



London Plan Appendix

Guildens, Courtenay Avenue, London N6 4LP

May 2024

E & S Bristol Ltd

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DOCUMENT CONTROL

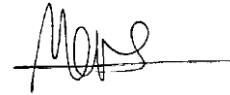
Prepared By: Graham Suttill

Signed:



Checked By: Marcus Eves

Signed:



Revision History

Revision	Date	Details
-	08/05/2024	First issue

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This report has been produced to demonstrate compliance with Part L of the Building Regulations and Local/regional policies relating to sustainability. How this impacts upon other aspects of the Building Regulations will need to be checked and confirmed by a suitably qualified professional.

1. DER REPORTS (BE LEAN)

Full SAP Calculation Printout



Property Reference	Guildens For SAP10				Issued on Date	28/05/2024
Assessment Reference	Be Lean	Prop Type Ref	Guildens For SAP10			
Property						
SAP Rating	88 B	DER	8.56	TER	11.31	
Environmental	89 B	% DER < TER				24.31
CO ₂ Emissions (t/year)	12.52	DFEE	50.46	TFEE	51.51	
Compliance Check	See BREL	% DFEE < TFEE				2.05
% DPER < TPER	18.34	DPER	49.34	TPER	60.42	
Assessor Details	Mr. Graham Suttill				Assessor ID	P035-0001
Client	Carnell Warren Associates Ltd, Wendy Warren					

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)
Basement floor	127.4400 (1a)	x 3.5000 (2a)	= 446.0400 (1a) - (3a)
Ground floor	511.5700 (1b)	x 3.1000 (2b)	= 1585.8670 (1b) - (3b)
First floor	414.1400 (1c)	x 4.4000 (2c)	= 1822.2161 (1c) - (3c)
Second floor	405.1300 (1d)	x 3.4400 (2d)	= 1393.6472 (1d) - (3d)
Third floor	278.8800 (1e)	x 2.8300 (2e)	= 789.2304 (1e) - (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	1737.1600		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 6037.0007 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	8 * 10 = 80.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

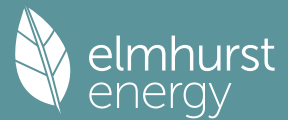
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	80.0000 / (5) =	0.0133 (8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	3.0000		(17)
Infiltration rate	0.1633		(18)
Number of sides sheltered	3		(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1265	(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	0.1613	0.1582	0.1550	0.1392	0.1360	0.1202	0.1202	0.1170	0.1265	0.1360	0.1423	0.1487 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.2563	0.2532	0.2500	0.2342	0.2310	0.2152	0.2152	0.2120	0.2215	0.2310	0.2373	0.2437 (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
Entrance Door			5.6300	1.4000	7.8820		(26)
Door to Garage			1.8900	1.4000	2.6460		(26)
W Main Wall (Uw = 1.20)			190.9800	1.1450	218.6794		(27)
LGF RL			7.7200	1.3258	10.2348		(27a)
Main Flat Roof RL			8.9600	1.3258	11.8788		(27a)
Basement Floor			127.4400	0.1300	16.5672	110.0000	14018.4003 (28)
Lower Ground Floor			385.2500	0.1300	50.0825	110.0000	42377.5000 (28a)
Ground Floor			20.0400	0.1300	2.6052	110.0000	2204.4001 (28a)
Exposed Floor over Garage			44.2200	0.1300	5.7486	75.0000	3316.5001 (28b)
Basement/ Retaining Wall	307.3500		307.3500	0.1800	55.3230	150.0000	46102.5009 (29a)
Main External Wall	958.4700	182.4900	775.9800	0.1800	139.6764	60.0000	46558.7984 (29a)

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Wall to Garage	34.7400	1.8900	32.8500	0.1600	5.2560	60.0000	1971.0001 (29a)
Stud Wall to Eaves	118.6900		118.6900	0.1800	21.3642	9.0000	1068.2100 (29a)
Dormer Cheeks and Face	39.4200	14.1200	25.3000	0.1800	4.5540	9.0000	227.7000 (29a)
Green Roof	42.1400		42.1400	0.1300	5.4782	9.0000	379.2600 (30)
Lower GF Flat Roof	63.6800	7.7200	55.9600	0.1300	7.2748	9.0000	503.6400 (30)
Ceiling to Garage	45.0900		45.0900	0.1300	5.8617	9.0000	405.8100 (30)
1F Ceiling to Terrace	11.4400		11.4400	0.1300	1.4872	9.0000	102.9600 (30)
2F ceiling to Eaves	82.0400		82.0400	0.1300	10.6652	9.0000	738.3600 (30)
Bed 5 Ceiling	112.0300		112.0300	0.1300	14.5639	9.0000	1008.2700 (30)
Dormer Roof	20.2400		20.2400	0.1300	2.6312	9.0000	182.1600 (30)
RinR Flat Roof	112.0300	8.9600	103.0700	0.1300	13.3991	9.0000	927.6300 (30)
Warm Pitch Roof	191.3800		191.3800	0.1300	24.8794	9.0000	1722.4200 (30)
Total net area of external elements Aum(A, m2)			2715.6900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	638.7388			(33)
Int Walls Block			2743.0200			75.0000	205726.5015 (32c)
Int Walls Framed			528.4900			9.0000	4756.4099 (32c)
Int Floors			1160.4900			18.0000	20888.8198 (32d)
Int Ceilings			1160.4900			9.0000	10444.4099 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 405631.6611 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 233.5028 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	78.6900	0.0590	4.6427
E3 Sill	52.3100	0.0200	1.0462
E4 Jamb	232.1600	0.0150	3.4824
E5 Ground floor (normal)	74.5300	0.1000	7.4530
E19 Ground floor (inverted)	48.9400	0.1000	4.8940
E22 Basement floor	81.2800	0.2200	17.8816
E6 Intermediate floor within a dwelling	209.4500	0.0010	0.2094
E10 Eaves (insulation at ceiling level)	20.4200	0.0730	1.4907
E24 Eaves (insulation at ceiling level - inverted)	57.9800	0.1500	8.6970
E11 Eaves (insulation at rafter level)	88.5700	0.0210	1.8600
E14 Flat roof	48.9600	0.1600	7.8336
E15 Flat roof with parapet	16.0000	0.3000	4.8000
E16 Corner (normal)	163.4000	0.0440	7.1896
E17 Corner (inverted - internal area greater than external area)	94.3000	-0.0730	-6.8839
E20 Exposed floor (normal)	14.9000	0.3200	4.7680
E21 Exposed floor (inverted)	11.7400	0.3200	3.7568
E16 Corner (normal)	22.9600	0.1800	4.1328
R1 Head of roof window	10.6000	0.2400	2.5440
R2 Sill of roof window	10.6000	0.2400	2.5440
R3 Jamb of roof window	59.1000	0.2400	14.1840
R4 Ridge (vaulted ceiling)	63.7000	0.1200	7.6440
R5 Ridge (inverted)	38.2200	0.1200	4.5864
R6 Flat ceiling	55.1000	0.1200	6.6120
R7 Flat ceiling (inverted)	56.9300	0.1200	6.8316
R9 Roof to wall (flat ceiling)	37.3700	0.3200	11.9584

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 134.1583 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 772.8971 (37)

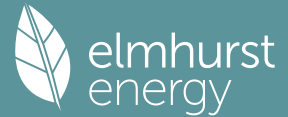
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	510.6294	504.3280	498.0267	466.5199	460.2185	428.7117	428.7117	422.4103	441.3144	460.2185	472.8212	485.4239	(38)
Average = Sum(39)m / 12 =	1283.5265	1277.2251	1270.9238	1239.4170	1233.1156	1201.6088	1201.6088	1195.3074	1214.2115	1233.1156	1245.7183	1258.3211	(39)
												1237.8416	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7389	0.7352	0.7316	0.7135	0.7098	0.6917	0.6917	0.6881	0.6990	0.7098	0.7171	0.7244	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													5.0002 (42)
Hot water usage for mixer showers													
121.5652	119.7384	117.0762	111.9827	108.2238	104.0319	101.6493	104.2913	107.1874	111.6882	116.8911	121.0995	(42a)	
Hot water usage for baths													
46.5917	45.8997	44.9253	43.1287	41.7834	40.2916	39.4859	40.4535	41.5070	43.1032	44.9369	46.4342	(42b)	
Hot water usage for other uses													
65.8374	63.4433	61.0493	58.6552	56.2611	53.8670	53.8670	56.2611	58.6552	61.0493	63.4433	65.8374	(42c)	
Average daily hot water use (litres/day)												215.1291	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	233.9944	229.0814	223.0508	213.7665	206.2683	198.1906	195.0021	201.0058	207.3496	215.8406	225.2713	233.3711	(44)
Energy content (annual)	370.5899	326.2089	342.8208	292.6357	277.6767	243.6984	235.8382	248.8872	255.6827	292.8937	320.9403	365.4027	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		3573.2752	
55.5885	48.9313	51.4231	43.8954	41.6515	36.5548	35.3757	37.3331	38.3524	43.9341	48.1410	54.8104	(46)	
Water storage loss:													
Store volume												800.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												4.5000	(48)
Temperature factor from Table 2b												0.7930	(49)
Enter (49) or (54) in (55)												3.5685	(55)
Total storage loss													
110.6221	99.9167	110.6221	107.0537	110.6221	107.0537	110.6221	110.6221	107.0537	110.6221	107.0537	110.6221	(56)	
If cylinder contains dedicated solar storage													
110.6221	99.9167	110.6221	107.0537	110.6221	107.0537	110.6221	110.6221	107.0537	110.6221	107.0537	110.6221	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
481.2120	426.1256	453.4429	399.6894	388.2988	350.7521	346.4603	359.5093	362.7364	403.5158	427.9939	476.0248	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	481.2120	426.1256	453.4429	399.6894	388.2988	350.7521	346.4603	359.5093	362.7364	403.5158	427.9939	476.0248	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		4875.7612	(64)
Electric shower(s)												4876	(64)
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													
211.7188	188.3978	202.4856	182.9443	180.8252	166.6726	166.9139	171.2527	170.6574	185.8848	192.3556	209.9941	(65)	

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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	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	708.7583	784.6967	708.7583	732.3836	708.7583	732.3836	708.7583	708.7583	732.3836	708.7583	732.3836	708.7583 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	1307.4954	1321.0631	1286.8729	1214.0861	1122.2057	1035.8511	978.1610	964.5932	998.7834	1071.5703	1163.4507	1249.8052 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012 (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)	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095 (71)
Water heating gains (Table 5)	284.5683	280.3539	272.1580	254.0893	243.0446	231.4898	224.3466	230.1783	237.0242	249.8452	267.1605	282.2501 (72)
Total internal gains	2401.8256	2487.1174	2368.7929	2301.5625	2175.0122	2097.7281	2009.2695	2001.5335	2066.1948	2131.1774	2263.9984	2341.8173 (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					26.3400	10.6334		0.6300	0.8000	0.7700		97.8253 (74)
East					109.3600	19.6403		0.6300	0.8000	0.7700		750.1871 (76)
South					7.1000	46.7521		0.6300	0.8000	0.7700		115.9372 (78)
West					48.1800	19.6403		0.6300	0.8000	0.7700		330.5049 (80)
Horizontal					16.6800	26.0000		0.6300	0.8000	1.0000		196.7172 (82)
Solar gains	1491.1718	2899.4539	4767.4407	6996.1813	8647.7619	8893.3935	8449.5288	7202.5193	5553.8984	3435.2097	1855.2807	1229.3280 (83)
Total gains	3892.9974	5386.5712	7136.2336	9297.7439	10822.7741	10991.1216	10458.7983	9204.0527	7620.0933	5566.3872	4119.2791	3571.1453 (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	87.7858	88.2190	88.6563	90.9101	91.3746	93.7705	93.7705	94.2648	92.7972	91.3746	90.4502	89.5443
alpha	6.8524	6.8813	6.9104	7.0607	7.0916	7.2514	7.2514	7.2843	7.1865	7.0916	7.0300	6.9696
util living area	1.0000	0.9999	0.9991	0.9867	0.9003	0.6830	0.5037	0.5917	0.9152	0.9985	1.0000	1.0000 (86)
MIT	20.0246	20.1496	20.3551	20.6456	20.8642	20.9473	20.9561	20.9545	20.8817	20.5686	20.2529	20.0211 (87)
Th 2	20.3066	20.3098	20.3130	20.3289	20.3321	20.3482	20.3482	20.3514	20.3417	20.3321	20.3258	20.3194 (88)
util rest of house	1.0000	0.9999	0.9988	0.9818	0.8690	0.6202	0.4301	0.5112	0.8754	0.9977	1.0000	1.0000 (89)
MIT 2	19.1156	19.2786	19.5448	19.9280	20.1911	20.2869	20.2927	20.2954	20.2239	19.8346	19.4245	19.1217 (90)
Living area fraction	19.1532	19.3146	19.5783	19.9577	20.2189	20.3143	20.3202	20.3226	20.2512	19.8650	19.4588	19.1590 (92)
MIT	19.1532	19.3146	19.5783	19.9577	20.2189	20.3143	20.3202	20.3226	20.2512	19.8650	19.4588	19.1590 (92)
Temperature adjustment	18.9032	19.0646	19.3283	19.7077	19.9689	20.0643	20.0702	20.0726	20.0012	19.6150	19.2088	-0.2500
adjusted MIT	18.9032	19.0646	19.3283	19.7077	19.9689	20.0643	20.0702	20.0726	20.0012	19.6150	19.2088	18.9090 (93)

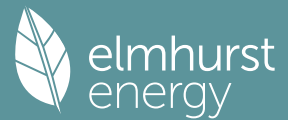
8. Space heating requirement

Utilisation	1.0000	0.9998	0.9981	0.9755	0.8488	0.5916	0.3984	0.4758	0.8492	0.9963	0.9999	1.0000 (94)
Useful gains	3892.9325	5385.6651	7122.9150	9069.7988	9186.1375	6501.9353	4166.6308	4379.4646	6470.9160	5545.7225	4118.9529	3571.1151 (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	18743.6012	18091.4003	16303.8548	13395.2167	10196.5344	6565.9004	4169.8186	4389.9328	7165.2703	11116.5060	15084.2031	18508.6009 (97)
Space heating kWh	11048.8975	8538.2540	6830.6192	3114.3009	751.7353	0.0000	0.0000	0.0000	0.0000	4144.6629	7894.9801	11113.4894 (98a)
Space heating requirement - total per year (kWh/year)												53436.9395
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	11048.8975	8538.2540	6830.6192	3114.3009	751.7353	0.0000	0.0000	0.0000	0.0000	4144.6629	7894.9801	11113.4894 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												53436.9395
Space heating per m2										(98c) / (4) =		30.7611 (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 %)												88.8000 (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	11048.8975	8538.2540	6830.6192	3114.3009	751.7353	0.0000	0.0000	0.0000	0.0000	4144.6629	7894.9801	11113.4894 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	12442.4522	9615.1510	7692.1388	3507.0956	846.5488	0.0000	0.0000	0.0000	0.0000	4667.4132	8890.7434	12515.1908 (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)												

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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	(215)
Water heating													
Water heating requirement	481.2120	426.1256	453.4429	399.6894	388.2988	350.7521	346.4603	359.5093	362.7364	403.5158	427.9939	476.0248	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.3840	88.3265	88.1809	87.6753	85.5150	79.8000	79.8000	79.8000	79.8000	87.9203	88.2880	88.3905	(217)
Fuel for water heating, kWh/month	544.4561	482.4439	514.2189	455.8746	454.0708	439.5389	434.1608	450.5129	454.5569	458.9566	484.7704	538.5472	(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	499.9110	451.5325	499.9110	483.7848	499.9110	483.7848	499.9110	499.9110	483.7848	499.9110	483.7848	499.9110	(231)
Lighting	189.5966	152.1014	136.9505	100.3358	77.5022	63.3200	70.7001	91.8987	119.3673	156.6164	176.8979	194.8661	(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												60176.7336	(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												5712.1079	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)													
mechanical ventilation fans (SFP = 0.7875)												5800.0484	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												5886.0484	(231)
Electricity for lighting (calculated in Appendix L)												1530.1530	(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												73305.0430	(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	60176.7336	0.2100	12637.1141	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	5712.1079	0.2100	1199.5427	(264)
Space and water heating			13836.6567	(265)
Pumps, fans and electric keep-hot	5886.0484	0.1387	816.4675	(267)
Energy for lighting	1530.1530	0.1443	220.8484	(268)
Total CO2, kg/year			14873.9726	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.5600	(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	60176.7336	1.1300	67999.7090	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	5712.1079	1.1300	6454.6819	(278)
Space and water heating			74454.3909	(279)
Pumps, fans and electric keep-hot	5886.0484	1.5128	8904.4141	(281)
Energy for lighting	1530.1530	1.5338	2346.9997	(282)
Total Primary energy kWh/year			85705.8048	(286)
Dwelling Primary energy Rate (DPER)			49.3400	(287)

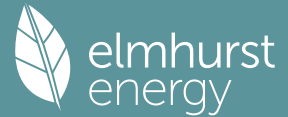
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	127.4400 (1a)	x	3.5000 (2a)	=	446.0400 (1a)	- (3a)
Ground floor	511.5700 (1b)	x	3.1000 (2b)	=	1585.8670 (1b)	- (3b)
First floor	414.1400 (1c)	x	4.4000 (2c)	=	1822.2161 (1c)	- (3c)
Second floor	405.1300 (1d)	x	3.4400 (2d)	=	1393.6472 (1d)	- (3d)
Third floor	278.8800 (1e)	x	2.8300 (2e)	=	789.2304 (1e)	- (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	1737.1600				(4)	

2. DER AND TER REPORTS (BE GREEN)

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Property Reference	Guildens For SAP10				Issued on Date	28/05/2024
Assessment Reference	Be Green	Prop Type Ref	Guildens For SAP10			
Property						
SAP Rating	79 C	DER	3.41	TER	11.31	
Environmental	96 A	% DER < TER				69.85
CO ₂ Emissions (t/year)	4.99	DFEE	50.46	TFEE	51.51	
Compliance Check	See BREL	% DFEE < TFEE				2.05
% DPER < TPER	42.37	DPER	34.82	TPER	60.42	
Assessor Details	Mr. Graham Suttill				Assessor ID	P035-0001
Client	Carnell Warren Associates Ltd, Wendy Warren					

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)	
Basement floor	127.4400 (1a)	x	3.5000 (2a)	=	446.0400 (1a)	- (3a)
Ground floor	511.5700 (1b)	x	3.1000 (2b)	=	1585.8670 (1b)	- (3b)
First floor	414.1400 (1c)	x	4.4000 (2c)	=	1822.2161 (1c)	- (3c)
Second floor	405.1300 (1d)	x	3.4400 (2d)	=	1393.6472 (1d)	- (3d)
Third floor	278.8800 (1e)	x	2.8300 (2e)	=	789.2304 (1e)	- (3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	1737.1600					
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	6037.0007 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	8 * 10 = 80.0000 (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) =	0.0133 (8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	3.0000 (17)		
Infiltration rate	0.1633 (18)		
Number of sides sheltered	3 (19)		
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1265 (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	0.1613	0.1582	0.1550	0.1392	0.1360	0.1202	0.1202	0.1170	0.1265	0.1360	0.1423	0.1487 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.2563	0.2532	0.2500	0.2342	0.2310	0.2152	0.2152	0.2120	0.2215	0.2310	0.2373	0.2437 (25)

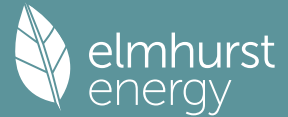
3. Heat losses and heat loss parameter

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
Entrance Door			5.6300	1.4000	7.8820		(26)
Door to Garage			1.8900	1.4000	2.6460		(26)
W Main Wall (Uw = 1.20)			190.9800	1.1450	218.6794		(27)
LGF RL			7.7200	1.3258	10.2348		(27a)
Main Flat Roof RL			8.9600	1.3258	11.8788		(27a)
Basement Floor			127.4400	0.1300	16.5672	110.0000	14018.4003 (28)
Lower Ground Floor			385.2500	0.1300	50.0825	110.0000	42377.5000 (28a)
Ground Floor			20.0400	0.1300	2.6052	110.0000	2204.4001 (28a)
Exposed Floor over Garage			44.2200	0.1300	5.7486	75.0000	3316.5001 (28b)
Basement/ Retaining Wall	307.3500		307.3500	0.1800	55.3230	150.0000	46102.5009 (29a)
Main External Wall	958.4700	182.4900	775.9800	0.1800	139.6764	60.0000	46558.7984 (29a)

elmhurst
energy

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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	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	708.7583	784.6967	708.7583	732.3836	708.7583	732.3836	708.7583	708.7583	732.3836	708.7583	732.3836	708.7583 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	1307.4954	1321.0631	1286.8729	1214.0861	1122.2057	1035.8511	978.1610	964.5932	998.7834	1071.5703	1163.4507	1249.8052 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012 (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)	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095 (71)
Water heating gains (Table 5)	284.5683	280.3539	272.1580	254.0893	243.0446	231.4898	224.3466	230.1783	237.0242	249.8452	267.1605	282.2501 (72)
Total internal gains	2401.8256	2487.1174	2368.7929	2301.5625	2175.0122	2097.7281	2009.2695	2001.5335	2066.1948	2131.1774	2263.9984	2341.8173 (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				26.3400	10.6334		0.6300		0.8000		0.7700		97.8253 (74)
East				109.3600	19.6403		0.6300		0.8000		0.7700		750.1871 (76)
South				7.1000	46.7521		0.6300		0.8000		0.7700		115.9372 (78)
West				48.1800	19.6403		0.6300		0.8000		0.7700		330.5049 (80)
Horizontal				16.6800	26.0000		0.6300		0.8000		1.0000		196.7172 (82)
Solar gains	1491.1718	2899.4539	4767.4407	6996.1813	8647.7619	8893.3935	8449.5288	7202.5193	5553.8984	3435.2097	1855.2807	1229.3280	(83)
Total gains	3892.9974	5386.5712	7136.2336	9297.7439	10822.7741	10991.1216	10458.7983	9204.0527	7620.0933	5566.3872	4119.2791	3571.1453	(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	87.7858	88.2190	88.6563	90.9101	91.3746	93.7705	93.7705	94.2648	92.7972	91.3746	90.4502	89.5443
alpha	6.8524	6.8813	6.9104	7.0607	7.0916	7.2514	7.2514	7.2843	7.1865	7.0916	7.0300	6.9696
util living area	1.0000	0.9999	0.9991	0.9867	0.9003	0.6830	0.5037	0.5917	0.9152	0.9985	1.0000	1.0000 (86)
MIT	20.0246	20.1496	20.3551	20.6456	20.8642	20.9473	20.9561	20.9545	20.8817	20.5686	20.2529	20.0211 (87)
Th 2	20.3066	20.3098	20.3130	20.3289	20.3321	20.3482	20.3482	20.3514	20.3417	20.3321	20.3258	20.3194 (88)
util rest of house	1.0000	0.9999	0.9988	0.9818	0.8690	0.6202	0.4301	0.5112	0.8754	0.9977	1.0000	1.0000 (89)
MIT 2	19.1156	19.2786	19.5448	19.9280	20.1911	20.2869	20.2927	20.2954	20.2239	19.8346	19.4245	19.1217 (90)
Living area fraction	19.1532	19.3146	19.5783	19.9577	20.2189	20.3143	20.3202	20.3226	20.2512	19.8650	19.4588	19.1590 (91)
MIT	19.1532	19.3146	19.5783	19.9577	20.2189	20.3143	20.3202	20.3226	20.2512	19.8650	19.4588	19.1590 (92)
Temperature adjustment	19.0532	19.2146	19.4783	19.8577	20.1189	20.2143	20.2202	20.2226	20.1512	19.7650	19.3588	-0.1000
adjusted MIT	19.0532	19.2146	19.4783	19.8577	20.1189	20.2143	20.2202	20.2226	20.1512	19.7650	19.3588	19.0590 (93)

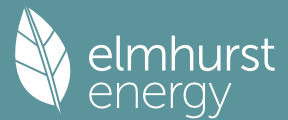
8. Space heating requirement

Utilisation	1.0000	0.9998	0.9983	0.9772	0.8574	0.6068	0.4155	0.4949	0.8613	0.9966	0.9999	1.0000 (94)
Useful gains	3892.9368	5385.7247	7123.8341	9085.7537	9279.7061	6669.1393	4345.6686	4555.1754	6562.9203	5547.7116	4118.9786	3571.1171 (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	18936.1302	18282.9841	16494.4934	13581.1292	10381.5017	6746.1417	4350.0600	4569.2289	7347.4020	11301.4733	15271.0608	18697.3491 (97)
Space heating kWh	11192.1359	8666.9583	6971.7705	3236.6704	819.7359	0.0000	0.0000	0.0000	0.0000	4280.7987	8029.4992	11253.9166 (98a)
Space heating requirement - total per year (kWh/year)												54451.4856
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	11192.1359	8666.9583	6971.7705	3236.6704	819.7359	0.0000	0.0000	0.0000	0.0000	4280.7987	8029.4992	11253.9166 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												54451.4856
Space heating per m ²												(98c) / (4) = 31.3451 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												170.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	11192.1359	8666.9583	6971.7705	3236.6704	819.7359	0.0000	0.0000	0.0000	0.0000	4280.7987	8029.4992	11253.9166 (98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)	6583.6094	5098.2108	4101.0415	1903.9238	482.1976	0.0000	0.0000	0.0000	0.0000	2518.1169	4723.2348	6619.9509 (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)												

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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	(215)
Water heating													
Water heating requirement	481.2120	426.1256	453.4429	399.6894	388.2988	350.7521	346.4603	359.5093	362.7364	403.5158	427.9939	476.0248	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month	283.0659	250.6621	266.7311	235.1114	228.4111	206.3247	203.8002	211.4761	213.3743	237.3622	251.7611	280.0146	(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	492.6069	444.9352	492.6069	476.7163	492.6069	476.7163	492.6069	492.6069	476.7163	492.6069	476.7163	492.6069	(231)
Lighting	189.5966	152.1014	136.9505	100.3358	77.5022	63.3200	70.7001	91.8987	119.3673	156.6164	176.8979	194.8661	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-77.3163	-144.8436	-284.1090	-425.1108	-549.4254	-544.0547	-532.0224	-447.0681	-321.7721	-195.3769	-94.9104	-62.4586	(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	-0.0597	-0.3084	-1.5870	-6.8892	-21.9666	-31.9453	-30.4416	-20.1639	-9.4279	-1.0391	-0.1296	-0.0374	(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												32030.2856	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												2868.0948	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)													
mechanical ventilation fans (SFP = 0.7875)												5800.0484	(230a)
Total electricity for the above, kWh/year												5800.0484	(231)
Electricity for lighting (calculated in Appendix L)												1530.1530	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3802.4640	(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												38426.1179	(238)

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	32030.2856	0.1557	4986.9369 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2868.0948	0.1408	403.8641 (264)
Space and water heating			5390.8010 (265)
Pumps, fans and electric keep-hot	5800.0484	0.1387	804.5382 (267)
Energy for lighting	1530.1530	0.1443	220.8484 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3678.4684	0.1298	-477.3136
PV Unit electricity exported	-123.9956	0.1089	-13.5076
Total			-490.8211 (269)
Total CO2, kg/year			5925.3665 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4100 (273)

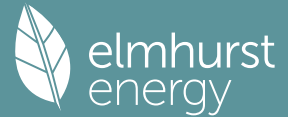
13a. Primary energy - Individual heating systems including micro-CHP			

	Energy	Primary energy factor	Primary energy
	kWh/year	kg CO2/kWh	kWh/year
Space heating - main system 1	32030.2856	1.5764	50493.3052 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2868.0948	1.5207	4361.4257 (278)
Space and water heating			54854.7309 (279)
Pumps, fans and electric keep-hot	5800.0484	1.5128	8774.3133 (281)
Energy for lighting	1530.1530	1.5338	2346.9997 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3678.4684	1.4793	-5441.4850
PV Unit electricity exported	-123.9956	0.3984	-49.3939
Total			-5490.8789 (283)
Total Primary energy kWh/year			60485.1650 (286)
Dwelling Primary energy Rate (DPER)			34.8200 (287)

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

1. Overall dwelling characteristics

Full SAP Calculation Printout



	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	127.4400 (1a)	x	3.5000 (2a)	=	446.0400 (1a) - (3a)	
Ground floor	511.5700 (1b)	x	3.1000 (2b)	=	1585.8670 (1b) - (3b)	
First floor	414.1400 (1c)	x	4.4000 (2c)	=	1822.2161 (1c) - (3c)	
Second floor	405.1300 (1d)	x	3.4400 (2d)	=	1393.6472 (1d) - (3d)	
Third floor	278.8800 (1e)	x	2.8300 (2e)	=	789.2304 (1e) - (3e)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	1737.1600				(4)	
Dwelling volume				(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	6037.0007 (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) =	Air changes per hour	
Pressure test	40.0000 / (5) =	0.0066 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate	5.0000	(17)
Number of sides sheltered	0.2566	(18)
	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1989 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.2536	0.2486	0.2436	0.2188	0.2138	0.1889	0.1889	0.1840	0.1989	0.2138	0.2237	0.2337 (22b)
	0.5322	0.5309	0.5297	0.5239	0.5229	0.5178	0.5178	0.5169	0.5198	0.5229	0.5250	0.5273 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			7.5200	1.0000	7.5200		(26)
TER Opening Type (Uw = 1.20)			190.9800	1.1450	218.6794		(27)
LGF RL			7.7200	1.5918	12.2884		(27a)
Main Flat Roof RL			8.9600	1.5918	14.2622		(27a)
Basement Floor			127.4400	0.1300	16.5672		(28)
Lower Ground Floor			385.2500	0.1300	50.0825		(28a)
Ground Floor			20.0400	0.1300	2.6052		(28a)
Exposed Floor over Garage			44.2200	0.1300	5.7486		(28b)
Basement/ Retaining Wall	307.3500		307.3500	0.1800	55.3230		(29a)
Main External Wall	958.4700	182.4900	775.9800	0.1800	139.6764		(29a)
Wall to Garage	34.7400	1.8900	32.8500	0.1800	5.9130		(29a)
Stud Wall to Eaves	118.6900		118.6900	0.1800	21.3642		(29a)
Dormer Cheeks and Face	39.4200	14.1200	25.3000	0.1800	4.5540		(29a)
Green Roof	42.1400		42.1400	0.1100	4.6354		(30)
Lower GF Flat Roof	63.6800	7.7200	55.9600	0.1100	6.1556		(30)
Ceiling to Garage	45.0900		45.0900	0.1100	4.9599		(30)
1F Ceiling to Terrace	11.4400		11.4400	0.1100	1.2584		(30)
2F ceiling to Eaves	82.0400		82.0400	0.1100	9.0244		(30)
Bed 5 Ceiling	112.0300		112.0300	0.1100	12.3233		(30)
Dormer Roof	20.2400		20.2400	0.1100	2.2264		(30)
RinR Flat Roof	112.0300	8.9600	103.0700	0.1100	11.3377		(30)
Warm Pitch Roof	191.3800		191.3800	0.1100	21.0518		(30)
Total net area of external elements Aum(A, m2)			2715.6900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	627.5569		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							233.5028 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	78.6900	0.0500	3.9345
E3 Sill	52.3100	0.0500	2.6155
E4 Jamb	232.1600	0.0500	11.6080
E5 Ground floor (normal)	74.5300	0.1600	11.9248
E19 Ground floor (inverted)	48.9400	0.0700	3.4258
E22 Basement floor	81.2800	0.0700	5.6896
E6 Intermediate floor within a dwelling	209.4500	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	20.4200	0.0600	1.2252
E24 Eaves (insulation at ceiling level - inverted)	57.9800	0.2400	13.9152
E11 Eaves (insulation at rafter level)	88.5700	0.0400	3.5428
E14 Flat roof	48.9600	0.0800	3.9168
E15 Flat roof with parapet	16.0000	0.5600	8.9600
E16 Corner (normal)	163.4000	0.0900	14.7060
E17 Corner (inverted - internal area greater than external area)	94.3000	-0.0900	-8.4870
E20 Exposed floor (normal)	14.9000	0.3200	4.7680
E21 Exposed floor (inverted)	11.7400	0.3200	3.7568
E16 Corner (normal)	22.9600	0.0900	2.0664
R1 Head of roof window	10.6000	0.0800	0.8480
R2 Sill of roof window	10.6000	0.0600	0.6360
R3 Jamb of roof window	59.1000	0.0800	4.7280
R4 Ridge (vaulted ceiling)	63.7000	0.0800	5.0960
R5 Ridge (inverted)	38.2200	0.0400	1.5288
R6 Flat ceiling	55.1000	0.0600	3.3060
R7 Flat ceiling (inverted)	56.9300	0.0400	2.2772
R9 Roof to wall (flat ceiling)	37.3700	0.0400	1.4948
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			107.4832 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	735.0401 (37)

[illegible]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0334	1.0320	1.0306	1.0240	1.0227	1.0170	1.0170	1.0159	1.0192	1.0227	1.0252	1.0279 (40)
HLP (average)												1.0240
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

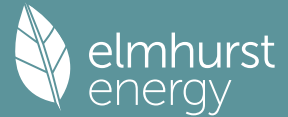
Assumed occupancy													5.0002 (42)
Hot water usage for mixer showers	108.0580	106.4341	104.0677	99.5402	96.1989	92.4728	90.3549	92.7033	95.2777	99.2784	103.9032	107.6440	(42a)
Hot water usage for baths	46.5917	45.8997	44.9253	43.1287	41.7834	40.2916	39.4859	40.4535	41.5070	43.1032	44.9369	46.4342	(42b)
Hot water usage for other uses	65.8374	63.4433	61.0493	58.6552	56.2611	53.8670	53.8670	56.2611	58.6552	61.0493	63.4433	65.8374	(42c)
Average daily hot water use (litres/day)													202.6759 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	220.4871	215.7772	210.0423	201.3240	194.2434	186.6315	183.7078	189.4179	195.4398	203.4308	212.2834	219.9156	(44)
Energy content (annual)	349.1977	307.2638	322.8272	275.6025	261.4889	229.4852	222.1786	234.5389	240.9969	276.0537	302.4366	344.3347	(45)
Distribution loss (46)m = 0.15 x (45)m	52.3797	46.0896	48.4241	41.3404	39.2233	34.4228	33.3268	35.1808	36.1495	41.4081	45.3655	51.6502	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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	395.7926	349.3495	369.4221	320.6944	308.0838	274.5770	268.7735	281.1338	286.0887	322.6486	347.5285	390.9296	(62)
WWHRS	-49.3996	-43.6894	-45.7490	-37.8820	-35.3047	-30.2105	-28.3175	-30.1128	-31.2569	-36.8484	-41.7448	-48.4848	(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	346.3930	305.6601	323.6731	282.8123	272.7792	244.3665	240.4561	251.0210	254.8318	285.8002	305.7836	342.4448	(64)
12Total per year (kWh/year)													3456 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													0.0000 (64a)
Heat gains from water heating, kWh/month	153.3842	135.8338	144.6160	127.7113	124.2210	112.3773	111.1503	115.2601	116.2049	129.0638	136.6336	151.7672	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119	250.0119
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	729.9803	808.1925	729.9803	754.3130	729.9803	754.3130	729.9803	729.9803	754.3130	729.9803	754.3130	729.9803
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	1307.4954	1321.0631	1286.8729	1214.0861	1122.2057	1035.8511	978.1610	964.5932	998.7834	1071.5703	1163.4507	1249.8052
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012	48.0012
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095	-200.0095
Water heating gains (Table 5)	206.1615	202.1336	194.3763	177.3768	166.9637	156.0796	149.3956	154.9195	161.3957	173.4728	189.7690	203.9882
Total internal gains	2344.6408	2432.3928	2312.2331	2246.7794	2120.1533	2044.2472	1955.5404	1947.4966	2012.4957	2076.0270	2208.5362	2284.7773

[Jan]					Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
North					26.3400	10.6334	0.6300	0.7000	0.7700	85.5972 (74)		
East					109.3600	19.6403	0.6300	0.7000	0.7700	656.4137 (76)		
South					7.1000	46.7521	0.6300	0.7000	0.7700	101.4451 (78)		
West					48.1800	19.6403	0.6300	0.7000	0.7700	289.1918 (80)		
Horizontal					16.6800	26.0000	0.6300	0.7000	1.0000	172.1276 (82)		
Solar gains	1304.7753	2537.0221	4171.5106	6121.6586	7566.7916	7781.7193	7393.3377	6302.2043	4859.6611	3005.8085	1623.3706	1075.6620 (83)
Total gains	3649.4161	4969.4149	6483.7437	8368.4381	9686.9448	9825.9665	9348.8781	8249.7009	6872.1568	5081.8355	3831.9068	3360.4393 (84)

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	62.7650	62.8520	62.9376	63.3428	63.4192	63.7772	63.7772	63.8439	63.6388	63.4192	63.2648	63.1043

Full SAP Calculation Printout



alpha	5.1843	5.1901	5.1958	5.2229	5.2279	5.2518	5.2518	5.2563	5.2426	5.2279	5.2177	5.2070
util living area	1.0000	0.9999	0.9994	0.9956	0.9737	0.8927	0.7538	0.8333	0.9780	0.9991	0.9999	1.0000 (86)
MIT	19.2465	19.4083	19.7021	20.1198	20.5268	20.8306	20.9515	20.9169	20.6330	20.1057	19.6043	19.2241 (87)
Th 2	20.0556	20.0568	20.0579	20.0634	20.0644	20.0692	20.0692	20.0701	20.0673	20.0644	20.0624	20.0602 (88)
util rest of house	1.0000	0.9999	0.9992	0.9936	0.9601	0.8329	0.6291	0.7245	0.9607	0.9987	0.9999	1.0000 (89)
MIT 2	17.9504	18.1589	18.5365	19.0752	19.5882	19.9425	20.0480	20.0272	19.7277	19.0590	18.4143	17.9250 (90)
Living area fraction	18.0040	18.2106	18.5848	19.1184	19.6271	19.9792	20.0854	20.0640	19.7652	19.1024	18.4636	0.0414 (91)
MIT	18.0040	18.2106	18.5848	19.1184	19.6271	19.9792	20.0854	20.0640	19.7652	19.1024	18.4636	17.9788 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0040	18.2106	18.5848	19.1184	19.6271	19.9792	20.0854	20.0640	19.7652	19.1024	18.4636	17.9788 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	1.0000	0.9998	0.9987	0.9905	0.9511	0.8257	0.6316	0.7236	0.9521	0.9978	0.9999	1.0000	(94)
Useful gains	3649.2590	4968.2711	6475.0698	8289.2276	9213.4587	8113.3656	5904.4761	5969.5977	6543.0793	5070.4875	3831.3806	3360.3479	(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	24601.4456	23862.0406	21635.0217	18176.7613	14083.8528	9503.4995	6157.6210	6466.4238	10030.4249	15105.9900	20238.6485	24602.6095	(97)
Space heating kWh	15588.4268	12696.6131	11279.0043	7119.0243	3623.5732	0.0000	0.0000	0.0000	0.0000	7466.4138	11813.2328	15804.2426	(98a)
Space heating requirement - total per year (kWh/year)												85390.5310	
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	15588.4268	12696.6131	11279.0043	7119.0243	3623.5732	0.0000	0.0000	0.0000	0.0000	7466.4138	11813.2328	15804.2426	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												85390.5310	
Space heating per m2										(98c) / (4) =		49.1552	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	15588.4268	12696.6131	11279.0043	7119.0243	3623.5732	0.0000	0.0000	0.0000	0.0000	7466.4138	11813.2328	15804.2426	(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)	16888.8697	13755.8105	12219.9396	7712.9191	3925.8648	0.0000	0.0000	0.0000	0.0000	8089.2891	12798.7355	17122.6897	(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	346.3930	305.6601	323.6731	282.8123	272.7792	244.3665	240.4561	251.0210	254.8318	285.8002	305.7836	342.4448	(64)
Efficiency of water heater (217)m	88.5828	88.5652	88.5215	88.4190	88.1044	79.8000	79.8000	79.8000	79.8000	88.4323	88.5480	88.5881	(216)
Fuel for water heating, kWh/month	391.0385	345.1244	365.6435	319.8548	309.6092	306.2237	301.3234	314.5627	319.3381	323.1853	345.3309	386.5584	(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	151.6755	121.6797	109.5591	80.2677	62.0011	50.6554	56.5594	73.5181	95.4928	125.2917	141.5166	155.8910	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-132.9637	-195.0300	-291.2488	-340.1637	-377.1495	-355.0152	-350.0149	-325.0813	-283.2994	-228.0873	-148.6331	-114.0417	(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)	-53.6336	-114.7824	-232.0696	-354.6430	-475.3406	-480.6513	-475.6547	-400.2792	-289.7454	-166.8081	-72.3933	-42.3119	(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												92514.1181	(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												4027.7929	(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)												1224.1081	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-6299.0414	(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												91552.9777	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	92514.1181	0.2100	19427.9648 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	4027.7929	0.2100	845.8365 (264)
Space and water heating			20273.8013 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	1224.1081	0.1443	176.6766 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3140.7284	0.1338	-420.3434
PV Unit electricity exported	-3158.3130	0.1254	-395.9090
Total			-816.2524 (269)
Total CO2, kg/year			19646.1548 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3100 (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	92514.1181	1.1300	104540.9534 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4027.7929	1.1300	4551.4060 (278)
Space and water heating			109092.3594 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	1224.1081	1.5338	1877.5778 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3140.7284	1.4946	-4694.1154
PV Unit electricity exported	-3158.3130	0.4601	-1453.1652
Total			-6147.2806 (283)
Total Primary energy kWh/year			104952.7574 (286)
Target Primary Energy Rate (TPER)			60.4200 (287)