.7586		(33)
Timber GF			53.8700			9.0000	484.8300 (32c)
Timber 1F			94.8800			9.0000	853.9200 (32c)
Masonry GF			26.0500			75.0000	1953.7499 (32c)
Internal Floor			45.0800			12.6000	568.0080 (32d)
Internal Ceiling			45.0800			9.0000	405.7200 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 14936.4595 (34)
List of Thermal Bridges
165.6661 (35)

	Length	Psi-value	Total
K1 Element	13.7100	0.0420	0.5758
E2 Other lintels (including other steel lintels)	10.3500	0.0090	0.0931
E3 Sill	34.8000	0.0090	0.3132
E4 Jamb	11.1800	0.0600	0.6708
E5 Ground floor (normal)	16.1300	0.0480	0.7742
E6 Intermediate floor within a dwelling	27.3100	0.0030	0.0819
E10 Eaves (insulation at ceiling level)	16.1300	0.0310	0.5000
E12 Gable (insulation at ceiling level)	11.1800	0.0440	0.4919
E16 Corner (normal)	19.6800	0.0290	0.5707
E4 Jamb	4.2000	0.0090	0.0378
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.1096 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 64.8682 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

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(38)m	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	36.5959	(38)
Heat transfer coeff	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	(39)
Average = Sum(39)m / 12 =													101.4642
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	(40)
HLP (average)												1.1254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6279 (42)
Hot water usage for mixer showers	68.2811	67.2549	65.7597	62.8987	60.7874	58.4329	57.0946	58.5786	60.2053	62.7333	65.6557	68.0195	(42a)
Hot water usage for baths	29.4863	29.0484	28.4317	27.2947	26.4433	25.4992	24.9893	25.6017	26.2684	27.2786	28.4390	29.3866	(42b)
Hot water usage for other uses	41.5424	40.0317	38.5211	37.0105	35.4998	33.9892	33.9892	35.4998	37.0105	38.5211	40.0317	41.5424	(42c)
Average daily hot water use (litres/day)												128.0571	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.3098	136.3351	132.7125	127.2039	122.7306	117.9214	116.0731	119.6801	123.4841	128.5330	134.1265	138.9485	(44)
Energy conte	220.6326	194.1393	203.9742	174.1358	165.2189	144.9981	140.3804	148.1889	152.2683	174.4180	191.0877	217.5597	(45)
Energy content (annual)										Total = Sum(45)m =		2127.0020	
Distribution loss (46)m = 0.15 x (45)m	33.0949	29.1209	30.5961	26.1204	24.7828	21.7497	21.0571	22.2283	22.8402	26.1627	28.6632	32.6340	(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	14.2861	12.8912	14.2461	13.7307	14.1531	13.6608	14.0935	14.1122	13.6782	14.1752	13.7714	14.2787	(61)
Total heat required for water heating calculated for each month													
WWHRS	234.9187	207.0306	218.2203	187.8665	179.3720	158.6589	154.4739	162.3011	165.9465	188.5932	204.8591	231.8384	(62)
PV diverter	-60.1336	-53.1827	-55.6898	-46.1134	-42.9760	-36.7749	-34.4706	-36.6560	-38.0487	-44.8552	-50.8156	-59.0201	(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	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	76.9319	67.7741	71.3829	61.3328	58.4736	51.6271	50.1998	52.8009	54.0488	61.5378	66.9795	75.9083	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	157.6743	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1643	25.0153	20.3438	15.4016	11.5128	9.7196	10.5024	13.6514	18.3229	23.2651	27.1538	28.9471	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	357.2713	360.9787	351.6363	331.7474	306.6412	283.0449	267.2811	263.5738	272.9162	292.8051	317.9113	341.5076	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	53.3953	(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)	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	(71)
Water heating gains (Table 5)	103.4030	100.8544	95.9448	85.1845	78.5935	71.7042	67.4729	70.9689	75.0677	82.7121	93.0271	102.0273	(72)
Total internal gains	597.7921	595.8017	576.8783	541.2868	505.7009	470.4222	451.2099	454.1475	472.2603	507.7358	547.0457	581.4353	(73)

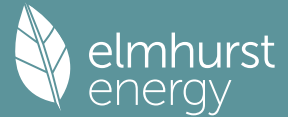
6. Solar gains

[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				3.2900	11.9814	0.4700	0.0000	0.7700	14.2657 (74)				
South				2.2200	50.9848	0.4700	0.0000	0.7700	40.9621 (78)				
West				7.0800	22.3313	0.4700	0.0000	0.7700	57.2185 (80)				
South				3.0900	50.9848	0.4000	0.0000	0.7700	48.5233 (78)				
Solar gains	160.9696	256.9576	370.6912	507.9198	580.8115	628.3257	594.6829	537.7815	447.9336	310.3983	199.7405	134.9896	(83)
Total gains	758.7616	852.7593	947.5694	1049.2066	1086.5124	1098.7478	1045.8928	991.9290	920.1938	818.1340	746.7862	716.4249	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	40.8914	
alpha	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	3.7261	
util living area	0.9672	0.9495	0.9070	0.8154	0.6618	0.4474	0.2983	0.3239	0.5899	0.8443	0.9441	0.9724	(86)
MIT	19.5654	19.7719	20.1510	20.5584	20.8489	20.9743	20.9959	20.9944	20.9256	20.5709	19.9984	19.5047	(87)
Th 2	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	19.9802	(88)
util rest of house	0.9601	0.9390	0.8876	0.7782	0.5988	0.3619	0.2014	0.2224	0.5030	0.8033	0.9302	0.9663	(89)

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MIT 2	18.3447	18.6021	19.0688	19.5484	19.8594	19.9672	19.9793	19.9788	19.9337	19.5760	18.8898	18.2689 (90)
Living area fraction									FLA = Living area / (4) =			0.1932 (91)
MIT	18.5806	18.8281	19.2779	19.7436	20.0506	20.1618	20.1757	20.1750	20.1254	19.7683	19.1040	18.5077 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5806	18.8281	19.2779	19.7436	20.0506	20.1618	20.1757	20.1750	20.1254	19.7683	19.1040	18.5077 (93)

8. Space heating requirement

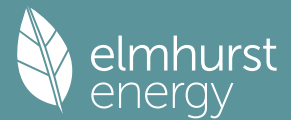
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9472	0.9238	0.8715	0.7686	0.6034	0.3775	0.2202	0.2420	0.5161	0.7935	0.9150	0.9544	(94)
Useful gains	718.6904	787.7664	825.8260	806.3872	655.5927	414.8218	230.2534	240.0443	474.8811	649.1715	683.2981	683.7538	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1367.7954	1342.1818	1205.1825	998.7691	715.3825	422.2732	230.9003	240.9819	499.7497	828.7865	1126.6615	1360.3985	(97)
Space heating kWh	482.9341	372.5672	282.2413	138.5150	44.4836	0.0000	0.0000	0.0000	0.0000	133.6335	319.2216	503.4237	(98a)
Space heating requirement - total per year (kWh/year)												2277.0200	
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	482.9341	372.5672	282.2413	138.5150	44.4836	0.0000	0.0000	0.0000	0.0000	133.6335	319.2216	503.4237	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2277.0200	
Space heating per m2											(98c) / (4) =	25.2553	(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 %)													92.5000 (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	482.9341	372.5672	282.2413	138.5150	44.4836	0.0000	0.0000	0.0000	0.0000	133.6335	319.2216	503.4237	(98)
Space heating efficiency (main heating system 1)	92.5000	92.5000	92.5000	92.5000	92.5000	0.0000	0.0000	0.0000	0.0000	92.5000	92.5000	92.5000	(210)
Space heating fuel (main heating system)	522.0909	402.7753	305.1257	149.7459	48.0904	0.0000	0.0000	0.0000	0.0000	144.4687	345.1045	544.2419	(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	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184	(64)
Efficiency of water heater													(216)
(217)m	88.5418	88.4964	88.3712	88.1320	87.7120	87.3000	87.3000	87.3000	87.3000	88.1109	88.4394	88.5593	(217)
Fuel for water heating, kWh/month	197.4040	173.8465	183.9180	160.8418	155.5043	139.6151	137.4608	143.9234	146.5038	163.1331	174.1797	195.1442	(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	10.4327	9.4230	10.4327	10.0961	10.4327	10.0961	10.4327	10.4327	10.0961	10.4327	10.0961	10.4327	(231)
Lighting	24.6520	19.7768	17.8068	13.0460	10.0771	8.2331	9.1927	11.9490	15.5206	20.3638	23.0009	25.3372	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.8762	-18.0834	-30.9445	-41.9188	-49.2691	-50.0516	-48.7479	-43.8270	-34.6552	-24.0241	-14.2086	-9.7625	(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	-2.8221	-6.0709	-14.6223	-27.4820	-39.0993	-44.8841	-43.1131	-34.8826	-22.0143	-10.4497	-4.1350	-2.0963	(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													2461.6432 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													87.3000
Water heating fuel used													1971.4747 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 6.1260, total flow = 45.0000, SFP = 0.1361)													
mechanical ventilation fans (SFP = 0.1361)													36.8361 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													122.8361 (231)
Electricity for lighting (calculated in Appendix L)													198.9560 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-629.0409 (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													4125.8692 (238)

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

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	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2461.6432	6.1900	152.3757 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1971.4747	6.1900	122.0343 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	122.8361	25.1600	30.9056 (249)
Energy for lighting	198.9560	25.1600	50.0573 (250)
Additional standing charges			102.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-377.3690	25.1600	-94.9460
PV Unit electricity exported	-251.6719	5.8100	-14.6221
Total			-109.5682 (252)
Total energy cost			347.8047 (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	2461.6432	0.2100	516.9451 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1971.4747	0.2100	414.0097 (264)
Space and water heating			930.9548 (265)
Pumps, fans and electric keep-hot	122.8361	0.1387	17.0389 (267)
Energy for lighting	198.9560	0.1443	28.7155 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-377.3690	0.1315	-49.6194
PV Unit electricity exported	-251.6719	0.1210	-30.4577
Total			-80.0771 (269)
Total CO2, kg/year			896.6320 (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	2461.6432	1.1300	2781.6569 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1971.4747	1.1300	2227.7665 (278)
Space and water heating			5009.4233 (279)
Pumps, fans and electric keep-hot	122.8361	1.5128	185.8264 (281)
Energy for lighting	198.9560	1.5338	305.1654 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-377.3690	1.4858	-560.6827
PV Unit electricity exported	-251.6719	0.4439	-111.7180
Total			-672.4007 (283)
Total Primary energy kWh/year			4828.0145 (286)