

Full SAP Calculation Printout



Property Reference	Cholmeley Crescent L				Issued on Date	06/07/2023
Assessment Reference	23404 - Cholmeley Crescent L		Prop Type Ref			
Property						
SAP Rating	89 B	DER	10.08	TER	8.34	
Environmental	88 B	% DER < TER			-20.86	
CO ₂ Emissions (t/year)	2.71	DFEE	40.43	TFEE	42.26	
Compliance Check	See BREL		% DFEE < TFEE		4.32	
% DPER < TPER	-26.43	DPER	55.55	TPER	43.94	
Assessor Details	Mr. Neil Ingham				Assessor ID	AV35-0001
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	117.1400 (1b)	x 2.8000 (2b)	= 327.9920 (1b)	-
First floor	117.1400 (1c)	x 2.8000 (2c)	= 327.9920 (1c)	-
Second floor	76.9800 (1d)	x 2.8400 (2d)	= 218.6232 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	311.2600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 874.6072	(5)

2. Ventilation rate

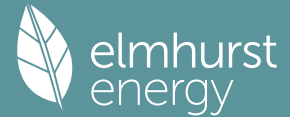
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	8 * 10 =	80.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	80.0000 / (5) =	0.0915 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3415	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3415 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4354	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3159	0.3415	0.3671	0.3842	0.4012	(22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
DOOR			2.5700	1.2000	3.0840			(26)
G (Uw = 1.20)			64.6500	1.1450	74.0267			(27)
RL			1.2600	1.1450	1.4427			(27a)
RL			0.6300	1.1450	0.7214			(27a)
RL			2.9700	1.1450	3.4008			(27a)
RL			0.6300	1.1450	0.7214			(27a)

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GF			117.1400	0.1400	16.3996	110.0000	12885.4000 (28a)
External Wall	259.9500	67.2200	192.7300	0.1400	26.9822	60.0000	11563.8000 (29a)
SW -RR	73.5000		73.5000	0.1200	8.8200	60.0000	4410.0000 (29a)
DORMER WALLS	20.4000		20.4000	0.1400	2.8560	60.0000	1224.0000 (29a)
FR	3.0800	1.8900	1.1900	0.1100	0.1309	9.0000	10.7100 (30)
PR	44.6500	3.6000	41.0500	0.1100	4.5155	9.0000	369.4500 (30)
DORMER ROOF	6.1800		6.1800	0.1100	0.6798	9.0000	55.6200 (30)
CEILING	39.2300		39.2300	0.1100	4.3153	9.0000	353.0700 (30)
SHELTERED CEILING	37.0800		37.0800	0.1001	3.7114	9.0000	333.7200 (30)
Total net area of external elements Aum(A, m2)			601.2100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	151.8077			(33)
Internal Walls			455.8100			9.0000	4102.2900 (32c)
Internal Floor			194.1200			18.0000	3494.1600 (32d)
Internal Ceiling			194.1200			9.0000	1747.0800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 40549.3000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 130.2747 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	35.2400	0.0540	1.9030
E3 Sill	35.2400	0.0400	1.4096
E4 Jamb	72.2900	0.0490	3.5422
E5 Ground floor (normal)	46.4200	0.0380	1.7640
E6 Intermediate floor within a dwelling	87.2200	0.0120	1.0466
E10 Eaves (insulation at ceiling level)	56.0900	0.0420	2.3558
E12 Gable (insulation at ceiling level)	39.4600	0.0870	3.4330
E11 Eaves (insulation at rafter level)	11.2900	0.0310	0.3500
E14 Flat roof	22.3300	0.0490	1.0942
E13 Gable (insulation at rafter level)	15.6300	0.0910	1.4223
E17 Corner (inverted - internal area greater than external area)	30.3000	-0.0630	-1.9089
R1 Head of roof window	5.2500	0.2400	1.2600
R2 Sill of roof window	5.2500	0.2400	1.2600
R3 Jamb of roof window	9.2000	0.2400	2.2080

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.1398 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 172.9474 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	171.6642	170.6020	169.5609	164.6706	163.7556	159.4964	159.4964	158.7076	161.1370	163.7556	165.6066	167.5417	(38)
Heat transfer coeff	344.6116	343.5495	342.5083	337.6180	336.7031	332.4438	332.4438	331.6550	334.0844	336.7031	338.5540	340.4891	(39)
Average = Sum(39)m / 12 =												337.6136	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1072	1.1037	1.1004	1.0847	1.0817	1.0681	1.0681	1.0655	1.0733	1.0817	1.0877	1.0939	(40)
HLP (average)												1.0847	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1466 (42)
Hot water usage for mixer showers	76.9775	75.8207	74.1350	70.9097	68.5294	65.8751	64.3663	66.0393	67.8732	70.7232	74.0177	76.6826	(42a)
Hot water usage for baths	33.2261	32.7326	32.0377	30.7565	29.7971	28.7333	28.1587	28.8487	29.6000	30.7383	32.0460	33.1137	(42b)
Hot water usage for other uses	46.8540	45.1502	43.4464	41.7427	40.0389	38.3351	38.3351	40.0389	41.7427	43.4464	45.1502	46.8540	(42c)
Average daily hot water use (litres/day)												144.3710	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	157.0576	153.7035	149.6191	143.4088	138.3654	132.9435	130.8601	134.9269	139.2158	144.9079	151.2139	156.6503	(44)
Energy conte	248.7408	218.8718	229.9590	196.3195	186.2665	163.4695	158.2639	167.0676	171.6670	196.6387	215.4320	245.2765	(45)
Energy content (annual)										Total = Sum(45)m =		2397.9728	
Distribution loss (46)m = 0.15 x (45)m	37.3111	32.8308	34.4939	29.4479	27.9400	24.5204	23.7396	25.0601	25.7501	29.4958	32.3148	36.7915	(46)

Water storage loss:

Store volume 250.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

298.9546	264.2262	280.1728	244.9135	236.4803	212.0635	208.4777	217.2814	220.2610	246.8525	264.0260	295.4903	(62)	
WWHRS	-68.5907	-60.6622	-63.5220	-52.5987	-49.0201	-41.9468	-39.3185	-41.8113	-43.3998	-51.1636	-57.9622	-67.3205	(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)

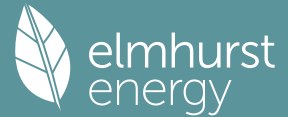
Output from w/h

230.3639	203.5639	216.6509	192.3148	187.4602	170.1166	169.1593	175.4702	176.8612	195.6889	206.0638	228.1698	(64)
Total per year (kWh/year) = Sum(64)m =												2351.8834 (64)
12Total per year (kWh/year)												2352 (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)	

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Heat gains from water heating, kWh/month
 122.8774 109.0584 116.6324 104.1514 102.1046 93.2288 92.7938 95.7210 95.9545 105.5534 110.5063 121.7255 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	237.3283	262.7563	237.3283	245.2392	237.3283	245.2392	237.3283	237.3283	245.2392	237.3283	245.2392	237.3283	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	467.3198	472.1692	459.9490	433.9338	401.0943	370.2298	349.6104	344.7611	356.9812	382.9964	415.8359	446.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	(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)	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	(71)
Water heating gains (Table 5)	165.1577	162.2893	156.7640	144.6548	137.2374	129.4845	124.7229	128.6573	133.2701	141.8728	153.4810	163.6095	(72)
Total internal gains	943.0044	970.4132	927.2398	897.0263	848.8585	815.1520	781.8601	780.9452	805.6891	835.3961	887.7547	920.8368	(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 Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.8800	10.6334	0.5700	0.7000	0.7700	0.7700	11.4080	(74)
East	23.0000	19.6403	0.5700	0.7000	0.7700	0.7700	124.9054	(76)
South	16.3000	46.7521	0.5700	0.7000	0.7700	0.7700	210.7146	(78)
West	21.4700	19.6403	0.5700	0.7000	0.7700	0.7700	116.5965	(80)
North	0.6300	15.2954	0.5700	0.7000	1.0000	1.0000	3.4603	(82)
South	1.2600	47.0123	0.5700	0.7000	1.0000	1.0000	21.2715	(82)
West	0.6300	26.0000	0.5700	0.7000	1.0000	1.0000	5.8821	(82)
Horizontal	2.9700	26.0000	0.5700	0.7000	1.0000	1.0000	27.7297	(82)

Solar gains	521.9680	953.5395	1445.6595	1978.2769	2350.8843	2383.7632	2278.1466	1998.8393	1633.2176	1094.7914	637.6628	438.2340	(83)
Total gains	1464.9724	1923.9528	2372.8993	2875.3032	3199.7428	3198.9153	3060.0066	2779.7845	2438.9067	1930.1875	1525.4175	1359.0708	(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	32.6852	32.7862	32.8859	33.3622	33.4529	33.8815	33.8815	33.9621	33.7151	33.4529	33.2700	33.0809	
alpha	3.1790	3.1857	3.1924	3.2241	3.2302	3.2588	3.2588	3.2641	3.2477	3.2302	3.2180	3.2054	
util living area	0.9903	0.9772	0.9482	0.8766	0.7553	0.5935	0.4545	0.5110	0.7426	0.9287	0.9818	0.9924	(86)
MIT	19.0914	19.3650	19.7580	20.2415	20.6017	20.8081	20.8749	20.8609	20.6952	20.1799	19.5461	19.0566	(87)
Th 2	19.9950	19.9978	20.0005	20.0134	20.0158	20.0270	20.0270	20.0291	20.0227	20.0158	20.0109	20.0058	(88)
util rest of house	0.9885	0.9729	0.9384	0.8533	0.7104	0.5223	0.3628	0.4165	0.6794	0.9103	0.9777	0.9909	(89)
MIT 2	17.7316	18.0815	18.5794	19.1847	19.6068	19.8330	19.8900	19.8832	19.7257	19.1244	18.3238	17.6946	(90)
Living area fraction									fLA = Living area / (4) =			0.0847	(91)
MIT	17.8467	18.1902	18.6792	19.2742	19.6911	19.9156	19.9734	19.9660	19.8078	19.2137	18.4273	17.8099	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.8467	18.1902	18.6792	19.2742	19.6911	19.9156	19.9734	19.9660	19.8078	19.2137	18.4273	17.8099	(93)

8. Space heating requirement

Utilisation	0.9826	0.9621	0.9214	0.8324	0.6938	0.5136	0.3576	0.4100	0.6636	0.8907	0.9684	0.9861	(94)
Useful gains	1439.5274	1851.0545	2186.4375	2393.3598	2219.8623	1642.8581	1094.1244	1139.7960	1618.3876	1719.2269	1477.1388	1340.1288	(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	4668.3596	4565.8262	4171.4702	3502.5305	2690.6196	1767.1392	1121.4788	1182.6725	1906.8756	2900.2755	3834.9116	4634.0292	(97)
Space heating kWh	2402.2512	1824.3266	1476.8643	798.6029	350.2434	0.0000	0.0000	0.0000	0.0000	878.7002	1697.5964	2450.6619	(98a)
Space heating requirement - total per year (kWh/year)												11879.2468	
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	2402.2512	1824.3266	1476.8643	798.6029	350.2434	0.0000	0.0000	0.0000	0.0000	878.7002	1697.5964	2450.6619	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11879.2468	
Space heating per m2										(98c) / (4) =		38.1650	(99)

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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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	2402.2512	1824.3266	1476.8643	798.6029	350.2434	0.0000	0.0000	0.0000	0.0000	878.7002	1697.5964	2450.6619 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	2402.2512	1824.3266	1476.8643	798.6029	350.2434	0.0000	0.0000	0.0000	0.0000	878.7002	1697.5964	2450.6619 (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	230.3639	203.5639	216.6509	192.3148	187.4602	170.1166	169.1593	175.4702	176.8612	195.6889	206.0638	228.1698 (64)
Efficiency of water heater (217)m	91.0520	90.8711	90.4867	89.5768	87.5205	79.8000	79.8000	79.8000	79.8000	89.7397	90.7611	79.8000 (216)
Fuel for water heating, kWh/month	253.0026	224.0139	239.4283	214.6926	214.1900	213.1788	211.9790	219.8874	221.6306	218.0628	227.0398	250.5027 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	54.8062	43.9676	39.5879	29.0038	22.4034	18.3038	20.4371	26.5649	34.5052	45.2727	51.1354	56.3294 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												11879.2468 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2707.6086 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												442.3175 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												15115.1729 (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	11879.2468	0.2100	2494.6418 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	2707.6086	0.2100	568.5978 (264)
Space and water heating			3063.2396 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	442.3175	0.1443	63.8401 (268)
Total CO2, kg/year			3139.0090 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.0800 (273)

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

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	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	11879.2468	1.1300	13423.5489 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2707.6086	1.1300	3059.5978 (278)
Space and water heating			16483.1466 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	442.3175	1.5338	678.4414 (282)
Total Primary energy kWh/year			17291.6888 (286)
Dwelling Primary energy Rate (DPER)			55.5500 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	117.1400 (1b)	x 2.8000 (2b)	= 327.9920 (1b) -
First floor	117.1400 (1c)	x 2.8000 (2c)	= 327.9920 (1c) -
Second floor	76.9800 (1d)	x 2.8400 (2d)	= 218.6232 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	311.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 874.6072 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test		40.0000 / (5) = 0.0457 (8)
Pressure Test Method		Yes
Measured/design AP50		Blower Door
Infiltration rate		5.0000 (17)
Number of sides sheltered		0.2957 (18)
		0 (19)

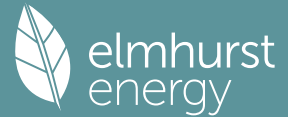
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2957 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3771	0.3697	0.3623	0.3253	0.3179	0.2809	0.2809	0.2736	0.2957	0.3179	0.3327	0.3475 (22b)
Effective ac	0.5711	0.5683	0.5656	0.5529	0.5505	0.5395	0.5395	0.5374	0.5437	0.5505	0.5553	0.5604 (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			2.5700	1.0000	2.5700		(26)
TER Opening Type (Uw = 1.20)			64.6500	1.1450	74.0267		(27)
RL			1.2600	1.8519	2.3333		(27a)
RL			0.6300	1.8519	1.1667		(27a)
RL			2.9700	2.0221	6.0055		(27a)
RL			0.6300	2.0221	1.2739		(27a)
GF			117.1400	0.1300	15.2282		(28a)
External Wall	259.9500	67.2200	192.7300	0.1800	34.6914		(29a)
SW -RR	73.5000		73.5000	0.1800	13.2300		(29a)
DORMER WALLS	20.4000		20.4000	0.1800	3.6720		(29a)
FR	3.0800	1.8900	1.1900	0.1100	0.1309		(30)
PR	44.6500	3.6000	41.0500	0.1100	4.5155		(30)
DORMER ROOF	6.1800		6.1800	0.1100	0.6798		(30)

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CEILING	39.2300	39.2300	0.1100	4.3153	(30)
SHELTERED CEILING	37.0800	37.0800	0.1100	4.0788	(30)
Total net area of external elements Aum(A, m2)		601.2100			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	167.9180		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 130.2747 (35)

List of Thermal Bridges					
K1 Element	Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)	35.2400	0.0500	1.7620		
E3 Sill	35.2400	0.0500	1.7620		
E4 Jamb	72.2900	0.0500	3.6145		
E5 Ground floor (normal)	46.4200	0.1600	7.4272		
E6 Intermediate floor within a dwelling	87.2200	0.0000	0.0000		
E10 Eaves (insulation at ceiling level)	56.0900	0.0600	3.3654		
E12 Gable (insulation at ceiling level)	39.4600	0.0600	2.3676		
E11 Eaves (insulation at rafter level)	11.2900	0.0400	0.4516		
E14 Flat roof	22.3300	0.0800	1.7864		
E13 Gable (insulation at rafter level)	15.6300	0.0800	1.2504		
E17 Corner (inverted - internal area greater than external area)	30.3000	-0.0900	-2.7270		
R1 Head of roof window	5.2500	0.0800	0.4200		
R2 Sill of roof window	5.2500	0.0600	0.3150		
R3 Jamb of roof window	9.2000	0.0800	0.7360		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			22.5311	(36)	
Point Thermal bridges			0.0000	(36a) =	
Total fabric heat loss		(33) + (36) + (36a) =	190.4491	(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)
Heat transfer coeff	164.8276	164.0309	163.2499	159.5819	158.8956	155.7009	155.7009	155.1092	156.9314	158.8956	160.2839	161.7354	(39)
Average = Sum(39)m / 12 =	355.2767	354.4800	353.6991	350.0310	349.3447	346.1500	346.1500	345.5584	347.3806	349.3447	350.7331	352.1845	(39)
													350.0277
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.1414	1.1389	1.1363	1.1246	1.1224	1.1121	1.1121	1.1102	1.1160	1.1224	1.1268	1.1315	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

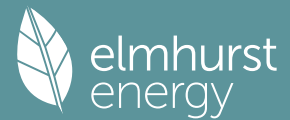
4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1466 (42)
Hot water usage for mixer showers													
	76.9775	75.8207	74.1350	70.9097	68.5294	65.8751	64.3663	66.0393	67.8732	70.7232	74.0177	76.6826	(42a)
Hot water usage for baths													
	33.2261	32.7326	32.0377	30.7565	29.7971	28.7333	28.1587	28.8487	29.6000	30.7383	32.0460	33.1137	(42b)
Hot water usage for other uses													
	46.8540	45.1502	43.4464	41.7427	40.0389	38.3351	38.3351	40.0389	41.7427	43.4464	45.1502	46.8540	(42c)
Average daily hot water use (litres/day)													144.3710 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	157.0576	153.7035	149.6191	143.4088	138.3654	132.9435	130.8601	134.9269	139.2158	144.9079	151.2139	156.6503	(44)
Energy content (annual)	248.7408	218.8718	229.9590	196.3195	186.2665	163.4695	158.2639	167.0676	171.6670	196.6387	215.4320	245.2765	(45)
Distribution loss (46)m = 0.15 x (45)m													
	37.3111	32.8308	34.4939	29.4479	27.9400	24.5204	23.7396	25.0601	25.7501	29.4958	32.3148	36.7915	(46)
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8903 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0208 (55)
Total storage loss													
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage													
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	303.6476	268.4650	284.8658	249.4551	241.1732	216.6051	213.1707	221.9744	224.8026	251.5455	268.5676	300.1833	(62)
WWHRS	-35.1909	-31.1231	-32.5903	-26.9861	-25.1501	-21.5211	-20.1726	-21.4515	-22.2665	-26.2498	-29.7378	-34.5392	(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													
	268.4567	237.3419	252.2755	222.4690	216.0232	195.0840	192.9981	200.5229	202.5361	225.2957	238.8297	265.6441	(64)
12Total per year (kWh/year)													
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
	126.6317	112.4494	120.3868	107.7847	105.8590	96.8621	96.5482	99.4754	99.5878	109.3078	114.1396	125.4799	(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	(66)
	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	235.7092	260.9638	235.7092	243.5662	235.7092	243.5662	235.7092	243.5662	235.7092	243.5662	235.7092	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	467.3198	472.1692	459.9490	433.9338	401.0943	370.2298	349.6104	344.7611	356.9812	382.9964	415.8359	446.7005 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	(71)
Water heating gains (Table 5)	170.2040	167.3355	161.8102	149.7010	142.2836	134.5307	129.7691	133.7035	138.3164	146.9191	158.5272	168.6558 (72)
Total internal gains	946.4315	973.6669	930.6670	900.3995	852.2857	818.5252	785.2872	784.3723	809.0623	838.8232	891.1279	924.2639 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				3.8800	10.6334	0.6300	0.7000	0.7700	12.6088 (74)			
East				23.0000	19.6403	0.6300	0.7000	0.7700	138.0534 (76)			
South				16.3000	46.7521	0.6300	0.7000	0.7700	232.8950 (78)			
West				21.4700	19.6403	0.6300	0.7000	0.7700	128.8698 (80)			
North				0.6300	15.2954	0.6300	0.7000	1.0000	3.8246 (82)			
South				1.2600	47.0123	0.6300	0.7000	1.0000	23.5106 (82)			
West				0.6300	26.0000	0.6300	0.7000	1.0000	6.5012 (82)			
Horizontal				2.9700	26.0000	0.6300	0.7000	1.0000	30.6486 (82)			
Solar gains	576.9120	1053.9121	1597.8342	2186.5165	2598.3458	2634.6857	2517.9515	2209.2434	1805.1352	1210.0326	704.7852	484.3639 (83)
Total gains	1523.3436	2027.5790	2528.5012	3086.9160	3450.6314	3453.2109	3303.2387	2993.6157	2614.1975	2048.8558	1595.9131	1408.6279 (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, n _{li,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.7040	31.7753	31.8454	32.1791	32.2423	32.5399	32.5399	32.5956	32.4247	32.2423	32.1147	31.9824	
alpha	3.1136	3.1184	3.1230	3.1453	3.1495	3.1693	3.1693	3.1730	3.1616	3.1495	3.1410	3.1322	
util living area	0.9892	0.9741	0.9411	0.8627	0.7357	0.5747	0.4388	0.4950	0.7258	0.9209	0.9796	0.9915	(86)
MIT	18.5407	18.9248	19.4703	20.1221	20.6031	20.8707	20.9588	20.9396	20.7203	20.0242	19.1520	18.4812	(87)
Th 2	19.9672	19.9692	19.9713	19.9808	19.9826	19.9910	19.9910	19.9925	19.9878	19.9826	19.9790	19.9752	(88)
util rest of house	0.9871	0.9692	0.9300	0.8373	0.6886	0.5021	0.3466	0.3994	0.6599	0.9005	0.9750	0.9898	(89)
MIT 2	17.0708	17.5600	18.2481	19.0537	19.6116	19.8960	19.9702	19.9597	19.7578	18.9553	17.8588	16.9995	(90)
Living area fraction									f _{LA} = Living area / (4) =			0.0847	(91)
MIT	17.1952	17.6756	18.3516	19.1442	19.6955	19.9785	20.0539	20.0427	19.8393	19.0458	17.9683	17.1250	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1952	17.6756	18.3516	19.1442	19.6955	19.9785	20.0539	20.0427	19.8393	19.0458	17.9683	17.1250	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9781	0.9532	0.9065	0.8122	0.6738	0.5012	0.3526	0.4045	0.6490	0.8757	0.9612	0.9823	(94)
Ext temp.	1489.9982	1932.7338	2292.1897	2507.3448	2324.8947	1730.6890	1164.6771	1210.7791	1696.5964	1794.2748	1534.0119	1383.7464	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	4581.3781	4528.6854	4191.9054	3585.7849	2793.1962	1861.7727	1195.5754	1258.7499	1993.7174	2950.5116	3811.8823	4551.9908	(97)
Space heating requirement - total per year (kWh/year)	2299.9867	1744.4795	1413.3885	776.4769	348.4163	0.0000	0.0000	0.0000	0.0000	860.2401	1640.0666	2357.1739	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	2299.9867	1744.4795	1413.3885	776.4769	348.4163	0.0000	0.0000	0.0000	0.0000	860.2401	1640.0666	2357.1739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11440.2285	(98c) / (4) =
Space heating per m2												36.7546	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)

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

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Space heating requirement	2299.9867	1744.4795	1413.3885	776.4769	348.4163	0.0000	0.0000	0.0000	0.0000	860.2401	1640.0666	2357.1739	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	2491.8599	1890.0103	1531.2985	841.2534	377.4825	0.0000	0.0000	0.0000	0.0000	932.0045	1776.8869	2553.8178	(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	268.4567	237.3419	252.2755	222.4690	216.0232	195.0840	192.9981	200.5229	202.5361	225.2957	238.8297	265.6441	(64)
Efficiency of water heater	87.7654	87.6166	87.3086	86.6243	85.1256	79.8000	79.8000	79.8000	79.8000	86.7690	87.5450	79.8000	(216)
Fuel for water heating, kWh/month	305.8798	270.8869	288.9468	256.8206	253.7698	244.4662	241.8523	251.2818	253.8046	259.6500	272.8081	302.5659	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	48.9757	39.2901	35.3764	25.9183	20.0200	16.3565	18.2629	23.7389	30.8344	40.4564	45.6954	50.3369	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-99.5244	-135.4690	-187.9690	-203.5779	-212.8978	-196.0202	-193.1734	-185.2737	-170.8410	-150.6938	-107.4949	-86.5853	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-71.9916	-149.3036	-293.0535	-435.0729	-570.6921	-572.1057	-565.7636	-481.4615	-355.8889	-212.2852	-95.6676	-57.1315	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												12394.6137	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	(216)
Water heating fuel used												3202.7329	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												395.2621	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-5789.9380	(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												10288.6707	(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	12394.6137	0.2100	2602.8689 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3202.7329	0.2100	672.5739 (264)
Space and water heating			3275.4428 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	395.2621	0.1443	57.0485 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1929.5203	0.1354	-261.2683
PV Unit electricity exported	-3860.4177	0.1262	-487.2831
Total			-748.5514 (269)
Total CO2, kg/year			2595.8692 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.3400 (273)

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

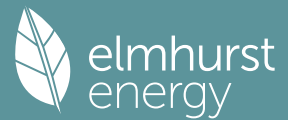
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	12394.6137	1.1300	14005.9135 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3202.7329	1.1300	3619.0882 (278)
Space and water heating			17625.0017 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)

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Energy for lighting	395.2621	1.5338	606.2662 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1929.5203	1.5005	-2895.2119
PV Unit electricity exported	-3860.4177	0.4633	-1788.7161
Total			-4683.9280 (283)
Total Primary energy kWh/year			13677.4406 (286)
Target Primary Energy Rate (TPER)			43.9400 (287)

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Property Reference	Cholmeley Crescent L				Issued on Date	06/07/2023	
Assessment Reference	23404 - Cholmeley Crescent L			Prop Type Ref			
Property							
SAP Rating	89 B		DER	10.08		TER	8.34
Environmental	88 B		% DER < TER				-20.86
CO ₂ Emissions (t/year)	2.71		DFEE	40.43		TFEE	42.26
Compliance Check	See BREL		% DFEE < TFEE				4.32
% DPER < TPER	-26.43		DPER	55.55		TPER	43.94
Assessor Details	Mr. Neil Ingham				Assessor ID	AV35-0001	
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	117.1400 (1b)	x 2.8000 (2b)	= 327.9920 (1b)	-
First floor	117.1400 (1c)	x 2.8000 (2c)	= 327.9920 (1c)	-
Second floor	76.9800 (1d)	x 2.8400 (2d)	= 218.6232 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	311.2600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 874.6072	(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	8 * 10 = 80.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

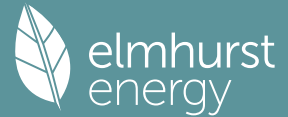
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	80.0000 / (5) =	0.0915 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000 (17)	
Infiltration rate	0.3415 (18)	
Number of sides sheltered	0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3415 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4354	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3159	0.3415	0.3671	0.3842	0.4012	(22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
DOOR			2.5700	1.2000	3.0840			(26)
G (Uw = 1.20)			64.6500	1.1450	74.0267			(27)
RL			1.2600	1.1450	1.4427			(27a)
RL			0.6300	1.1450	0.7214			(27a)
RL			2.9700	1.1450	3.4008			(27a)
RL			0.6300	1.1450	0.7214			(27a)

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GF			117.1400	0.1400	16.3996	110.0000	12885.4000 (28a)
External Wall	259.9500	67.2200	192.7300	0.1400	26.9822	60.0000	11563.8000 (29a)
SW -RR	73.5000		73.5000	0.1200	8.8200	60.0000	4410.0000 (29a)
DORMER WALLS	20.4000		20.4000	0.1400	2.8560	60.0000	1224.0000 (29a)
FR	3.0800	1.8900	1.1900	0.1100	0.1309	9.0000	10.7100 (30)
PR	44.6500	3.6000	41.0500	0.1100	4.5155	9.0000	369.4500 (30)
DORMER ROOF	6.1800		6.1800	0.1100	0.6798	9.0000	55.6200 (30)
CEILING	39.2300		39.2300	0.1100	4.3153	9.0000	353.0700 (30)
SHELTERED CEILING	37.0800		37.0800	0.1001	3.7114	9.0000	333.7200 (30)
Total net area of external elements Aum(A, m2)			601.2100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	151.8077			(33)
Internal Walls			455.8100			9.0000	4102.2900 (32c)
Internal Floor			194.1200			18.0000	3494.1600 (32d)
Internal Ceiling			194.1200			9.0000	1747.0800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 40549.3000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 130.2747 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	35.2400	0.0540	1.9030
E3 Sill	35.2400	0.0400	1.4096
E4 Jamb	72.2900	0.0490	3.5422
E5 Ground floor (normal)	46.4200	0.0380	1.7640
E6 Intermediate floor within a dwelling	87.2200	0.0120	1.0466
E10 Eaves (insulation at ceiling level)	56.0900	0.0420	2.3558
E12 Gable (insulation at ceiling level)	39.4600	0.0870	3.4330
E11 Eaves (insulation at rafter level)	11.2900	0.0310	0.3500
E14 Flat roof	22.3300	0.0490	1.0942
E13 Gable (insulation at rafter level)	15.6300	0.0910	1.4223
E17 Corner (inverted - internal area greater than external area)	30.3000	-0.0630	-1.9089
R1 Head of roof window	5.2500	0.2400	1.2600
R2 Sill of roof window	5.2500	0.2400	1.2600
R3 Jamb of roof window	9.2000	0.2400	2.2080

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.1398 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 172.9474 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	171.6642	170.6020	169.5609	164.6706	163.7556	159.4964	159.4964	158.7076	161.1370	163.7556	165.6066	167.5417	(38)
Heat transfer coeff	344.6116	343.5495	342.5083	337.6180	336.7031	332.4438	332.4438	331.6550	334.0844	336.7031	338.5540	340.4891	(39)
Average = Sum(39)m / 12 =													337.6136

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1072	1.1037	1.1004	1.0847	1.0817	1.0681	1.0681	1.0655	1.0733	1.0817	1.0877	1.0939	(40)
HLP (average)													1.0847
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1466 (42)
Hot water usage for mixer showers	76.9775	75.8207	74.1350	70.9097	68.5294	65.8751	64.3663	66.0393	67.8732	70.7232	74.0177	76.6826	(42a)
Hot water usage for baths	33.2261	32.7326	32.0377	30.7565	29.7971	28.7333	28.1587	28.8487	29.6000	30.7383	32.0460	33.1137	(42b)
Hot water usage for other uses	46.8540	45.1502	43.4464	41.7427	40.0389	38.3351	38.3351	40.0389	41.7427	43.4464	45.1502	46.8540	(42c)
Average daily hot water use (litres/day)													144.3710 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	157.0576	153.7035	149.6191	143.4088	138.3654	132.9435	130.8601	134.9269	139.2158	144.9079	151.2139	156.6503	(44)
Energy conte	248.7408	218.8718	229.9590	196.3195	186.2665	163.4695	158.2639	167.0676	171.6670	196.6387	215.4320	245.2765	(45)
Energy content (annual)													2397.9728
Distribution loss (46)m = 0.15 x (45)m	37.3111	32.8308	34.4939	29.4479	27.9400	24.5204	23.7396	25.0601	25.7501	29.4958	32.3148	36.7915	(46)

Water storage loss:

Store volume 250.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	298.9546	264.2262	280.1728	244.9135	236.4803	212.0635	208.4777	217.2814	220.2610	246.8525	264.0260	295.4903	(62)
WWHRS	-68.5907	-60.6622	-63.5220	-52.5987	-49.0201	-41.9468	-39.3185	-41.8113	-43.3998	-51.1636	-57.9622	-67.3205	(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)

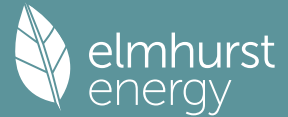
Output from w/h

	230.3639	203.5639	216.6509	192.3148	187.4602	170.1166	169.1593	175.4702	176.8612	195.6889	206.0638	228.1698	(64)
Total per year (kWh/year) = Sum(64)m =													2351.8834 (64)
12Total per year (kWh/year)													2352 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)

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Heat gains from water heating, kWh/month
 122.8774 109.0584 116.6324 104.1514 102.1046 93.2288 92.7938 95.7210 95.9545 105.5534 110.5063 121.7255 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	237.3283	262.7563	237.3283	245.2392	237.3283	245.2392	237.3283	237.3283	245.2392	237.3283	245.2392	237.3283	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	467.3198	472.1692	459.9490	433.9338	401.0943	370.2298	349.6104	344.7611	356.9812	382.9964	415.8359	446.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	(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)	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	(71)
Water heating gains (Table 5)	165.1577	162.2893	156.7640	144.6548	137.2374	129.4845	124.7229	128.6573	133.2701	141.8728	153.4810	163.6095	(72)
Total internal gains	943.0044	970.4132	927.2398	897.0263	848.8585	815.1520	781.8601	780.9452	805.6891	835.3961	887.7547	920.8368	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.8800	10.6334	0.5700	0.7000	0.7700	11.4080	(74)
East	23.0000	19.6403	0.5700	0.7000	0.7700	124.9054	(76)
South	16.3000	46.7521	0.5700	0.7000	0.7700	210.7146	(78)
West	21.4700	19.6403	0.5700	0.7000	0.7700	116.5965	(80)
North	0.6300	15.2954	0.5700	0.7000	1.0000	3.4603	(82)
South	1.2600	47.0123	0.5700	0.7000	1.0000	21.2715	(82)
West	0.6300	26.0000	0.5700	0.7000	1.0000	5.8821	(82)
Horizontal	2.9700	26.0000	0.5700	0.7000	1.0000	27.7297	(82)

Solar gains	521.9680	953.5395	1445.6595	1978.2769	2350.8843	2383.7632	2278.1466	1998.8393	1633.2176	1094.7914	637.6628	438.2340	(83)
Total gains	1464.9724	1923.9528	2372.8993	2875.3032	3199.7428	3198.9153	3060.0066	2779.7845	2438.9067	1930.1875	1525.4175	1359.0708	(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	32.6852	32.7862	32.8859	33.3622	33.4529	33.8815	33.8815	33.9621	33.7151	33.4529	33.2700	33.0809	
alpha	3.1790	3.1857	3.1924	3.2241	3.2302	3.2588	3.2588	3.2641	3.2477	3.2302	3.2180	3.2054	
util living area	0.9903	0.9772	0.9482	0.8766	0.7553	0.5935	0.4545	0.5110	0.7426	0.9287	0.9818	0.9924	(86)
MIT	19.0914	19.3650	19.7580	20.2415	20.6017	20.8081	20.8749	20.8609	20.6952	20.1799	19.5461	19.0566	(87)
Th 2	19.9950	19.9978	20.0005	20.0134	20.0158	20.0270	20.0270	20.0291	20.0227	20.0158	20.0109	20.0058	(88)
util rest of house	0.9885	0.9729	0.9384	0.8533	0.7104	0.5223	0.3628	0.4165	0.6794	0.9103	0.9777	0.9909	(89)
MIT 2	17.7316	18.0815	18.5794	19.1847	19.6068	19.8330	19.8900	19.8832	19.7257	19.1244	18.3238	17.6946	(90)
Living area fraction									fLA = Living area / (4) =			0.0847	(91)
MIT	17.8467	18.1902	18.6792	19.2742	19.6911	19.9156	19.9734	19.9660	19.8078	19.2137	18.4273	17.8099	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.8467	18.1902	18.6792	19.2742	19.6911	19.9156	19.9734	19.9660	19.8078	19.2137	18.4273	17.8099	(93)

8. Space heating requirement

Utilisation	0.9826	0.9621	0.9214	0.8324	0.6938	0.5136	0.3576	0.4100	0.6636	0.8907	0.9684	0.9861	(94)
Useful gains	1439.5274	1851.0545	2186.4375	2393.3598	2219.8623	1642.8581	1094.1244	1139.7960	1618.3876	1719.2269	1477.1388	1340.1288	(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	4668.3596	4565.8262	4171.4702	3502.5305	2690.6196	1767.1392	1121.4788	1182.6725	1906.8756	2900.2755	3834.9116	4634.0292	(97)
Space heating kWh	2402.2512	1824.3266	1476.8643	798.6029	350.2434	0.0000	0.0000	0.0000	0.0000	878.7002	1697.5964	2450.6619	(98a)
Space heating requirement - total per year (kWh/year)												11879.2468	
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	2402.2512	1824.3266	1476.8643	798.6029	350.2434	0.0000	0.0000	0.0000	0.0000	878.7002	1697.5964	2450.6619	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11879.2468	
Space heating per m2										(98c) / (4) =		38.1650	(99)

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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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	2402.2512	1824.3266	1476.8643	798.6029	350.2434	0.0000	0.0000	0.0000	0.0000	878.7002	1697.5964	2450.6619 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	2402.2512	1824.3266	1476.8643	798.6029	350.2434	0.0000	0.0000	0.0000	0.0000	878.7002	1697.5964	2450.6619 (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	230.3639	203.5639	216.6509	192.3148	187.4602	170.1166	169.1593	175.4702	176.8612	195.6889	206.0638	228.1698 (64)
Efficiency of water heater (217)m	91.0520	90.8711	90.4867	89.5768	87.5205	79.8000	79.8000	79.8000	79.8000	89.7397	90.7611	79.8000 (216)
Fuel for water heating, kWh/month	253.0026	224.0139	239.4283	214.6926	214.1900	213.1788	211.9790	219.8874	221.6306	218.0628	227.0398	250.5027 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	54.8062	43.9676	39.5879	29.0038	22.4034	18.3038	20.4371	26.5649	34.5052	45.2727	51.1354	56.3294 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												11879.2468 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2707.6086 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												442.3175 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												15115.1729 (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	11879.2468	0.2100	2494.6418 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	2707.6086	0.2100	568.5978 (264)
Space and water heating			3063.2396 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	442.3175	0.1443	63.8401 (268)
Total CO2, kg/year			3139.0090 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.0800 (273)

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

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	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	11879.2468	1.1300	13423.5489 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2707.6086	1.1300	3059.5978 (278)
Space and water heating			16483.1466 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	442.3175	1.5338	678.4414 (282)
Total Primary energy kWh/year			17291.6888 (286)
Dwelling Primary energy Rate (DPER)			55.5500 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	117.1400 (1b)	x 2.8000 (2b)	= 327.9920 (1b) -
First floor	117.1400 (1c)	x 2.8000 (2c)	= 327.9920 (1c) -
Second floor	76.9800 (1d)	x 2.8400 (2d)	= 218.6232 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	311.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 874.6072 (5)

2. Ventilation rate

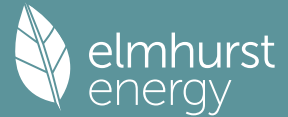
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0457 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2957 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2957 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3771	0.3697	0.3623	0.3253	0.3179	0.2809	0.2809	0.2736	0.2957	0.3179	0.3327	0.3475 (22b)
Effective ac	0.5711	0.5683	0.5656	0.5529	0.5505	0.5395	0.5395	0.5374	0.5437	0.5505	0.5553	0.5604 (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			2.5700	1.0000	2.5700		(26)
TER Opening Type (Uw = 1.20)			64.6500	1.1450	74.0267		(27)
RL			1.2600	1.8519	2.3333		(27a)
RL			0.6300	1.8519	1.1667		(27a)
RL			2.9700	2.0221	6.0055		(27a)
RL			0.6300	2.0221	1.2739		(27a)
GF			117.1400	0.1300	15.2282		(28a)
External Wall	259.9500	67.2200	192.7300	0.1800	34.6914		(29a)
SW -RR	73.5000		73.5000	0.1800	13.2300		(29a)
DORMER WALLS	20.4000		20.4000	0.1800	3.6720		(29a)
FR	3.0800	1.8900	1.1900	0.1100	0.1309		(30)
PR	44.6500	3.6000	41.0500	0.1100	4.5155		(30)
DORMER ROOF	6.1800		6.1800	0.1100	0.6798		(30)

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CEILING	39.2300	39.2300	0.1100	4.3153	(30)
SHELTERED CEILING	37.0800	37.0800	0.1100	4.0788	(30)
Total net area of external elements Aum(A, m2)		601.2100			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	167.9180		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 130.2747 (35)

List of Thermal Bridges					
K1 Element	Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)	35.2400	0.0500	1.7620		
E3 Sill	35.2400	0.0500	1.7620		
E4 Jamb	72.2900	0.0500	3.6145		
E5 Ground floor (normal)	46.4200	0.1600	7.4272		
E6 Intermediate floor within a dwelling	87.2200	0.0000	0.0000		
E10 Eaves (insulation at ceiling level)	56.0900	0.0600	3.3654		
E12 Gable (insulation at ceiling level)	39.4600	0.0600	2.3676		
E11 Eaves (insulation at rafter level)	11.2900	0.0400	0.4516		
E14 Flat roof	22.3300	0.0800	1.7864		
E13 Gable (insulation at rafter level)	15.6300	0.0800	1.2504		
E17 Corner (inverted - internal area greater than external area)	30.3000	-0.0900	-2.7270		
R1 Head of roof window	5.2500	0.0800	0.4200		
R2 Sill of roof window	5.2500	0.0600	0.3150		
R3 Jamb of roof window	9.2000	0.0800	0.7360		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			22.5311	(36)	
Point Thermal bridges			0.0000	(36a) =	
Total fabric heat loss		(33) + (36) + (36a) =	190.4491	(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)
Heat transfer coeff	164.8276	164.0309	163.2499	159.5819	158.8956	155.7009	155.7009	155.1092	156.9314	158.8956	160.2839	161.7354	(39)
Average = Sum(39)m / 12 =	355.2767	354.4800	353.6991	350.0310	349.3447	346.1500	346.1500	345.5584	347.3806	349.3447	350.7331	352.1845	(39)
													350.0277
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.1414	1.1389	1.1363	1.1246	1.1224	1.1121	1.1121	1.1102	1.1160	1.1224	1.1268	1.1315	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1466 (42)
Hot water usage for mixer showers													
	76.9775	75.8207	74.1350	70.9097	68.5294	65.8751	64.3663	66.0393	67.8732	70.7232	74.0177	76.6826	(42a)
Hot water usage for baths													
	33.2261	32.7326	32.0377	30.7565	29.7971	28.7333	28.1587	28.8487	29.6000	30.7383	32.0460	33.1137	(42b)
Hot water usage for other uses													
	46.8540	45.1502	43.4464	41.7427	40.0389	38.3351	38.3351	40.0389	41.7427	43.4464	45.1502	46.8540	(42c)
Average daily hot water use (litres/day)													144.3710 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	157.0576	153.7035	149.6191	143.4088	138.3654	132.9435	130.8601	134.9269	139.2158	144.9079	151.2139	156.6503	(44)
Energy content (annual)	248.7408	218.8718	229.9590	196.3195	186.2665	163.4695	158.2639	167.0676	171.6670	196.6387	215.4320	245.2765	(45)
Distribution loss (46)m = 0.15 x (45)m													
	37.3111	32.8308	34.4939	29.4479	27.9400	24.5204	23.7396	25.0601	25.7501	29.4958	32.3148	36.7915	(46)
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8903 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0208 (55)
Total storage loss													
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage													
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	303.6476	268.4650	284.8658	249.4551	241.1732	216.6051	213.1707	221.9744	224.8026	251.5455	268.5676	300.1833	(62)
WVHRS	-35.1909	-31.1231	-32.5903	-26.9861	-25.1501	-21.5211	-20.1726	-21.4515	-22.2665	-26.2498	-29.7378	-34.5392	(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													
	268.4567	237.3419	252.2755	222.4690	216.0232	195.0840	192.9981	200.5229	202.5361	225.2957	238.8297	265.6441	(64)
12Total per year (kWh/year)													
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
	126.6317	112.4494	120.3868	107.7847	105.8590	96.8621	96.5482	99.4754	99.5878	109.3078	114.1396	125.4799	(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	(66)
	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	235.7092	260.9638	235.7092	243.5662	235.7092	243.5662	235.7092	243.5662	235.7092	243.5662	235.7092	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	467.3198	472.1692	459.9490	433.9338	401.0943	370.2298	349.6104	344.7611	356.9812	382.9964	415.8359	446.7005 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	(71)
Water heating gains (Table 5)	170.2040	167.3355	161.8102	149.7010	142.2836	134.5307	129.7691	133.7035	138.3164	146.9191	158.5272	168.6558 (72)
Total internal gains	946.4315	973.6669	930.6670	900.3995	852.2857	818.5252	785.2872	784.3723	809.0623	838.8232	891.1279	924.2639 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W		
North				3.8800	10.6334	0.6300		0.7000		0.7700	12.6088 (74)		
East				23.0000	19.6403	0.6300		0.7000		0.7700	138.0534 (76)		
South				16.3000	46.7521	0.6300		0.7000		0.7700	232.8950 (78)		
West				21.4700	19.6403	0.6300		0.7000		0.7700	128.8698 (80)		
North				0.6300	15.2954	0.6300		0.7000		1.0000	3.8246 (82)		
South				1.2600	47.0123	0.6300		0.7000		1.0000	23.5106 (82)		
West				0.6300	26.0000	0.6300		0.7000		1.0000	6.5012 (82)		
Horizontal				2.9700	26.0000	0.6300		0.7000		1.0000	30.6486 (82)		
Solar gains	576.9120	1053.9121	1597.8342	2186.5165	2598.3458	2634.6857	2517.9515	2209.2434	1805.1352	1210.0326	704.7852	484.3639	(83)
Total gains	1523.3436	2027.5790	2528.5012	3086.9160	3450.6314	3453.2109	3303.2387	2993.6157	2614.1975	2048.8558	1595.9131	1408.6279	(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, n _{li,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.7040	31.7753	31.8454	32.1791	32.2423	32.5399	32.5399	32.5956	32.4247	32.2423	32.1147	31.9824	
alpha	3.1136	3.1184	3.1230	3.1453	3.1495	3.1693	3.1693	3.1730	3.1616	3.1495	3.1410	3.1322	
util living area	0.9892	0.9741	0.9411	0.8627	0.7357	0.5747	0.4388	0.4950	0.7258	0.9209	0.9796	0.9915	(86)
MIT	18.5407	18.9248	19.4703	20.1221	20.6031	20.8707	20.9588	20.9396	20.7203	20.0242	19.1520	18.4812	(87)
Th 2	19.9672	19.9692	19.9713	19.9808	19.9826	19.9910	19.9910	19.9925	19.9878	19.9826	19.9790	19.9752	(88)
util rest of house	0.9871	0.9692	0.9300	0.8373	0.6886	0.5021	0.3466	0.3994	0.6599	0.9005	0.9750	0.9898	(89)
MIT 2	17.0708	17.5600	18.2481	19.0537	19.6116	19.8960	19.9702	19.9597	19.7578	18.9553	17.8588	16.9995	(90)
Living area fraction									f _{LA} = Living area / (4) =			0.0847	(91)
MIT	17.1952	17.6756	18.3516	19.1442	19.6955	19.9785	20.0539	20.0427	19.8393	19.0458	17.9683	17.1250	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1952	17.6756	18.3516	19.1442	19.6955	19.9785	20.0539	20.0427	19.8393	19.0458	17.9683	17.1250	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9781	0.9532	0.9065	0.8122	0.6738	0.5012	0.3526	0.4045	0.6490	0.8757	0.9612	0.9823	(94)
Ext temp.	1489.9982	1932.7338	2292.1897	2507.3448	2324.8947	1730.6890	1164.6771	1210.7791	1696.5964	1794.2748	1534.0119	1383.7464	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	4581.3781	4528.6854	4191.9054	3585.7849	2793.1962	1861.7727	1195.5754	1258.7499	1993.7174	2950.5116	3811.8823	4551.9908	(97)
Space heating requirement - total per year (kWh/year)	2299.9867	1744.4795	1413.3885	776.4769	348.4163	0.0000	0.0000	0.0000	0.0000	860.2401	1640.0666	2357.1739	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	2299.9867	1744.4795	1413.3885	776.4769	348.4163	0.0000	0.0000	0.0000	0.0000	860.2401	1640.0666	2357.1739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11440.2285	(98c) / (4) =
Space heating per m2												36.7546	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)

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

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Space heating requirement	2299.9867	1744.4795	1413.3885	776.4769	348.4163	0.0000	0.0000	0.0000	0.0000	860.2401	1640.0666	2357.1739	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	2491.8599	1890.0103	1531.2985	841.2534	377.4825	0.0000	0.0000	0.0000	0.0000	932.0045	1776.8869	2553.8178	(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	268.4567	237.3419	252.2755	222.4690	216.0232	195.0840	192.9981	200.5229	202.5361	225.2957	238.8297	265.6441	(64)
Efficiency of water heater	87.7654	87.6166	87.3086	86.6243	85.1256	79.8000	79.8000	79.8000	79.8000	86.7690	87.5450	79.8000	(216)
Fuel for water heating, kWh/month	305.8798	270.8869	288.9468	256.8206	253.7698	244.4662	241.8523	251.2818	253.8046	259.6500	272.8081	302.5659	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	48.9757	39.2901	35.3764	25.9183	20.0200	16.3565	18.2629	23.7389	30.8344	40.4564	45.6954	50.3369	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-99.5244	-135.4690	-187.9690	-203.5779	-212.8978	-196.0202	-193.1734	-185.2737	-170.8410	-150.6938	-107.4949	-86.5853	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-71.9916	-149.3036	-293.0535	-435.0729	-570.6921	-572.1057	-565.7636	-481.4615	-355.8889	-212.2852	-95.6676	-57.1315	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												12394.6137	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	(216)
Water heating fuel used												3202.7329	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												395.2621	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-5789.9380	(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												10288.6707	(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	12394.6137	0.2100	2602.8689 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3202.7329	0.2100	672.5739 (264)
Space and water heating			3275.4428 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	395.2621	0.1443	57.0485 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1929.5203	0.1354	-261.2683
PV Unit electricity exported	-3860.4177	0.1262	-487.2831
Total			-748.5514 (269)
Total CO2, kg/year			2595.8692 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.3400 (273)

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

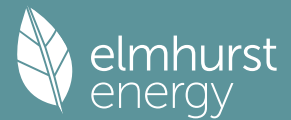
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	12394.6137	1.1300	14005.9135 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3202.7329	1.1300	3619.0882 (278)
Space and water heating			17625.0017 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)

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Energy for lighting	395.2621	1.5338	606.2662 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1929.5203	1.5005	-2895.2119
PV Unit electricity exported	-3860.4177	0.4633	-1788.7161
Total			-4683.9280 (283)
Total Primary energy kWh/year			13677.4406 (286)
Target Primary Energy Rate (TPER)			43.9400 (287)

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Property Reference	Cholmeley Crescent GREEN				Issued on Date	06/07/2023
Assessment Reference	23404 - Cholmeley Crescent	Prop Type Ref				
Property						
SAP Rating	93 A	DER	1.20	TER	8.34	
Environmental	99 A	% DER < TER				85.61
CO ₂ Emissions (t/year)	0.27	DFEE	40.43	TFEE	42.26	
Compliance Check	See BREL	% DFEE < TFEE				4.32
% DPER < TPER	68.71	DPER	13.75	TPER	43.94	
Assessor Details	Mr. Neil Ingham				Assessor ID	AV35-0001
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	117.1400 (1b)	x 2.8000 (2b)	= 327.9920 (1b)	-
First floor	117.1400 (1c)	x 2.8000 (2c)	= 327.9920 (1c)	-
Second floor	76.9800 (1d)	x 2.8400 (2d)	= 218.6232 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	311.2600			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 874.6072 (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	8 * 10 = 80.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

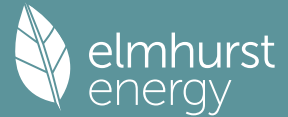
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	80.0000 / (5) =	0.0915 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000 (17)	
Infiltration rate	0.3415 (18)	
Number of sides sheltered	0 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3415 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4354	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3159	0.3415	0.3671	0.3842	0.4012	(22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
DOOR			2.5700	1.2000	3.0840			(26)
G (Uw = 1.20)			64.6500	1.1450	74.0267			(27)
RL			1.2600	1.1450	1.4427			(27a)
RL			0.6300	1.1450	0.7214			(27a)
RL			2.9700	1.1450	3.4008			(27a)
RL			0.6300	1.1450	0.7214			(27a)

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GF			117.1400	0.1400	16.3996	110.0000	12885.4000 (28a)
External Wall	259.9500	67.2200	192.7300	0.1400	26.9822	60.0000	11563.8000 (29a)
SW -RR	73.5000		73.5000	0.1200	8.8200	60.0000	4410.0000 (29a)
DORMER WALLS	20.4000		20.4000	0.1400	2.8560	60.0000	1224.0000 (29a)
FR	3.0800	1.8900	1.1900	0.1100	0.1309	9.0000	10.7100 (30)
PR	44.6500	3.6000	41.0500	0.1100	4.5155	9.0000	369.4500 (30)
DORMER ROOF	6.1800		6.1800	0.1100	0.6798	9.0000	55.6200 (30)
CEILING	39.2300		39.2300	0.1100	4.3153	9.0000	353.0700 (30)
SHELTERED CEILING	37.0800		37.0800	0.1001	3.7114	9.0000	333.7200 (30)
Total net area of external elements Aum(A, m2)			601.2100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	151.8077			(33)
Internal Walls			455.8100			9.0000	4102.2900 (32c)
Internal Floor			194.1200			18.0000	3494.1600 (32d)
Internal Ceiling			194.1200			9.0000	1747.0800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 40549.3000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 130.2747 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	35.2400	0.0540	1.9030
E3 Sill	35.2400	0.0400	1.4096
E4 Jamb	72.2900	0.0490	3.5422
E5 Ground floor (normal)	46.4200	0.0380	1.7640
E6 Intermediate floor within a dwelling	87.2200	0.0120	1.0466
E10 Eaves (insulation at ceiling level)	56.0900	0.0420	2.3558
E12 Gable (insulation at ceiling level)	39.4600	0.0870	3.4330
E11 Eaves (insulation at rafter level)	11.2900	0.0310	0.3500
E14 Flat roof	22.3300	0.0490	1.0942
E13 Gable (insulation at rafter level)	15.6300	0.0910	1.4223
E17 Corner (inverted - internal area greater than external area)	30.3000	-0.0630	-1.9089
R1 Head of roof window	5.2500	0.2400	1.2600
R2 Sill of roof window	5.2500	0.2400	1.2600
R3 Jamb of roof window	9.2000	0.2400	2.2080

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.1398 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 172.9474 (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	171.6642	170.6020	169.5609	164.6706	163.7556	159.4964	159.4964	158.7076	161.1370	163.7556	165.6066	167.5417	(38)
Average = Sum(39)m / 12 =	344.6116	343.5495	342.5083	337.6180	336.7031	332.4438	332.4438	331.6550	334.0844	336.7031	338.5540	340.4891	(39)
												337.6136	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1072	1.1037	1.1004	1.0847	1.0817	1.0681	1.0681	1.0655	1.0733	1.0817	1.0877	1.0939	(40)
HLP (average)												1.0847	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1466 (42)
Hot water usage for mixer showers	76.9775	75.8207	74.1350	70.9097	68.5294	65.8751	64.3663	66.0393	67.8732	70.7232	74.0177	76.6826	(42a)
Hot water usage for baths	34.9748	34.4554	33.7239	32.3752	31.3654	30.2456	29.6407	30.3671	31.1579	32.3561	33.7326	34.8566	(42b)
Hot water usage for other uses	49.3200	47.5265	45.7331	43.9396	42.1462	40.3527	40.3527	42.1462	43.9396	45.7331	47.5265	49.3200	(42c)
Average daily hot water use (litres/day)												148.2342	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	161.2723	157.8026	153.5920	147.2245	142.0410	136.4734	134.3598	138.5525	142.9707	148.8124	155.2769	160.8591	(44)
Energy conte	255.4159	224.7088	236.0652	201.5430	191.2145	167.8099	162.4965	171.5570	176.2972	201.9370	221.2204	251.8665	(45)
Energy content (annual)										Total = Sum(45)m =		2462.1319	
Distribution loss (46)m = 0.15 x (45)m	38.3124	33.7063	35.4098	30.2315	28.6822	25.1715	24.3745	25.7335	26.4446	30.2905	33.1831	37.7800	(46)

Water storage loss:

Store volume 250.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.7800 (49)

Enter (49) or (54) in (55) 1.2558 (55)

Total storage loss

	38.9298	35.1624	38.9298	37.6740	38.9298	37.6740	38.9298	38.9298	37.6740	38.9298	37.6740	38.9298	(56)
If cylinder contains dedicated solar storage	38.9298	35.1624	38.9298	37.6740	38.9298	37.6740	38.9298	38.9298	37.6740	38.9298	37.6740	38.9298	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	349.2033	309.4200	329.8526	292.3050	285.0019	227.9959	224.6887	233.7492	236.4832	295.7244	311.9824	345.6539	(62)
WVHRS	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	-21.0351	-45.8895	-94.7111	-148.1650	-201.1920	-206.6355	-204.0710	-169.3228	-120.4571	-67.0226	-28.4834	-16.4760	(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	328.1682	263.5305	235.1414	144.1400	83.8098	21.3604	20.6177	64.4264	116.0261	228.7018	283.4989	329.1779	(64)
Total per year (kWh/year) = Sum(64)m =												2118.5993	(64)
												2119	(64)

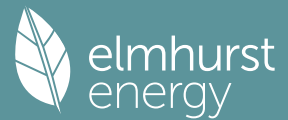
12Total per year (kWh/year)

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)

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Heat gains from water heating, kWh/month
 128.8119 114.3547 122.3777 109.4835 107.4649 73.8064 72.6400 75.6526 76.6284 111.0301 116.0262 127.6317 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	237.3283	262.7563	237.3283	245.2392	237.3283	245.2392	237.3283	237.3283	245.2392	237.3283	245.2392	237.3283	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	467.3198	472.1692	459.9490	433.9338	401.0943	370.2298	349.6104	344.7611	356.9812	382.9964	415.8359	446.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	(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)	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	(71)
Water heating gains (Table 5)	173.1342	170.1707	164.4862	152.0604	144.4421	102.5089	97.6344	101.6836	106.4284	149.2340	161.1475	171.5480	(72)
Total internal gains	947.9809	975.2947	931.9620	901.4319	853.0632	788.1764	754.7716	753.9715	778.8473	839.7573	892.4211	925.7752	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.8800	10.6334	0.5700	0.7000	0.7700	11.4080	(74)
East	23.0000	19.6403	0.5700	0.7000	0.7700	124.9054	(76)
South	16.3000	46.7521	0.5700	0.7000	0.7700	210.7146	(78)
West	21.4700	19.6403	0.5700	0.7000	0.7700	116.5965	(80)
North	0.6300	15.2954	0.5700	0.7000	1.0000	3.4603	(82)
South	1.2600	47.0123	0.5700	0.7000	1.0000	21.2715	(82)
West	0.6300	26.0000	0.5700	0.7000	1.0000	5.8821	(82)
Horizontal	2.9700	26.0000	0.5700	0.7000	1.0000	27.7297	(82)

Solar gains	521.9680	953.5395	1445.6595	1978.2769	2350.8843	2383.7632	2278.1466	1998.8393	1633.2176	1094.7914	637.6628	438.2340	(83)
Total gains	1469.9489	1928.8342	2377.6215	2879.7088	3203.9474	3171.9397	3032.9182	2752.8108	2412.0649	1934.5487	1530.0840	1364.0093	(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	32.6852	32.7862	32.8859	33.3622	33.4529	33.8815	33.8815	33.9621	33.7151	33.4529	33.2700	33.0809	
alpha	3.1790	3.1857	3.1924	3.2241	3.2302	3.2588	3.2588	3.2641	3.2477	3.2302	3.2180	3.2054	
util living area	0.9902	0.9770	0.9480	0.8762	0.7548	0.5972	0.4580	0.5151	0.7470	0.9283	0.9817	0.9923	(86)
Living	19.0935	19.3669	19.7596	20.2426	20.6023	20.8063	20.8742	20.8598	20.6912	20.1813	19.5479	19.0586	
Non living	17.7341	18.0838	18.5814	19.1861	19.6075	19.8316	19.8896	19.8825	19.7219	19.1260	18.3261	17.6972	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0247	19.3669	19.7596	20.2426	20.6023	20.8063	20.8742	20.8598	20.6912	20.1813	19.5479	19.3302	(87)
Th 2	19.9950	19.9978	20.0005	20.0134	20.0158	20.0270	20.0270	20.0291	20.0227	20.0158	20.0109	20.0058	(88)
util rest of house	0.9884	0.9727	0.9381	0.8528	0.7098	0.5259	0.3658	0.4202	0.6841	0.9098	0.9776	0.9908	(89)
MIT 2	19.0937	18.0838	18.5814	19.1861	19.6075	19.8316	19.8896	19.8825	19.7219	19.1260	18.3261	18.1132	(90)
Living area fraction									fLA = Living area / (4) =			0.0847	(91)
MIT	19.1725	18.1925	18.6812	19.2756	19.6918	19.9141	19.9730	19.9653	19.8040	19.2154	18.4296	18.2162	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1725	18.1925	18.6812	19.2756	19.6918	19.9141	19.9730	19.9653	19.8040	19.2154	18.4296	18.2162	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9865	0.9619	0.9211	0.8319	0.6932	0.5170	0.3605	0.4136	0.6680	0.8902	0.9681	0.9870	(94)
Useful gains	1450.0636	1855.3064	2190.0004	2395.7491	2221.1234	1639.9387	1093.3252	1138.4847	1611.3795	1722.1666	1481.2908	1346.3324	(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	5125.2417	4566.6282	4172.1500	3502.9799	2690.8472	1766.6391	1121.3407	1182.4464	1905.6171	2900.8322	3835.6845	4772.3775	(97)
Space heating kWh	2734.3325	1822.0083	1474.7194	797.2062	349.4745	0.0000	0.0000	0.0000	0.0000	876.9273	1695.1634	2548.9775	(98a)
Space heating requirement - total per year (kWh/year)												12298.8090	
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													

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2734.3325	1822.0083	1474.7194	797.2062	349.4745	0.0000	0.0000	0.0000	0.0000	876.9273	1695.1634	2548.9775	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12298.8090
Space heating per m2												(98c) / (4) = 39.5130 (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 %)												403.0641 (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	2734.3325	1822.0083	1474.7194	797.2062	349.4745	0.0000	0.0000	0.0000	0.0000	876.9273	1695.1634	2548.9775 (98)
Space heating efficiency (main heating system 1)	403.0641	403.0641	403.0641	403.0641	403.0641	0.0000	0.0000	0.0000	0.0000	403.0641	403.0641	403.0641 (210)
Space heating fuel (main heating system)	678.3864	452.0393	365.8771	197.7864	86.7044	0.0000	0.0000	0.0000	0.0000	217.5652	420.5691	632.4000 (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	328.1682	263.5305	235.1414	144.1400	83.8098	21.3604	20.6177	64.4264	116.0261	228.7018	283.4989	329.1779 (64)
Efficiency of water heater												169.5454 (216)
(217)m	169.5454	169.5454	169.5454	169.5454	169.5454	169.5454	169.5454	169.5454	169.5454	169.5454	169.5454	169.5454 (217)
Fuel for water heating, kWh/month	193.5577	155.4336	138.6893	85.0156	49.4321	12.5987	12.1606	37.9995	68.4337	134.8912	167.2112	194.1533 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	54.8062	43.9676	39.5879	29.0038	22.4034	18.3038	20.4371	26.5649	34.5052	45.2727	51.1354	56.3294 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-90.9253	-132.3572	-193.9408	-212.2155	-213.6832	-177.0398	-174.3713	-169.8616	-156.0366	-147.4309	-100.0657	-77.5237 (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	-6.9117	-18.9180	-45.3025	-84.8250	-133.1224	-154.1124	-152.2198	-125.4551	-88.7629	-36.6666	-12.0578	-5.6011 (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												3051.3280 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												169.5454
Water heating fuel used												1249.5763 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												442.3175 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2709.4068 (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												2033.8150 (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	3051.3280	0.1556	474.7869 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1249.5763	0.1497	187.0286 (264)
Space and water heating			661.8155 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	442.3175	0.1443	63.8401 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1845.4516	0.1358	-250.6818
PV Unit electricity exported	-863.9552	0.1192	-103.0006

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Total	-353.6824 (269)
Total CO2, kg/year	371.9732 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)	1.2000 (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	3051.3280	1.5760	4808.9461 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1249.5763	1.5539	1941.6973 (278)
Space and water heating			6750.6433 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	442.3175	1.5338	678.4414 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1845.4516	1.5021	-2772.1190
PV Unit electricity exported	-863.9552	0.4372	-377.7038
Total			-3149.8228 (283)
Total Primary energy kWh/year			4279.2620 (286)
Dwelling Primary energy Rate (DPER)			13.7500 (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	117.1400 (1b)	x 2.8000 (2b)	= 327.9920 (1b) -
First floor	117.1400 (1c)	x 2.8000 (2c)	= 327.9920 (1c) -
Second floor	76.9800 (1d)	x 2.8400 (2d)	= 218.6232 (1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	311.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 874.6072 (5)

2. Ventilation rate

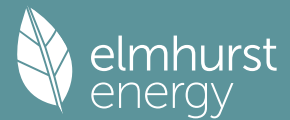
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0457 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2957 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2957 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3771	0.3697	0.3623	0.3253	0.3179	0.2809	0.2809	0.2736	0.2957	0.3179	0.3327	0.3475 (22b)
Effective ac	0.5711	0.5683	0.5656	0.5529	0.5505	0.5395	0.5395	0.5374	0.5437	0.5505	0.5553	0.5604 (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
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TER Opaque door			2.5700	1.0000	2.5700	(26)
TER Opening Type (Uw = 1.20)			64.6500	1.1450	74.0267	(27)
RL			1.2600	1.8519	2.3333	(27a)
RL			0.6300	1.8519	1.1667	(27a)
RL			2.9700	2.0221	6.0055	(27a)
RL			0.6300	2.0221	1.2739	(27a)
GF			117.1400	0.1300	15.2282	(28a)
External Wall	259.9500	67.2200	192.7300	0.1800	34.6914	(29a)
SW -RR	73.5000		73.5000	0.1800	13.2300	(29a)
DORMER WALLS	20.4000		20.4000	0.1800	3.6720	(29a)
FR	3.0800	1.8900	1.1900	0.1100	0.1309	(30)
PR	44.6500	3.6000	41.0500	0.1100	4.5155	(30)
DORMER ROOF	6.1800		6.1800	0.1100	0.6798	(30)
CEILING	39.2300		39.2300	0.1100	4.3153	(30)
SHELTERED CEILING	37.0800		37.0800	0.1100	4.0788	(30)
Total net area of external elements Aum(A, m2)			601.2100			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		167.9180	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 130.2747 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	35.2400	0.0500	1.7620
E3 Sill	35.2400	0.0500	1.7620
E4 Jamb	72.2900	0.0500	3.6145
E5 Ground floor (normal)	46.4200	0.1600	7.4272
E6 Intermediate floor within a dwelling	87.2200	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	56.0900	0.0600	3.3654
E12 Gable (insulation at ceiling level)	39.4600	0.0600	2.3676
E11 Eaves (insulation at rafter level)	11.2900	0.0400	0.4516
E14 Flat roof	22.3300	0.0800	1.7864
E13 Gable (insulation at rafter level)	15.6300	0.0800	1.2504
E17 Corner (inverted - internal area greater than external area)	30.3000	-0.0900	-2.7270
R1 Head of roof window	5.2500	0.0800	0.4200
R2 Sill of roof window	5.2500	0.0600	0.3150
R3 Jamb of roof window	9.2000	0.0800	0.7360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 22.5311 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 190.4491 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	164.8276	164.0309	163.2499	159.5819	158.8956	155.7009	155.7009	155.1092	156.9314	158.8956	160.2839	161.7354	(38)
Heat transfer coeff	355.2767	354.4800	353.6991	350.0310	349.3447	346.1500	346.1500	345.5584	347.3806	349.3447	350.7331	352.1845	(39)
Average = Sum(39)m / 12 =												350.0277	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1414	1.1389	1.1363	1.1246	1.1224	1.1121	1.1121	1.1102	1.1160	1.1224	1.1268	1.1315	(40)
HLP (average)												1.1246	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1466 (42)
Hot water usage for mixer showers	76.9775	75.8207	74.1350	70.9097	68.5294	65.8751	64.3663	66.0393	67.8732	70.7232	74.0177	76.6826	(42a)
Hot water usage for baths	33.2261	32.7326	32.0377	30.7565	29.7971	28.7333	28.1587	28.8487	29.6000	30.7383	32.0460	33.1137	(42b)
Hot water usage for other uses	46.8540	45.1502	43.4464	41.7427	40.0389	38.3351	38.3351	40.0389	41.7427	43.4464	45.1502	46.8540	(42c)
Average daily hot water use (litres/day)												144.3710	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	157.0576	153.7035	149.6191	143.4088	138.3654	132.9435	130.8601	134.9269	139.2158	144.9079	151.2139	156.6503	(44)
Energy conte	248.7408	218.8718	229.9590	196.3195	186.2665	163.4695	158.2639	167.0676	171.6670	196.6387	215.4320	245.2765	(45)
Energy content (annual)												2397.9728	
Distribution loss (46)m = 0.15 x (45)m	37.3111	32.8308	34.4939	29.4479	27.9400	24.5204	23.7396	25.0601	25.7501	29.4958	32.3148	36.7915	(46)

Water storage loss:

Store volume 250.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):

Temperature factor from Table 2b 1.8903 (48)

Enter (49) or (54) in (55) 0.5400 (49)

Total storage loss 1.0208 (55)

31.6444 28.5820 31.6444 30.6236 31.6444 30.6236 31.6444 31.6444 30.6236 31.6444 30.6236 31.6444 (56)

If cylinder contains dedicated solar storage 31.6444 28.5820 31.6444 30.6236 31.6444 30.6236 31.6444 31.6444 30.6236 31.6444 30.6236 31.6444 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month 303.6476 268.4650 284.8658 249.4551 241.1732 216.6051 213.1707 221.9744 224.8026 251.5455 268.5676 300.1833 (62)

WWHRS -35.1909 -31.1231 -32.5903 -26.9861 -25.1501 -21.5211 -20.1726 -21.4515 -22.2665 -26.2498 -29.7378 -34.5392 (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)

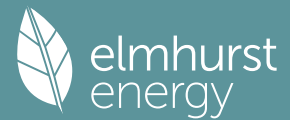
Output from w/h 268.4567 237.3419 252.2755 222.4690 216.0232 195.0840 192.9981 200.5229 202.5361 225.2957 238.8297 265.6441 (64)

Total per year (kWh/year) = Sum(64)m = 2717.4768 (64)

12Total per year (kWh/year) 2717 (64)

Electric shower(s)

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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	126.6317	112.4494	120.3868	107.7847	105.8590	96.8621	96.5482	99.4754	99.5878	109.3078	114.1396	125.4799 (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)
(66)m	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	157.3284	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	235.7092	260.9638	235.7092	243.5662	235.7092	243.5662	235.7092	235.7092	243.5662	235.7092	243.5662	235.7092	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	467.3198	472.1692	459.9490	433.9338	401.0943	370.2298	349.6104	344.7611	356.9812	382.9964	415.8359	446.7005	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	38.7328	(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)	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	-125.8627	(71)
Water heating gains (Table 5)	170.2040	167.3355	161.8102	149.7010	142.2836	134.5307	129.7691	133.7035	138.3164	146.9191	158.5272	168.6558	(72)
Total internal gains	946.4315	973.6669	930.6670	900.3995	852.2857	818.5252	785.2872	784.3723	809.0623	838.8232	891.1279	924.2639	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				3.8800	10.6334		0.6300		0.7000		0.7700		12.6088 (74)
East				23.0000	19.6403		0.6300		0.7000		0.7700		138.0534 (76)
South				16.3000	46.7521		0.6300		0.7000		0.7700		232.8950 (78)
West				21.4700	19.6403		0.6300		0.7000		0.7700		128.8698 (80)
North				0.6300	15.2954		0.6300		0.7000		1.0000		3.8246 (82)
South				1.2600	47.0123		0.6300		0.7000		1.0000		23.5106 (82)
West				0.6300	26.0000		0.6300		0.7000		1.0000		6.5012 (82)
Horizontal				2.9700	26.0000		0.6300		0.7000		1.0000		30.6486 (82)
Solar gains	576.9120	1053.9121	1597.8342	2186.5165	2598.3458	2634.6857	2517.9515	2209.2434	1805.1352	1210.0326	704.7852	484.3639	(83)
Total gains	1523.3436	2027.5790	2528.5012	3086.9160	3450.6314	3453.2109	3303.2387	2993.6157	2614.1975	2048.8558	1595.9131	1408.6279	(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, n _{l,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.7040	31.7753	31.8454	32.1791	32.2423	32.5399	32.5399	32.5956	32.4247	32.2423	32.1147	31.9824	
alpha	3.1136	3.1184	3.1230	3.1453	3.1495	3.1693	3.1693	3.1730	3.1616	3.1495	3.1410	3.1322	
util living area	0.9892	0.9741	0.9411	0.8627	0.7357	0.5747	0.4388	0.4950	0.7258	0.9209	0.9796	0.9915	(86)
MIT	18.5407	18.9248	19.4703	20.1221	20.6031	20.8707	20.9588	20.9396	20.7203	20.0242	19.1520	18.4812	(87)
Th 2	19.9672	19.9692	19.9713	19.9808	19.9826	19.9910	19.9910	19.9925	19.9878	19.9826	19.9790	19.9752	(88)
util rest of house	0.9871	0.9692	0.9300	0.8373	0.6886	0.5021	0.3466	0.3994	0.6599	0.9005	0.9750	0.9898	(89)
MIT 2	17.0708	17.5600	18.2481	19.0537	19.6116	19.8960	19.9702	19.9597	19.7578	18.9553	17.8588	16.9995	(90)
Living area fraction									f _{LA} = Living area / (4) =			0.0847	(91)
MIT	17.1952	17.6756	18.3516	19.1442	19.6955	19.9785	20.0539	20.0427	19.8393	19.0458	17.9683	17.1250	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1952	17.6756	18.3516	19.1442	19.6955	19.9785	20.0539	20.0427	19.8393	19.0458	17.9683	17.1250	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9781	0.9532	0.9065	0.8122	0.6738	0.5012	0.3526	0.4045	0.6490	0.8757	0.9612	0.9823	(94)
Ext temp.	1489.9982	1932.7338	2292.1897	2507.3448	2324.8947	1730.6890	1164.6771	1210.7791	1696.5964	1794.2748	1534.0119	1383.7464	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	4581.3781	4528.6854	4191.9054	3585.7849	2793.1962	1861.7727	1195.5754	1258.7499	1993.7174	2950.5116	3811.8823	4551.9908	(97)
Space heating requirement - total per year (kWh/year)	2299.9867	1744.4795	1413.3885	776.4769	348.4163	0.0000	0.0000	0.0000	0.0000	860.2401	1640.0666	2357.1739	(98a)
Solar heating kWh												11440.2285	
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating kWh	2299.9867	1744.4795	1413.3885	776.4769	348.4163	0.0000	0.0000	0.0000	0.0000	860.2401	1640.0666	2357.1739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11440.2285	
Space heating per m2										(98c) / (4) =		36.7546	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	2299.9867	1744.4795	1413.3885	776.4769	348.4163	0.0000	0.0000	0.0000	0.0000	860.2401	1640.0666	2357.1739 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	2491.8599	1890.0103	1531.2985	841.2534	377.4825	0.0000	0.0000	0.0000	0.0000	932.0045	1776.8869	2553.8178 (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	268.4567	237.3419	252.2755	222.4690	216.0232	195.0840	192.9981	200.5229	202.5361	225.2957	238.8297	265.6441 (64)
Efficiency of water heater (217)m	87.7654	87.6166	87.3086	86.6243	85.1256	79.8000	79.8000	79.8000	79.8000	86.7690	87.5450	79.8000 (216)
Fuel for water heating, kWh/month	305.8798	270.8869	288.9468	256.8206	253.7698	244.4662	241.8523	251.2818	253.8046	259.6500	272.8081	302.5659 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	48.9757	39.2901	35.3764	25.9183	20.0200	16.3565	18.2629	23.7389	30.8344	40.4564	45.6954	50.3369 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-99.5244	-135.4690	-187.9690	-203.5779	-212.8978	-196.0202	-193.1734	-185.2737	-170.8410	-150.6938	-107.4949	-86.5853 (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	-71.9916	-149.3036	-293.0535	-435.0729	-570.6921	-572.1057	-565.7636	-481.4615	-355.8889	-212.2852	-95.6676	-57.1315 (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												12394.6137 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												3202.7329 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												395.2621 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-5789.9380 (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												10288.6707 (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	12394.6137	0.2100	2602.8689 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	3202.7329	0.2100	672.5739 (264)
Space and water heating			3275.4428 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	395.2621	0.1443	57.0485 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1929.5203	0.1354	-261.2683
PV Unit electricity exported	-3860.4177	0.1262	-487.2831
Total			-748.5514 (269)
Total CO2, kg/year			2595.8692 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.3400 (273)

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----- 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	12394.6137	1.1300	14005.9135 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3202.7329	1.1300	3619.0882 (278)
Space and water heating			17625.0017 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	395.2621	1.5338	606.2662 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1929.5203	1.5005	-2895.2119
PV Unit electricity exported	-3860.4177	0.4633	-1788.7161
Total			-4683.9280 (283)
Total Primary energy kWh/year			13677.4406 (286)
Target Primary Energy Rate (TPER)			43.9400 (287)

Part L 2021 Performance	
Residential	Non-residential

Residential

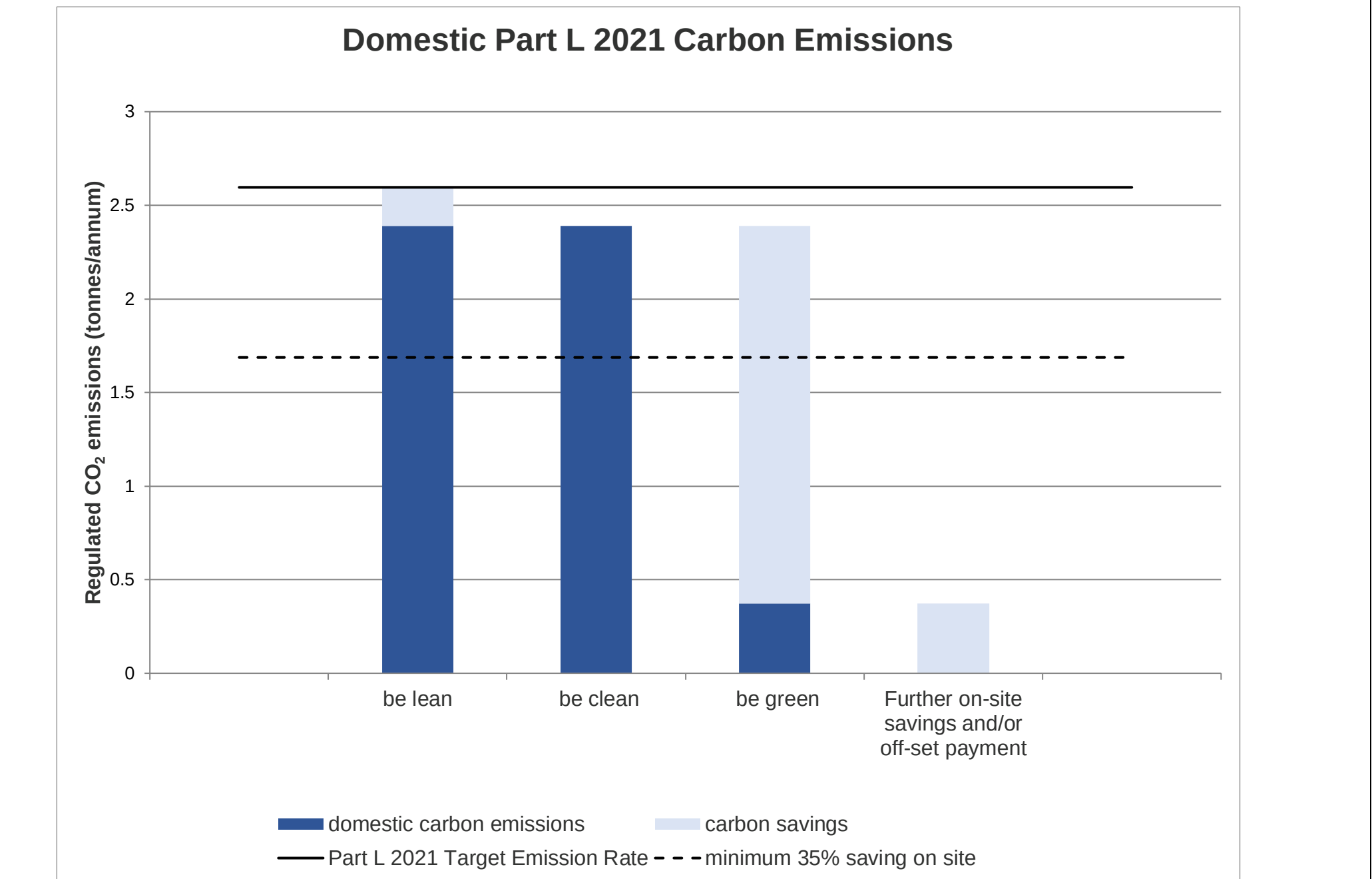
Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

	Carbon Dioxide Emissions for residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	2.6	0.8
After energy demand reduction (be lean)	2.4	0.8
After heat network connection (be clean)	2.4	0.8
After renewable energy (be green)	0.4	0.8

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for residential buildings

	Regulated residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	0.2	8%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	2.0	78%
Cumulative on site savings	2.2	86%
Annual savings from off-set payment	0.4	-
	(Tonnes CO₂)	
Cumulative savings for off-set payment	11	-
Cash in-lieu contribution (£)	1,065	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab



Non-residential	
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99	99
100	100

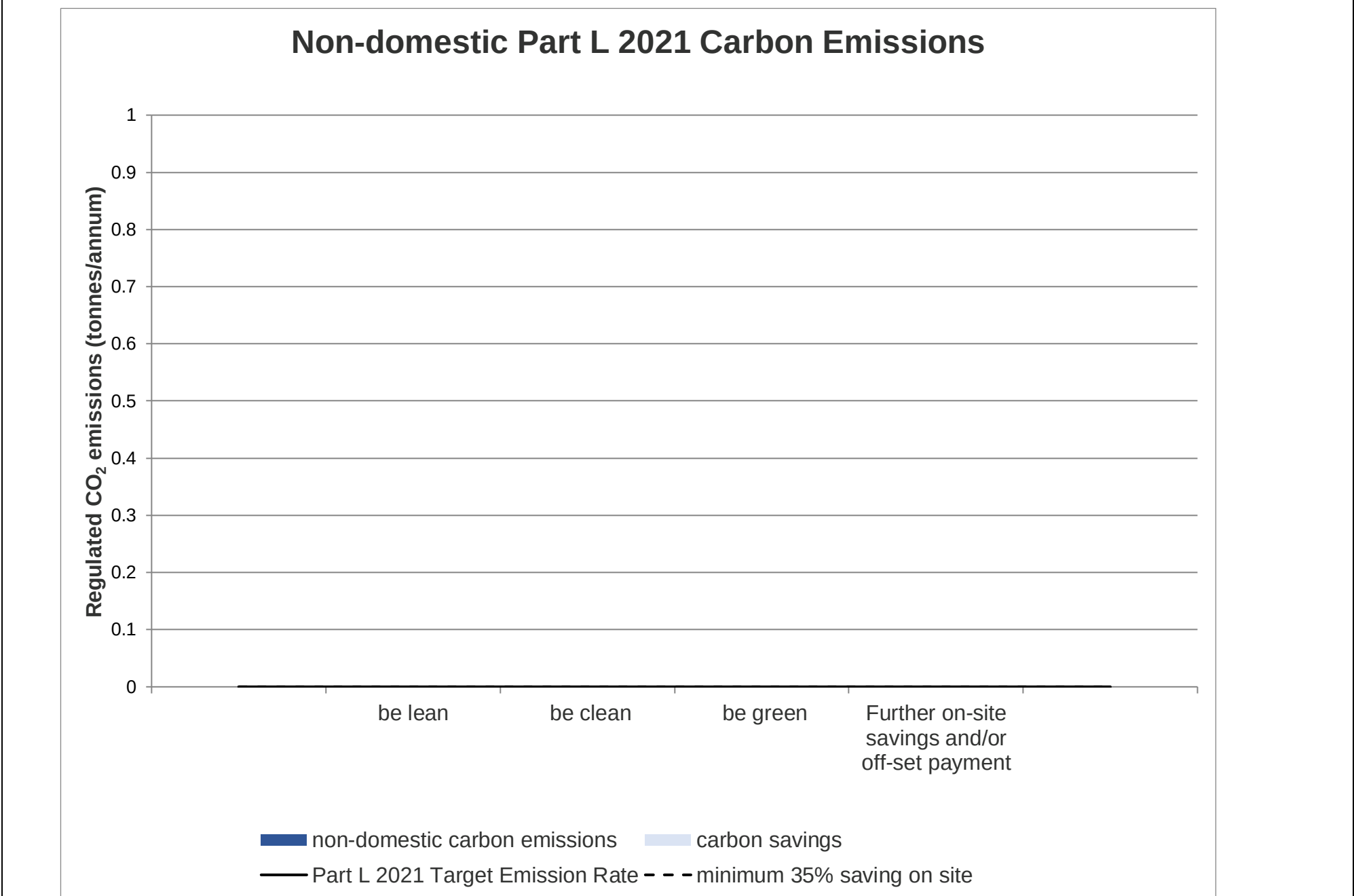
Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential buildings

	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential buildings

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	0.0	0%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Total Cumulative Savings	0.0	0%
Annual savings from off-set payment	0.0	-
	(Tonnes CO₂)	
Cumulative savings for off-set payment	0	-
Cash in-lieu contribution (£)	0	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab



SITE-WIDE

	Total regulated emissions (Tonnes CO ₂ / year)	CO ₂ savings (Tonnes CO ₂ / year)	Percentage savings (%)
Part L 2021 baseline	2.6		
Be lean	2.4	0.2	8%
Be clean	2.4	0.0	0%
Be green	0.4	2.0	78%
Total Savings	-	2.2	86%
	-	CO ₂ savings off-set (Tonnes CO ₂)	-
Off-set	-	11.2	-

	Target Fabric Energy Efficiency (kWh/m²)	Dwelling Fabric Energy Efficiency (kWh/m²)	Improvement (%)
Development total	42.26	40.43	4%

	Area weighted non-residential cooling demand (MJ/m ²)	Total non-residential cooling demand (MJ/year)
Actual		
Notional		

EUI & space heating demand (predicted energy use)

Residential

Building type	EUI (kWh/m ² /year) (excluding renewable energy)	Space heating demand (kWh/m ² /year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m ² /year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m ² /year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)
Residential	33.42209086	9.802094712	35	15	Part L1 - SAP 10.2 & none dwellings / & Landlord Circulation	

Non-residential

Building type	EUI (kWh/m ² /year) (excluding renewable energy)	Space heating demand (kWh/m ² /year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m ² /year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m ² /year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)

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