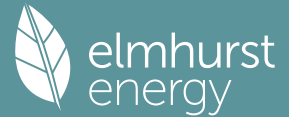


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Property Reference	4907-CA16-6920-008		Issued on Date	09/04/2024	
Assessment Reference	Plot 008	Prop Type Ref	Mountford-Det-Opp		
Property	Plot 008, Mountford-Det-Opp				
SAP Rating	89 B	DER	11.75	TER	12.39
Environmental	90 B	% DER < TER			5.17
CO ₂ Emissions (t/year)	0.93	DFEE	41.65	TFEE	42.40
Compliance Check	See BREL	% DFEE < TFEE			1.77
% DPER < TPER	2.83	DPER	63.02	TPER	64.86
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)

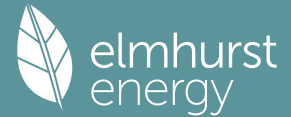
2. Ventilation rate

	m3 per hour											
Number of open chimneys	0 * 80 =											0.0000 (6a)
Number of open flues	0 * 20 =											0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)
Number of blocked chimneys	0 * 20 =											0.0000 (6f)
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)
Number of passive vents	0 * 10 =											0.0000 (7b)
Number of flueless gas fires	0 * 40 =											0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =											0.0000 (8)
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50												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

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

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

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
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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec																										
Energy conte	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																							2127.0020															
Water storage loss:																							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)			
Total storage loss																							0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	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	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	-0.0000	-0.0000	-0.0000	(63b)
Solar input																							0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS																							0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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)																																		1735.3425	(64)			
Electric shower(s)																																		1735	(64)			
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	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952
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
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
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
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162
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
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

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	7.0800	10.6334	0.4700	0.0000	0.7700	27.2454
East	3.2900	19.6403	0.4700	0.0000	0.7700	23.3847
West	2.2200	19.6403	0.4700	0.0000	0.7700	15.7793
West	3.0900	19.6403	0.4000	0.0000	0.7700	18.6920

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Solar gains	85.1015	165.2462	274.8645	413.9516	524.5878	545.9782	516.0199	430.6991	323.1544	196.2756	105.7505	70.2912 (83)
Total gains	617.3172	710.6852	795.8465	914.9818	998.0717	997.8975	949.0121	864.7034	771.6509	664.6080	605.3531	590.5694 (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	0.9851	0.9741	0.9508	0.8866	0.7658	0.5980	0.4550	0.5134	0.7485	0.9255	0.9751	0.9873 (86)
MIT	19.2279	19.4644	19.8344	20.3205	20.7074	20.9141	20.9761	20.9628	20.8001	20.2820	19.6622	19.1705 (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	0.9818	0.9684	0.9397	0.8611	0.7159	0.5193	0.3561	0.4103	0.6776	0.9031	0.9687	0.9845 (89)
MIT 2	17.9185	18.2179	18.6826	19.2761	19.7172	19.9221	19.9697	19.9625	19.8258	19.2443	18.4720	17.8456 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.1715	18.4587	18.9051	19.4779	19.9085	20.1138	20.1642	20.1557	20.0140	19.4448	18.7019	18.1016 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.1715	18.4587	18.9051	19.4779	19.9085	20.1138	20.1642	20.1557	20.0140	19.4448	18.7019	18.1016 (93)

8. Space heating requirement

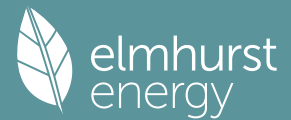
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9734	0.9568	0.9247	0.8463	0.7120	0.5301	0.3745	0.4288	0.6802	0.8882	0.9574	0.9769 (94)
Useful gains	600.9102	680.0144	735.9535	774.3717	710.6603	529.0234	355.4245	370.7956	524.8856	590.3362	579.5686	576.9560 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1407.4607	1375.7273	1258.6782	1073.2807	832.8703	559.4517	361.6368	381.0713	600.0602	897.4283	1177.1816	1410.5159 (97)
Space heating kWh	600.0736	467.5190	388.9072	215.2145	90.9242	0.0000	0.0000	0.0000	0.0000	228.4766	430.2814	620.1686 (98a)
Space heating requirement - total per year (kWh/year)												3041.5651
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	600.0736	467.5190	388.9072	215.2145	90.9242	0.0000	0.0000	0.0000	0.0000	228.4766	430.2814	620.1686 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3041.5651
Space heating per m2												(98c) / (4) = 33.7352 (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	600.0736	467.5190	388.9072	215.2145	90.9242	0.0000	0.0000	0.0000	0.0000	228.4766	430.2814	620.1686 (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)	648.7282	505.4260	420.4402	232.6643	98.2965	0.0000	0.0000	0.0000	0.0000	247.0017	465.1691	670.4525 (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 (217)m	88.6108	88.5729	88.4921	88.3171	87.9721	87.3000	87.3000	87.3000	87.3000	88.3357	88.5454	88.6239 (217)
Fuel for water heating, kWh/month	197.2503	173.6962	183.6666	160.5048	155.0446	139.6151	137.4608	143.9234	146.5038	162.7178	173.9712	195.0020 (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	-15.7767	-23.9983	-37.2624	-45.3599	-51.9833	-49.6630	-49.0138	-44.6789	-37.6477	-28.8437	-17.9425	-13.4382 (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	-4.5083	-9.8515	-20.3878	-31.9028	-43.4682	-44.1810	-43.5900	-36.2295	-25.7199	-14.4289	-6.1185	-3.5369 (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												3288.1785 (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												1969.3566 (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)

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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	-699.5320 (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	4879.7952 (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	3288.1785	0.2100	690.5175 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1969.3566	0.2100	413.5649 (264)
Space and water heating			1104.0824 (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	-415.6086	0.1330	-55.2804
PV Unit electricity exported	-283.9233	0.1248	-35.4258
Total			-90.7062 (269)
Total CO2, kg/year			1059.1306 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.7500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3288.1785	1.1300	3715.6417 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1969.3566	1.1300	2225.3729 (278)
Space and water heating			5941.0146 (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	-415.6086	1.4915	-619.8780
PV Unit electricity exported	-283.9233	0.4579	-130.0209
Total			-749.8989 (283)
Total Primary energy kWh/year			5682.1076 (286)
Dwelling Primary energy Rate (DPER)			63.0200 (287)

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

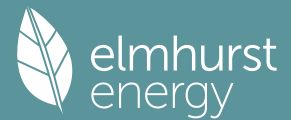
1. Overall dwelling characteristics

	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)
Air changes per hour		
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		
Infiltration rate adjusted to include shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
	(21) = (18) x (20) =	0.3275 (21)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4175	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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.9800	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 Supafill 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, m ²)			224.5252				(31)
Fabric heat loss, W/K = Sum (A x U)					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	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	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)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	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)
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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	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													
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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (59)	

Total heat required for water heating calculated for each month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WWHRS	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)
PV diverter	-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)
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	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)

Electric shower(s) 2437 (64)

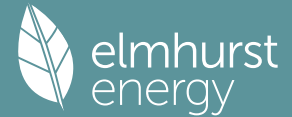
Heat gains from water heating, kWh/month Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

86.1001 76.0582 80.5611 70.2289 67.6750 60.5406 59.4162 62.0125 62.9580 70.7337 75.8654 85.0783 (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	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)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values) (71)
Water heating gains	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5) (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	7.0800	10.6334	0.6300	0.7000	0.7700	23.0079 (74)						
East	3.2900	19.6403	0.6300	0.7000	0.7700	19.7476 (76)						
West	5.3100	19.6403	0.6300	0.7000	0.7700	31.8723 (80)						
Solar gains	74.6278	144.9488	241.0135	362.5478	458.9038	477.3440	451.2642	377.0275	283.2437	172.1604	92.7472	61.6303 (83)
Total gains	619.1664	702.7154	774.3318	875.9337	944.7553	941.6432	896.6440	823.4131	744.1141	652.8530	604.6914	594.2338 (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)	38.6703	38.7598	38.8479	39.2673	39.3468	39.7210	39.7210	39.7910	39.5760	39.3468	39.1863	39.0200
tau	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	0.9853	0.9758	0.9567	0.9029	0.7981	0.6358	0.4897	0.5458	0.7732	0.9320	0.9759	0.9872 (86)
MIT	19.1029	19.3330	19.7014	20.2137	20.6342	20.8871	20.9669	20.9510	20.7607	20.2123	19.5792	19.0690 (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	0.9820	0.9704	0.9465	0.8796	0.7500	0.5543	0.3828	0.4364	0.7031	0.9108	0.9695	0.9844 (89)
MIT 2	17.7263	18.0193	18.4850	19.1226	19.6115	19.8760	19.9388	19.9314	19.7630	19.1354	18.3414	17.6887 (90)
Living area fraction	17.9923	18.2731	18.7200	19.3334	19.8091	20.0714	20.1374	20.1284	19.9558	19.3435	18.5806	17.9554 (92)
MIT	17.9923	18.2731	18.7200	19.3334	19.8091	20.0714	20.1374	20.1284	19.9558	19.3435	18.5806	17.9554 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9923	18.2731	18.7200	19.3334	19.8091	20.0714	20.1374	20.1284	19.9558	19.3435	18.5806	17.9554 (93)

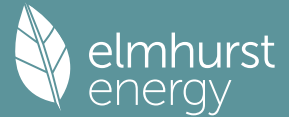
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9732	0.9587	0.9313	0.8633	0.7430	0.5641	0.4024	0.4556	0.7035	0.8952	0.9580	0.9765 (94)
Useful gains	602.5733	673.6719	721.1498	756.2258	701.9923	531.2138	360.7968	375.1159	523.5141	584.4091	579.2837	580.2465 (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	1469.0742	1431.5186	1305.1157	1102.3993	855.0861	571.5077	369.4963	388.7648	613.9027	921.9767	1215.5566	1462.6162 (97)
Space heating kWh	644.6767	509.2730	434.4706	249.2449	113.9018	0.0000	0.0000	0.0000	0.0000	251.1502	458.1165	656.4831 (98a)
Space heating requirement - total per year (kWh/year)												3317.3169
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	644.6767	509.2730	434.4706	249.2449	113.9018	0.0000	0.0000	0.0000	0.0000	251.1502	458.1165	656.4831 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3317.3169
Space heating per m2										(98c) / (4) =		36.7937 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fraction of space heat from main system(s)												0.0000 (201)
Efficiency of main space heating system 1 (in %)												1.0000 (202)
Efficiency of main space heating system 2 (in %)												92.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (207)
												0.0000 (208)
Space heating requirement	644.6767	509.2730	434.4706	249.2449	113.9018	0.0000	0.0000	0.0000	0.0000	251.1502	458.1165	656.4831 (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)	697.7021	551.1612	470.2063	269.7456	123.2704	0.0000	0.0000	0.0000	0.0000	271.8076	495.7971	710.4795 (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	86.3872	86.1820	85.7570	84.8594	83.2816	80.3000	80.3000	80.3000	80.3000	84.8482	85.9683	86.4377 (217)
Fuel for water heating, kWh/month	278.2544	246.6404	263.5639	235.1105	232.7874	218.2109	215.9971	224.3086	226.4413	238.1814	248.9576	275.2055 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.0685	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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Property Reference	4907-CA16-6920-008		Issued on Date	09/04/2024	
Assessment Reference	Plot 008	Prop Type Ref	Mountford-Det-Opp		
Property	Plot 008, Mountford-Det-Opp				
SAP Rating	89 B	DER	11.75	TER	12.39
Environmental	90 B	% DER < TER			5.17
CO ₂ Emissions (t/year)	0.93	DFEE	41.65	TFEE	42.40
Compliance Check	See BREL	% DFEE < TFEE			1.77
% DPER < TPER	2.83	DPER	63.02	TPER	64.86
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)

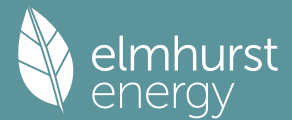
2. Ventilation rate

	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												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)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
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 (36a) = 4.1096 (36)
 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 42.1745 Feb 41.9579 Mar 41.7456 Apr 40.7483 May 40.5617 Jun 39.6930 Jul 39.6930 Aug 39.5322 Sep 40.0276 Oct 40.5617 Nov 40.9391 Dec 41.3338 (38)
 Heat transfer coeff 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)
 Average = Sum(39)m / 12 = 105.6156

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)												919 (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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												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)

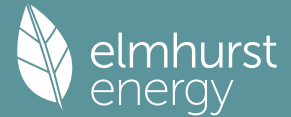
5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	7.0800	10.6334	0.4700	0.0000	0.7700	27.2454 (74)						
East	3.2900	19.6403	0.4700	0.0000	0.7700	23.3847 (76)						
West	2.2200	19.6403	0.4700	0.0000	0.7700	15.7793 (80)						
West	3.0900	19.6403	0.4000	0.0000	0.7700	18.6920 (80)						
Solar gains	85.1015	165.2462	274.8645	413.9516	524.5878	545.9782	516.0199	430.6991	323.1544	196.2756	105.7505	70.2912 (83)

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Total gains 561.4182 656.0629 744.1702 870.4072 957.6753 964.9136 919.0437 832.7234 737.2413 622.2758 556.2423 535.6365 (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	0.9891	0.9803	0.9612	0.9043	0.7928	0.6250	0.4797	0.5412	0.7771	0.9401	0.9813	0.9908 (86)
MIT	19.0204	19.2692	19.6641	20.2084	20.6431	20.8931	20.9689	20.9522	20.7561	20.1747	19.5092	18.9817 (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	0.9866	0.9758	0.9520	0.8813	0.7442	0.5437	0.3743	0.4323	0.7073	0.9208	0.9762	0.9887 (89)
MIT 2	18.1323	18.3799	18.7699	19.2991	19.6921	19.8956	19.9418	19.9360	19.8006	19.2795	18.6264	18.0992 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	18.3039	18.5518	18.9426	19.4748	19.8758	20.0884	20.1402	20.1323	19.9852	19.4525	18.7970	18.2697 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3039	18.5518	18.9426	19.4748	19.8758	20.0884	20.1402	20.1323	19.9852	19.4525	18.7970	18.2697 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9813	0.9679	0.9409	0.8691	0.7407	0.5549	0.3939	0.4519	0.7100	0.9094	0.9686	0.9840 (94)
Useful gains	550.9062	635.0018	700.1762	756.4768	709.3607	535.4473	362.0198	376.2912	523.4712	565.8832	538.7942	527.0465 (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	1499.0124	1458.3652	1326.5563	1116.8693	861.9777	573.8703	370.1720	389.6539	617.3313	933.3142	1237.6241	1494.2330 (97)
Space heating kWh	705.3910	553.3002	466.0268	259.4826	113.5470	0.0000	0.0000	0.0000	0.0000	273.3687	503.1575	719.5868 (98a)
Space heating requirement - total per year (kWh/year)												3593.8606
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	705.3910	553.3002	466.0268	259.4826	113.5470	0.0000	0.0000	0.0000	0.0000	273.3687	503.1575	719.5868 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3593.8606
Space heating per m2												(98c) / (4) =
												39.8609 (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	0.8190	0.8796	0.8415	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	804.9669	680.5587	667.6447	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1076.7265	1025.6047	927.1718	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	195.6669	256.7142	193.0881	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	48.9167	64.1785	48.2720	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												161.3673 (107)
Energy for space heating												39.8609 (99)
Energy for space cooling												1.7898 (108)
Total												41.6507 (109)
Fabric Energy Efficiency (DFEE)												41.7 (109)

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

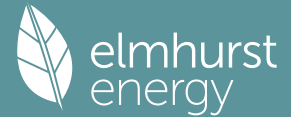
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	45.0800 (1b)	x	2.3100 (2b) =
First floor	45.0800 (1c)	x	2.6100 (2c) =
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.1600		
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)

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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)

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

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)

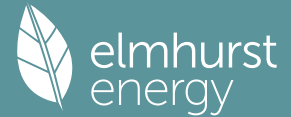
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.9757	42.7279	42.4851	41.3445	41.1312	40.1378	40.1378	39.9538	40.5204	41.1312	41.5628	42.0142	(38)
Heat transfer coeff	107.2920	107.0443	106.8014	105.6609	105.4475	104.4541	104.4541	104.2701	104.8367	105.4475	105.8792	106.3305	(39)
Average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

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

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													2.6279 (42)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for other uses	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)
Average daily hot water use (litres/day)	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)
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 content (annual)	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)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month	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)													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	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
North	7.0800	10.6334	0.6300	0.7000	0.7700	23.0079 (74)						
East	3.2900	19.6403	0.6300	0.7000	0.7700	19.7476 (76)						
West	5.3100	19.6403	0.6300	0.7000	0.7700	31.8723 (80)						
Solar gains	74.6278	144.9488	241.0135	362.5478	458.9038	477.3440	451.2642	377.0275	283.2437	172.1604	92.7472	61.6303 (83)
Total gains	550.9446	635.7656	710.3191	819.0034	891.9913	896.2794	854.2880	779.0518	697.3306	598.1607	543.2390	526.9756 (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)	38.6703	38.7598	38.8479	39.2673	39.3468	39.7210	39.7210	39.7910	39.5760	39.3468	39.1863	39.0200
tau	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	0.9898	0.9821	0.9661	0.9177	0.8192	0.6585	0.5106	0.5707	0.7986	0.9462	0.9826	0.9913 (86)
MIT	18.9989	19.2345	19.6137	20.1504	20.5967	20.8732	20.9621	20.9433	20.7309	20.1437	19.4884	18.9655 (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	0.9874	0.9780	0.9578	0.8971	0.7735	0.5766	0.4005	0.4587	0.7315	0.9285	0.9778	0.9893 (89)
MIT 2	18.1095	18.3444	18.7199	19.2458	19.6550	19.8848	19.9402	19.9334	19.7831	19.2507	18.6056	18.0824 (90)
Living area fraction	18.2813	18.5164	18.8926	19.4206	19.8369	20.0758	20.1376	20.1285	19.9662	19.4232	18.7762	18.2530 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2813	18.5164	18.8926	19.4206	19.8369	20.0758	20.1376	20.1285	19.9662	19.4232	18.7762	18.2530 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9823	0.9705	0.9474	0.8847	0.7682	0.5870	0.4208	0.4785	0.7327	0.9172	0.9706	0.9847 (94)
Useful gains	541.1653	617.0237	672.9296	724.5711	685.2540	526.0762	359.4558	372.7681	510.9085	548.6316	527.2634	518.9138 (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	1500.0865	1457.5555	1323.5478	1111.6147	858.0199	571.9679	369.5184	388.7755	614.9938	930.3868	1236.2648	1494.2619 (97)
Space heating kWh	713.4373	564.8374	484.0599	278.6713	128.5378	0.0000	0.0000	0.0000	0.0000	284.0258	510.4810	725.6590 (98a)
Space heating requirement - total per year (kWh/year)												3689.7096
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	713.4373	564.8374	484.0599	278.6713	128.5378	0.0000	0.0000	0.0000	0.0000	284.0258	510.4810	725.6590 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3689.7096
Space heating per m2												40.9240 (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	0.7906	0.8575	0.8178	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	776.2897	662.8411	648.0822	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	996.5047	949.9162	864.4388	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	158.5548	213.5839	160.9693	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												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	39.6387	53.3960	40.2423	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												133.2770 (107)
Energy for space heating												40.9240 (99)

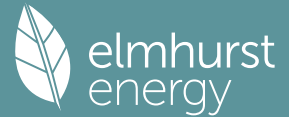
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Energy for space cooling
Total
Fabric Energy Efficiency (TFEE)

1.4782 (108)
42.4022 (109)
42.4 (109)

Full SAP Calculation Printout



Property Reference	4907-CA16-6920-008		Issued on Date	09/04/2024	
Assessment Reference	Plot 008	Prop Type Ref	Mountford-Det-Opp		
Property	Plot 008, Mountford-Det-Opp				
SAP Rating	89 B	DER	11.75	TER	12.39
Environmental	90 B	% DER < TER			5.17
CO ₂ Emissions (t/year)	0.93	DFEE	41.65	TFEE	42.40
Compliance Check	See BREL	% DFEE < TFEE			1.77
% DPER < TPER	2.83	DPER	63.02	TPER	64.86
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)

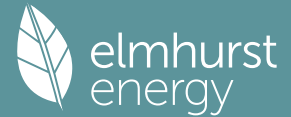
2. Ventilation rate

	m3 per hour												
Number of open chimneys	0 * 80 =											0.0000 (6a)	
Number of open flues	0 * 20 =											0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)	
Number of blocked chimneys	0 * 20 =											0.0000 (6f)	
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)	
Number of passive vents	0 * 10 =											0.0000 (7b)	
Number of flueless gas fires	0 * 40 =											0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =											0.0000 (8)	
Pressure test	Yes												
Pressure Test Method	Blower Door												
Measured/design AP50	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

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

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

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
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	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	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	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	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	217.5597 (45)
Energy content (annual)													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	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	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	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	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	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	-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	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184	172.8184 (64)
12Total per year (kWh/year)													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	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	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952	131.3952
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
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
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
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162	-105.1162
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
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

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	7.0800	10.6334	0.4700	0.0000	0.7700	27.2454 (74)
East	3.2900	19.6403	0.4700	0.0000	0.7700	23.3847 (76)
West	2.2200	19.6403	0.4700	0.0000	0.7700	15.7793 (80)
West	3.0900	19.6403	0.4000	0.0000	0.7700	18.6920 (80)

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Solar gains	85.1015	165.2462	274.8645	413.9516	524.5878	545.9782	516.0199	430.6991	323.1544	196.2756	105.7505	70.2912 (83)
Total gains	617.3172	710.6852	795.8465	914.9818	998.0717	997.8975	949.0121	864.7034	771.6509	664.6080	605.3531	590.5694 (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	0.9851	0.9741	0.9508	0.8866	0.7658	0.5980	0.4550	0.5134	0.7485	0.9255	0.9751	0.9873 (86)
MIT	19.2279	19.4644	19.8344	20.3205	20.7074	20.9141	20.9761	20.9628	20.8001	20.2820	19.6622	19.1705 (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	0.9818	0.9684	0.9397	0.8611	0.7159	0.5193	0.3561	0.4103	0.6776	0.9031	0.9687	0.9845 (89)
MIT 2	17.9185	18.2179	18.6826	19.2761	19.7172	19.9221	19.9697	19.9625	19.8258	19.2443	18.4720	17.8456 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.1715	18.4587	18.9051	19.4779	19.9085	20.1138	20.1642	20.1557	20.0140	19.4448	18.7019	18.1016 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.1715	18.4587	18.9051	19.4779	19.9085	20.1138	20.1642	20.1557	20.0140	19.4448	18.7019	18.1016 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9734	0.9568	0.9247	0.8463	0.7120	0.5301	0.3745	0.4288	0.6802	0.8882	0.9574	0.9769 (94)
Useful gains	600.9102	680.0144	735.9535	774.3717	710.6603	529.0234	355.4245	370.7956	524.8856	590.3362	579.5686	576.9560 (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	1407.4607	1375.7273	1258.6782	1073.2807	832.8703	559.4517	361.6368	381.0713	600.0602	897.4283	1177.1816	1410.5159 (97)
Space heating kWh	600.0736	467.5190	388.9072	215.2145	90.9242	0.0000	0.0000	0.0000	0.0000	228.4766	430.2814	620.1686 (98a)
Space heating requirement - total per year (kWh/year)	3041.5651											
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	600.0736	467.5190	388.9072	215.2145	90.9242	0.0000	0.0000	0.0000	0.0000	228.4766	430.2814	620.1686 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	3041.5651											
Space heating per m2	(98c) / (4) = 33.7352 (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	600.0736	467.5190	388.9072	215.2145	90.9242	0.0000	0.0000	0.0000	0.0000	228.4766	430.2814	620.1686 (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)	648.7282	505.4260	420.4402	232.6643	98.2965	0.0000	0.0000	0.0000	0.0000	247.0017	465.1691	670.4525 (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 (217)m	88.6108	88.5729	88.4921	88.3171	87.9721	87.3000	87.3000	87.3000	87.3000	88.3357	88.5454	88.6239 (217)
Fuel for water heating, kWh/month	197.2503	173.6962	183.6666	160.5048	155.0446	139.6151	137.4608	143.9234	146.5038	162.7178	173.9712	195.0020 (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	-15.7767	-23.9983	-37.2624	-45.3599	-51.9833	-49.6630	-49.0138	-44.6789	-37.6477	-28.8437	-17.9425	-13.4382 (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	-4.5083	-9.8515	-20.3878	-31.9028	-43.4682	-44.1810	-43.5900	-36.2295	-25.7199	-14.4289	-6.1185	-3.5369 (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	3288.1785 (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	1969.3566 (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)

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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	-699.5320 (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	4879.7952 (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	3288.1785	0.2100	690.5175 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1969.3566	0.2100	413.5649 (264)
Space and water heating			1104.0824 (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	-415.6086	0.1330	-55.2804
PV Unit electricity exported	-283.9233	0.1248	-35.4258
Total			-90.7062 (269)
Total CO2, kg/year			1059.1306 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.7500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3288.1785	1.1300	3715.6417 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1969.3566	1.1300	2225.3729 (278)
Space and water heating			5941.0146 (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	-415.6086	1.4915	-619.8780
PV Unit electricity exported	-283.9233	0.4579	-130.0209
Total			-749.8989 (283)
Total Primary energy kWh/year			5682.1076 (286)
Dwelling Primary energy Rate (DPER)			63.0200 (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)
Air changes per hour		
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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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4175	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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.9800	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 Supafill 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, m ²)			224.5252				(31)
Fabric heat loss, W/K = Sum (A x U)					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	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	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)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	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)
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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	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													
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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (59)	
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)												2436.9629 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

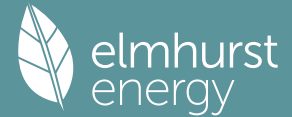
Heat gains from water heating, kWh/month Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

	86.1001	76.0582	80.5611	70.2289	67.6750	60.5406	59.4162	62.0125	62.9580	70.7337	75.8654	85.0783 (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	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)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values) (71)
Water heating gains	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	7.0800	10.6334	0.6300	0.7000	0.7700	23.0079 (74)						
East	3.2900	19.6403	0.6300	0.7000	0.7700	19.7476 (76)						
West	5.3100	19.6403	0.6300	0.7000	0.7700	31.8723 (80)						
Solar gains	74.6278	144.9488	241.0135	362.5478	458.9038	477.3440	451.2642	377.0275	283.2437	172.1604	92.7472	61.6303 (83)
Total gains	619.1664	702.7154	774.3318	875.9337	944.7553	941.6432	896.6440	823.4131	744.1141	652.8530	604.6914	594.2338 (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)	0.9853	0.9758	0.9567	0.9029	0.7981	0.6358	0.4897	0.5458	0.7732	0.9320	0.9759	0.9872 (86)
MIT	19.1029	19.3330	19.7014	20.2137	20.6342	20.8871	20.9669	20.9510	20.7607	20.2123	19.5792	19.0690 (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	0.9820	0.9704	0.9465	0.8796	0.7500	0.5543	0.3828	0.4364	0.7031	0.9108	0.9695	0.9844 (89)
MIT 2	17.7263	18.0193	18.4850	19.1226	19.6115	19.8760	19.9388	19.9314	19.7630	19.1354	18.3414	17.6887 (90)
Living area fraction	17.9923	18.2731	18.7200	19.3334	19.8091	20.0714	20.1374	20.1284	19.9558	19.3435	18.5806	17.9554 (92)
Temperature adjustment	17.9923	18.2731	18.7200	19.3334	19.8091	20.0714	20.1374	20.1284	19.9558	19.3435	18.5806	17.9554 (93)
adjusted MIT	17.9923	18.2731	18.7200	19.3334	19.8091	20.0714	20.1374	20.1284	19.9558	19.3435	18.5806	17.9554 (93)

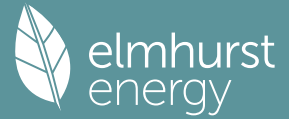
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	602.5733	673.6719	721.1498	756.2258	701.9923	531.2138	360.7968	375.1159	523.5141	584.4091	579.2837	580.2465 (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	1469.0742	1431.5186	1305.1157	1102.3993	855.0861	571.5077	369.4963	388.7648	613.9027	921.9767	1215.5566	1462.6162 (97)
Space heating kWh	644.6767	509.2730	434.4706	249.2449	113.9018	0.0000	0.0000	0.0000	0.0000	251.1502	458.1165	656.4831 (98a)
Space heating requirement - total per year (kWh/year)	644.6767	509.2730	434.4706	249.2449	113.9018	0.0000	0.0000	0.0000	0.0000	251.1502	458.1165	3317.3169
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
Space heating kWh	644.6767	509.2730	434.4706	249.2449	113.9018	0.0000	0.0000	0.0000	0.0000	251.1502	458.1165	656.4831 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	644.6767	509.2730	434.4706	249.2449	113.9018	0.0000	0.0000	0.0000	0.0000	251.1502	458.1165	3317.3169
Space heating per m2										(98c) / (4) =		36.7937 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fraction of space heat from main system(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 (201)
Efficiency of main space heating system 1 (in %)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000 (202)
Efficiency of main space heating system 2 (in %)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	92.4000 (206)
Efficiency of secondary/supplementary heating system, %	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (207)
Space heating requirement	644.6767	509.2730	434.4706	249.2449	113.9018	0.0000	0.0000	0.0000	0.0000	251.1502	458.1165	656.4831 (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)	697.7021	551.1612	470.2063	269.7456	123.2704	0.0000	0.0000	0.0000	0.0000	271.8076	495.7971	710.4795 (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	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	86.3872	86.1820	85.7570	84.8594	83.2816	80.3000	80.3000	80.3000	80.3000	84.8482	85.9683	86.4377 (217)
Fuel for water heating, kWh/month	278.2544	246.6404	263.5639	235.1105	232.7874	218.2109	215.9971	224.3086	226.4413	238.1814	248.9576	275.2055 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.0685	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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Property Reference	4907-CA16-6920-008		Issued on Date	09/04/2024	
Assessment Reference	Plot 008	Prop Type Ref	Mountford-Det-Opp		
Property	Plot 008, Mountford-Det-Opp				
SAP Rating	89 B	DER	11.75	TER	12.39
Environmental	90 B	% DER < TER			5.17
CO ₂ Emissions (t/year)	0.93	DFEE	41.65	TFEE	42.40
Compliance Check	See BREL	% DFEE < TFEE			1.77
% DPER < TPER	2.83	DPER	63.02	TPER	64.86
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)

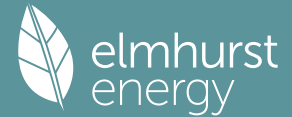
2. Ventilation rate

	m3 per hour											
Number of open chimneys	0 * 80 =											0.0000 (6a)
Number of open flues	0 * 20 =											0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)
Number of blocked chimneys	0 * 20 =											0.0000 (6f)
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)
Number of passive vents	0 * 10 =											0.0000 (7b)
Number of flueless gas fires	0 * 40 =											0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =											0.0000 (8)
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	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)
Mechanical extract ventilation - decentralised	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)
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

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) =	0.0000
			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
101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642	101.4642
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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
139.3098	136.3351	132.7125	127.2039	122.7306	117.9214	116.0731	119.6801	123.4841	128.5330	134.1265	138.9485	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)												
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	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

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
157.6743	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	53.3953 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
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	-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	7.0800	10.6334	0.4700	0.0000	0.7700	27.2454 (74)
East	3.2900	19.6403	0.4700	0.0000	0.7700	23.3847 (76)
West	2.2200	19.6403	0.4700	0.0000	0.7700	15.7793 (80)
West	3.0900	19.6403	0.4700	0.0000	0.7700	18.6920 (80)

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Solar gains	85.1015	165.2462	274.8645	413.9516	524.5878	545.9782	516.0199	430.6991	323.1544	196.2756	105.7505	70.2912 (83)
Total gains	682.8936	761.0479	851.7428	955.2384	1030.2887	1016.4004	967.2298	884.8467	795.4146	704.0113	652.7961	651.7265 (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	0.9795	0.9681	0.9406	0.8746	0.7525	0.5895	0.4473	0.5033	0.7355	0.9136	0.9687	0.9826 (86)
MIT	19.3270	19.5371	19.9068	20.3600	20.7254	20.9181	20.9774	20.9651	20.8122	20.3278	19.7309	19.2640 (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	0.9751	0.9613	0.9277	0.8474	0.7017	0.5112	0.3497	0.4016	0.6637	0.8886	0.9608	0.9789 (89)
MIT 2	18.0437	18.3087	18.7711	19.3213	19.7349	19.9251	19.9704	19.9637	19.8363	19.2973	18.5575	17.9640 (90)
Living area fraction												fLA = Living area / (4) = 0.1932 (91)
MIT	18.2917	18.5461	18.9905	19.5220	19.9263	20.1169	20.1649	20.1572	20.0249	19.4964	18.7842	18.2152 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2917	18.5461	18.9905	19.5220	19.9263	20.1169	20.1649	20.1572	20.0249	19.4964	18.7842	18.2152 (93)

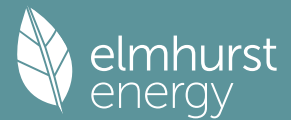
8. Space heating requirement

Utilisation	0.9649	0.9485	0.9119	0.8332	0.6988	0.5222	0.3679	0.4200	0.6672	0.8739	0.9483	0.9696 (94)
Useful gains	658.9537	721.8761	776.7406	795.8832	719.9407	530.7991	355.8587	371.6233	530.6732	615.2162	619.0281	631.9449 (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	1419.6536	1384.5853	1267.3419	1077.7519	834.6706	559.7698	361.7131	381.2171	601.1616	902.6697	1185.5280	1422.0375 (97)
Space heating kWh	565.9607	445.3406	365.0073	202.9454	85.3591	0.0000	0.0000	0.0000	0.0000	213.8654	407.8800	587.8289 (98a)
Space heating requirement - total per year (kWh/year)												2874.1875
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	565.9607	445.3406	365.0073	202.9454	85.3591	0.0000	0.0000	0.0000	0.0000	213.8654	407.8800	587.8289 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2874.1875
Space heating per m2												(98c) / (4) = 31.8787 (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	565.9607	445.3406	365.0073	202.9454	85.3591	0.0000	0.0000	0.0000	0.0000	213.8654	407.8800	587.8289 (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)	611.8494	481.4493	394.6025	219.4005	92.2801	0.0000	0.0000	0.0000	0.0000	231.2059	440.9513	635.4907 (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	88.5929	88.5572	88.4692	88.2929	87.9466	87.3000	87.3000	87.3000	87.3000	88.3088	88.5274	88.6080 (216)
Fuel for water heating, kWh/month	197.2900	173.7271	183.7141	160.5486	155.0895	139.6151	137.4608	143.9234	146.5038	162.7674	174.0066	195.0370 (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	-15.7767	-23.9983	-37.2624	-45.3599	-51.9833	-49.6630	-49.0138	-44.6789	-37.6477	-28.8437	-17.9425	-13.4382 (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	-4.5083	-9.8515	-20.3878	-31.9028	-43.4682	-44.1810	-43.5900	-36.2295	-25.7199	-14.4289	-6.1185	-3.5369 (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												3107.2297 (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												1969.6835 (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)												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	-699.5320 (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	4699.1733 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3107.2297	3.6400	113.1032 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1969.6835	3.6400	71.6965 (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	-415.6086	16.4900	-68.5339
PV Unit electricity exported	-283.9233	5.5900	-15.8713
Total			-84.4052 (252)
Total energy cost			245.4580 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.6538 (257)
SAP value		89.4022
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	3107.2297	0.2100	652.5182 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1969.6835	0.2100	413.6335 (264)
Space and water heating			1066.1518 (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	-415.6086	0.1330	-55.2804
PV Unit electricity exported	-283.9233	0.1248	-35.4258
Total			-90.7062 (269)
Total CO2, kg/year			1021.2000 (272)
CO2 emissions per m2			11.3300 (273)
EI value			89.8756
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) =												Air changes per hour	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 infiltr 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				
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	60.7586			
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)

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)

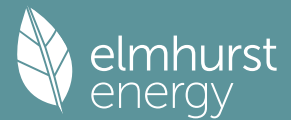
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254 (40)
HLP (average)	1.1254											
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6279 (42)
Hot water usage for mixer showers												68.0195 (42a)	
Hot water usage for baths												29.3866 (42b)	
Hot water usage for other uses												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												32.6340 (46)
Water storage loss:												
Total storage loss												0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss												0.0000 (57)
Combi loss												0.0000 (59)
Total heat required for water heating calculated for each month												231.8384 (62)
WWHRS												-59.0201 (63a)
PV diverter												-0.0000 (63b)
Solar input												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	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	1735.3425 (64)
	Total per year (kWh/year) = Sum(64)m =												
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 =												
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	0.0000 (64a)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	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	7.0800	11.9814	0.4700	0.0000	0.7700	30.6995 (74)							
East	3.2900	22.3313	0.4700	0.0000	0.7700	26.5888 (76)							
West	2.2200	22.3313	0.4700	0.0000	0.7700	17.9414 (80)							
West	3.0900	22.3313	0.4000	0.0000	0.7700	21.2532 (80)							
Solar gains	96.4828	169.0168	278.2877	431.8663	532.4528	592.4961	554.1679	473.6652	354.7261	214.5637	122.9283	78.8549	(83)
Total gains	694.2749	764.8186	855.1660	973.1531	1038.1538	1062.9183	1005.3778	927.8128	826.9863	722.2994	669.9740	660.2902	(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)	0.9749	0.9631	0.9286	0.8418	0.6827	0.4609	0.3100	0.3454	0.6394	0.8822	0.9589	0.9785	(85)
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	0.9749	0.9631	0.9286	0.8418	0.6827	0.4609	0.3100	0.3454	0.6394	0.8822	0.9589	0.9785	(86)
MIT	19.4724	19.6526	20.0444	20.4992	20.8320	20.9716	20.9953	20.9931	20.9026	20.4836	19.8963	19.4222	(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	0.9693	0.9550	0.9126	0.8076	0.6198	0.3735	0.2094	0.2375	0.5504	0.8475	0.9481	0.9737	(89)
MIT 2	18.2285	18.4549	18.9419	19.4843	19.8446	19.9658	19.9791	19.9785	19.9177	19.4817	18.7654	18.1655	(90)
Living area fraction									fLA = Living area / (4) =				(91)
MIT	18.4688	18.6863	19.1549	19.6804	20.0354	20.1601	20.1755	20.1745	20.1079	19.6753	18.9839	18.4083	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4688	18.6863	19.1549	19.6804	20.0354	20.1601	20.1755	20.1745	20.1079	19.6753	18.9839	18.4083	(93)

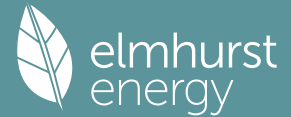
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9580	0.9414	0.8966	0.7960	0.6235	0.3894	0.2289	0.2584	0.5623	0.8350	0.9342	0.9632	(94)
Useful gains	665.1005	719.9931	766.7517	774.6713	647.2659	413.8478	230.1374	239.7518	465.0552	603.1498	625.8745	635.9966	(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	1356.4561	1327.7880	1192.7061	992.3561	713.8390	422.1033	230.8783	240.9270	497.9808	819.3486	1114.4688	1350.3156	(97)
Space heating kWh	514.3685	408.4382	316.9101	156.7330	49.5304	0.0000	0.0000	0.0000	0.0000	160.8519	351.7879	531.4534	(98a)
Space heating requirement - total per year (kWh/year)	2490.0735												
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	514.3685	408.4382	316.9101	156.7330	49.5304	0.0000	0.0000	0.0000	0.0000	160.8519	351.7879	531.4534	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2490.0735												
Space heating per m2	(98c) / (4) =												
	27.6184 (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	514.3685	408.4382	316.9101	156.7330	49.5304	0.0000	0.0000	0.0000	0.0000	160.8519	351.7879	531.4534	(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)	556.0741	441.5548	342.6055	169.4411	53.5464	0.0000	0.0000	0.0000	0.0000	173.8940	380.3112	574.5442	(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	88.5626	88.5283	88.4163	88.1845	87.7465	87.3000	87.3000	87.3000	87.3000	88.1896	88.4753	88.5767	(216)
Fuel for water heating, kWh/month	197.3576	173.7838	183.8240	160.7461	155.4432	139.6151	137.4608	143.9234	146.5038	162.9875	174.1091	195.1058	(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	-17.4205	-24.1894	-37.2166	-46.3366	-52.1223	-52.1123	-51.0572	-47.3071	-39.8889	-30.6150	-20.1722	-14.7249	(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	-5.3189	-9.9879	-20.3424	-33.2275	-43.6996	-48.7361	-47.3696	-40.5886	-28.7140	-16.0543	-7.4681	-4.1148	(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												2691.9713	(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												1970.8601	(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												-738.7847	(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												4245.8389	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2691.9713	6.1900	166.6330	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1970.8601	6.1900	121.9962	(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	-433.1629	25.1600	-108.9838	
PV Unit electricity exported	-305.6217	5.8100	-17.7566	
Total			-126.7404	(252)
Total energy cost			344.8517	(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	2691.9713	0.2100	565.3140	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1970.8601	0.2100	413.8806	(264)
Space and water heating			979.1946	(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	-433.1629	0.1330	-57.6057	
PV Unit electricity exported	-305.6217	0.1242	-37.9667	
Total			-95.5724	(269)
Total CO2, kg/year			929.3766	(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	2691.9713	1.1300	3041.9276 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1970.8601	1.1300	2227.0719 (278)
Space and water heating			5268.9995 (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	-433.1629	1.4914	-646.0181
PV Unit electricity exported	-305.6217	0.4558	-139.3140
Total			-785.3321 (283)
Total Primary energy kWh/year			4974.6592 (286)

SAP 10 EPC IMPROVEMENTS

Plot 008

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 -133 kg (14.4%)

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

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	£391	£391	£0
Space heating	£300	£300	£0
Water heating	£122	£122	£0
Lighting	£50	£50	£0
Generated (PV)	-£127	-£127	£0
Total cost of fuels	£345	£345	£0
Total cost of uses	£345	£345	£0
Delivered energy	47 kWh/m²	47 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	55 kWh/m²	55 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

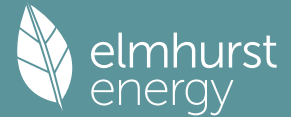
1. Overall dwelling characteristics

	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)
	Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)

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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	
	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)
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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Solid Door			1.9800	1.000	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)

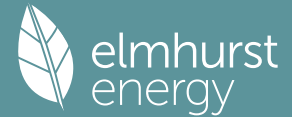
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	1.1254	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6279 (42)
Hot water usage for mixer showers													68.0195 (42a)
Hot water usage for baths													29.3866 (42b)
Hot water usage for other uses													41.5424 (42c)
Average daily hot water use (litres/day)													128.0571 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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													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	0.0000 (56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	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	-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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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)
	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	88.5929	88.5572	88.4692	88.2929	87.9466	87.3000	87.3000	87.3000	87.3000	88.3088	88.5274	87.3000	(216)
Fuel for water heating, kWh/month	197.2900	173.7271	183.7141	160.5486	155.0895	139.6151	137.4608	143.9234	146.5038	162.7674	174.0066	195.0370	(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	10.0961	10.4327	10.0961	10.4327	10.0961	(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	-15.7767	-23.9983	-37.2624	-45.3599	-51.9833	-49.6630	-49.0138	-44.6789	-37.6477	-28.8437	-17.9425	-13.4382	(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	-4.5083	-9.8515	-20.3878	-31.9028	-43.4682	-44.1810	-43.5900	-36.2295	-25.7199	-14.4289	-6.1185	-3.5369	(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													3107.2297 (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													1969.6835 (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													-699.5320 (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													4699.1733 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3107.2297	3.6400	113.1032	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1969.6835	3.6400	71.6965	(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	-415.6086	16.4900	-68.5339	
PV Unit electricity exported	-283.9233	5.5900	-15.8713	
Total			-84.4052	(252)
Total energy cost			245.4580	(255)

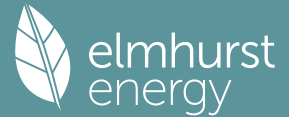
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.6538	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	89.4022	
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	3107.2297	0.2100	652.5182	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1969.6835	0.2100	413.6335	(264)
Space and water heating			1066.1518	(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	-415.6086	0.1330	-55.2804	
PV Unit electricity exported	-283.9233	0.1248	-35.4258	
Total			-90.7062	(269)
Total CO2, kg/year			1021.2000	(272)
CO2 emissions per m2			11.3300	(273)

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EI value
EI rating
EI band

89.8756
90 (274)
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												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)												
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)

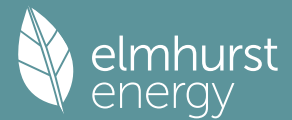
3. Heat losses and heat loss parameter

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)							(28)...(30) + (32) + (32a)...(32e) = 14936.4595 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							165.6661 (35)

List of Thermal Bridges	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
E5 Ground floor (normal)	27.3100	0.0030	0.0819
E6 Intermediate floor within a dwelling	16.1300	0.0310	0.5000
E10 Eaves (insulation at ceiling level)	11.1800	0.0440	0.4919
E12 Gable (insulation at ceiling level)	19.6800	0.0290	0.5707
E16 Corner (normal)	4.2000	0.0090	0.0378
E4 Jamb			
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	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	101.4642	(39)
Average = Sum(39)m / 12 =														101.4642
HLP	Jan 1.1254	Feb 1.1254	Mar 1.1254	Apr 1.1254	May 1.1254	Jun 1.1254	Jul 1.1254	Aug 1.1254	Sep 1.1254	Oct 1.1254	Nov 1.1254	Dec 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	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	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	41.5424		(42c)
Average daily hot water use (litres/day)													128.0571		(43)
Daily hot water use	Jan 139.3098	Feb 136.3351	Mar 132.7125	Apr 127.2039	May 122.7306	Jun 117.9214	Jul 116.0731	Aug 119.6801	Sep 123.4841	Oct 128.5330	Nov 134.1265	Dec 138.9485	138.9485		(44)
Energy conte	220.6326	194.1393	203.9742	174.1358	165.2189	144.9981	140.3804	148.1889	152.2683						(45)
Energy content (annual)														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	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	0.0000		(56)
If cylinder contains dedicated solar storage															
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(57)
Combi loss	14.2861	12.8912	14.2461	13.7307	14.1531	13.6608	14.0935	14.1122	13.6782	14.1752	13.7714	14.2787	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	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	-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	-0.0000		(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(63d)
Output from w/h	174.7850	153.8479	162.5304	141.7531	136.3960	121.8840	120.0033	125.6451	127.8978	143.7380	154.0436	172.8184	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	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	75.9083		(65)

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

Metabolic gains (Table 5), Watts	Jan 157.6743	Feb 157.6743	Mar 157.6743	Apr 157.6743	May 157.6743	Jun 157.6743	Jul 157.6743	Aug 157.6743	Sep 157.6743	Oct 157.6743	Nov 157.6743	Dec 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	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	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	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	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	-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	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	581.4353	(73)

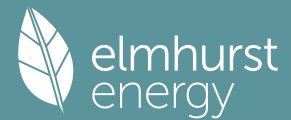
6. Solar gains

[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		7.0800	11.9814	0.4700	0.0000	0.7700	30.6995 (74)							
East		3.2900	22.3313	0.4700	0.0000	0.7700	26.5888 (76)							
West		2.2200	22.3313	0.4700	0.0000	0.7700	17.9414 (80)							
West		3.0900	22.3313	0.4000	0.0000	0.7700	21.2532 (80)							
Solar gains	96.4828	169.0168	278.2877	431.8663	532.4528	592.4961	554.1679	473.6652	354.7261	214.5637	122.9283	78.8549	78.8549	(83)
Total gains	694.2749	764.8186	855.1660	973.1531	1038.1538	1062.9183	1005.3778	927.8128	826.9863	722.2994	669.9740	660.2902	660.2902	(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	Jan 40.8914	Feb 40.8914	Mar 40.8914	Apr 40.8914	May 40.8914	Jun 40.8914	Jul 40.8914	Aug 40.8914	Sep 40.8914	Oct 40.8914	Nov 40.8914	Dec 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	3.7261		
util living area	0.9749	0.9631	0.9286	0.8418	0.6827	0.4609	0.3100	0.3454	0.6394	0.8822	0.9589	0.9785	0.9785		(86)
MIT	19.4724	19.6526	20.0444	20.4992	20.8320	20.9716	20.9953	20.9931	20.9026	20.4836	19.8963	19.4222	19.4222		(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	19.9802		(88)
util rest of house	0.9693	0.9550	0.9126	0.8076	0.6198	0.3735	0.2094	0.2375	0.5504	0.8475	0.9481	0.9737	0.9737		(89)

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MIT 2	18.2285	18.4549	18.9419	19.4843	19.8446	19.9658	19.9791	19.9785	19.9177	19.4817	18.7654	18.1655 (90)
Living area fraction									FLA = Living area / (4) =			0.1932 (91)
MIT	18.4688	18.6863	19.1549	19.6804	20.0354	20.1601	20.1755	20.1745	20.1079	19.6753	18.9839	18.4083 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4688	18.6863	19.1549	19.6804	20.0354	20.1601	20.1755	20.1745	20.1079	19.6753	18.9839	18.4083 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9580	0.9414	0.8966	0.7960	0.6235	0.3894	0.2289	0.2584	0.5623	0.8350	0.9342	0.9632	(94)
Useful gains	665.1005	719.9931	766.7517	774.6713	647.2659	413.8478	230.1374	239.7518	465.0552	603.1498	625.8745	635.9966	(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	1356.4561	1327.7880	1192.7061	992.3561	713.8390	422.1033	230.8783	240.9270	497.9808	819.3486	1114.4688	1350.3156	(97)
Space heating kWh	514.3685	408.4382	316.9101	156.7330	49.5304	0.0000	0.0000	0.0000	0.0000	160.8519	351.7879	531.4534	(98a)
Space heating requirement - total per year (kWh/year)												2490.0735	
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	514.3685	408.4382	316.9101	156.7330	49.5304	0.0000	0.0000	0.0000	0.0000	160.8519	351.7879	531.4534	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2490.0735	
Space heating per m2										(98c) / (4) =		27.6184	(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	514.3685	408.4382	316.9101	156.7330	49.5304	0.0000	0.0000	0.0000	0.0000	160.8519	351.7879	531.4534	(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)	556.0741	441.5548	342.6055	169.4411	53.5464	0.0000	0.0000	0.0000	0.0000	173.8940	380.3112	574.5442	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	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	88.5626	88.5283	88.4163	88.1845	87.7465	87.3000	87.3000	87.3000	87.3000	88.1896	88.4753	88.5767	(216)
Fuel for water heating, kWh/month	197.3576	173.7838	183.8240	160.7461	155.4432	139.6151	137.4608	143.9234	146.5038	162.9875	174.1091	195.1058	(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	-17.4205	-24.1894	-37.2166	-46.3366	-52.1223	-52.1123	-51.0572	-47.3071	-39.8889	-30.6150	-20.1722	-14.7249	(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	-5.3189	-9.9879	-20.3424	-33.2275	-43.6996	-48.7361	-47.3696	-40.5886	-28.7140	-16.0543	-7.4681	-4.1148	(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													2691.9713 (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													1970.8601 (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													-738.7847 (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													4245.8389 (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	122.8361	6.1900	166.6330 (240)
Total CO2 associated with community systems	2691.9713	6.1900	0.0000 (473)
Water heating (other fuel)	1970.8601	6.1900	121.9962 (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	-433.1629	25.1600	-108.9838
PV Unit electricity exported	-305.6217	5.8100	-17.7566
Total			-126.7404 (252)
Total energy cost			344.8517 (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	122.8361	0.2100	565.3140 (261)
Total CO2 associated with community systems	2691.9713	0.2100	0.0000 (373)
Water heating (other fuel)	1970.8601	0.2100	413.8806 (264)
Space and water heating			979.1946 (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	-433.1629	0.1330	-57.6057
PV Unit electricity exported	-305.6217	0.1242	-37.9667
Total			-95.5724 (269)
Total CO2, kg/year			929.3766 (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	122.8361	1.1300	3041.9276 (275)
Total CO2 associated with community systems	2691.9713	1.1300	0.0000 (473)
Water heating (other fuel)	1970.8601	1.1300	2227.0719 (278)
Space and water heating			5268.9995 (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	-433.1629	1.4914	-646.0181
PV Unit electricity exported	-305.6217	0.4558	-139.3140
Total			-785.3321 (283)
Total Primary energy kWh/year			4974.6592 (286)