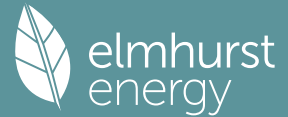


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Property Reference	HOUSE				Issued on Date	13/08/2024
Assessment Reference	Be Lean	Prop Type Ref				
Property	Gondar Gardens, NW6 1EW					
SAP Rating	84 B	DER	14.79	TER	13.90	
Environmental	88 B	% DER < TER				-6.40
CO ₂ Emissions (t/year)	0.95	DFEE	41.97	TFEE	44.69	
Compliance Check	See BREL	% DFEE < TFEE				6.09
% DPER < TPER	-15.44	DPER	84.17	TPER	72.91	
Assessor Details	Mr. Ondrej Gajdos				Assessor ID	W452-0001
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	35.5000 (1b)	x 2.7000 (2b)	= 95.8500 (1b) - (3b)
First floor	37.8000 (1c)	x 3.2500 (2c)	= 122.8500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 218.7000 (5)

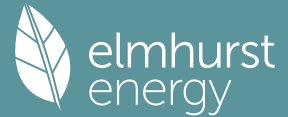
2. Ventilation rate

	m ³ per hour											
Number of open chimneys	0 * 80 = 0.0000 (6a)											
Number of open flues	0 * 20 = 0.0000 (6b)											
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)											
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)											
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)											
Number of blocked chimneys	0 * 20 = 0.0000 (6f)											
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)											
Number of passive vents	0 * 10 = 0.0000 (7b)											
Number of flueless gas fires	0 * 40 = 0.0000 (7c)											
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)											
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	4.0000 (17)											
Infiltration rate	0.2000 (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) = 0.1550 (21)											
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (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	0.2926	0.2888	0.2849	0.2655	0.2616	0.2422	0.2422	0.2384	0.2500	0.2616	0.2694	0.2771 (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
1 (Uw = 1.20)			2.5600	1.1450	2.9313		(27)
2 (Uw = 1.20)			8.0400	1.1450	9.2061		(27)
3 (Uw = 1.20)			1.3200	1.1450	1.5115		(27)
1			1.9800	1.0000	1.9800		(26)
1			1.6150	1.1450	1.8550		(27a)
2			1.9550	1.1450	2.2443		(27a)
ground			35.5000	0.1300	4.6150	110.0000	3905.0000 (28a)
exposed below 1F			1.0000	0.1300	0.1300	75.0000	75.0000 (28b)
exposed	99.3000	13.9000	85.4000	0.1800	15.3720	60.0000	5124.0000 (29a)
pitched (rafters)	46.1000	3.5700	42.5300	0.1100	4.6783	9.0000	382.7700 (30)
Total net area of external elements Aum(A, m ²)			181.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.5234		(33)
pw			38.4000	0.0000	0.0000	110.0000	4224.0000 (32)
iw			153.4700			9.0000	1381.2300 (32c)

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if 35.5000 18.0000 639.0000 (32d)
ic 35.5000 9.0000 319.5000 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K (28)...(30) + (32) + (32a)...(32e) = 16050.5000 (34)
List of Thermal Bridges 218.9700 (35)

K1 Element Length Psi-value Total
E2 Other lintels (including other steel lintels) 181.9000 0.0500 9.0950
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.0950 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.6184 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Heat transfer coeff 21.1190 20.8394 20.5597 19.1614 18.8817 17.4834 17.4834 17.2038 18.0428 18.8817 19.4411 20.0004 (38)
Average = Sum(39)m / 12 = 74.7374 74.4578 74.1781 72.7798 72.5001 71.1018 71.1018 70.8222 71.6611 72.5001 73.0595 73.6188 (39)
72.7099

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
HLP (average) 1.0196 1.0158 1.0120 0.9929 0.9891 0.9700 0.9700 0.9662 0.9776 0.9891 0.9967 1.0043 (40)
Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3235 (42)
Hot water usage for mixer showers 63.1772 62.2278 60.8442 58.1972 56.2437 54.0652 52.8269 54.1999 55.7050 58.0441 60.7480 62.9351 (42a)
Hot water usage for baths 27.2915 26.8862 26.3154 25.2630 24.4750 23.6012 23.1292 23.6960 24.3131 25.2481 26.3222 27.1992 (42b)
Hot water usage for other uses 38.4250 37.0277 35.6305 34.2332 32.8359 31.4386 31.4386 32.8359 34.2332 35.6305 37.0277 38.4250 (42c)
Average daily hot water use (litres/day) 118.4826 (43)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Daily hot water use 128.8937 126.1416 122.7901 117.6933 113.5546 109.1050 107.3947 110.7318 114.2513 118.9226 124.0979 128.5593 (44)
Energy conte 204.1361 179.6240 188.7238 161.1163 152.8663 134.1573 129.8846 137.1091 140.8833 161.3769 176.8002 201.2929 (45)
Energy content (annual) Total = Sum(45)m = 1967.9708
Distribution loss (46)m = 0.15 x (45)m

30.6204 26.9436 28.3086 24.1674 22.9299 20.1236 19.4827 20.5664 21.1325 24.2065 26.5200 30.1939 (46)
Water storage loss:
Total storage loss

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)

If cylinder contains dedicated solar storage 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)

Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)

Combi loss 50.9589 46.0274 50.9589 49.3151 50.9589 49.3151 50.9589 50.9589 49.3151 50.9589 49.3151 50.9589 (61)

Total heat required for water heating calculated for each month 255.0950 225.6514 239.6827 210.4314 203.8252 183.4724 180.8435 188.0680 190.1984 212.3358 226.1153 252.2518 (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 255.0950 225.6514 239.6827 210.4314 203.8252 183.4724 180.8435 188.0680 190.1984 212.3358 226.1153 252.2518 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2567.9708 (64)

Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Heat gains from water heating, kWh/month 80.6150 71.2318 75.4904 65.8999 63.5678 56.9361 55.9264 58.3285 59.1725 66.3975 71.1148 79.6696 (65)

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

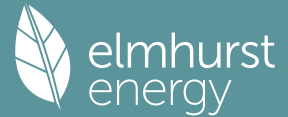
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(66)m 116.1752 116.1752 116.1752 116.1752 116.1752 116.1752 116.1752 116.1752 116.1752 116.1752 116.1752 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 103.3529 114.4264 103.3529 106.7980 103.3529 106.7980 103.3529 103.3529 106.7980 103.3529 106.7980 103.3529 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 204.8733 206.9993 201.6420 190.2369 175.8400 162.3090 153.2695 151.1435 156.5008 167.9059 182.3028 195.8338 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 34.6175 34.6175 34.6175 34.6175 34.6175 34.6175 34.6175 34.6175 34.6175 34.6175 34.6175 34.6175 (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) -92.9401 -92.9401 -92.9401 -92.9401 -92.9401 -92.9401 -92.9401 -92.9401 -92.9401 -92.9401 -92.9401 -92.9401 (71)
Water heating gains (Table 5) 108.3534 105.9998 101.4656 91.5277 85.4405 79.0779 75.1698 78.3985 82.1840 89.2440 98.7706 107.0828 (72)
Total internal gains 477.4323 488.2780 467.3130 449.4151 425.4860 406.0374 389.6448 390.7475 403.3354 421.3554 448.7239 467.1221 (73)

6. Solar gains

[Jan] Area Solar flux g FF Access Gains
m2 Table 6a W/m2 Specific data or Table 6b Specific data or Table 6c factor Table 6d W
East 2.5600 19.6403 0.6300 0.7000 0.7700 15.3659 (76)
West 8.0400 19.6403 0.6300 0.7000 0.7700 48.2587 (80)
West 1.3200 19.6403 0.6300 0.7000 0.7700 7.9231 (80)
South 1.6150 43.9921 0.6300 0.7000 1.0000 28.1986 (82)
South 1.9550 43.9921 0.6300 0.7000 1.0000 34.1352 (82)

Solar gains 133.8815 253.7009 402.3962 570.2202 688.8679 701.8950 669.5066 580.9233 461.9185 296.5386 165.3423 111.1814 (83)
Total gains 611.3137 741.9789 869.7092 1019.6354 1114.3539 1107.9324 1059.1514 971.6708 865.2538 717.8940 614.0662 578.3035 (84)

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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	59.6551	59.8792	60.1050	61.2598	61.4961	62.7055	62.7055	62.9531	62.2160	61.4961	61.0253	60.5616	
alpha	4.9770	4.9919	5.0070	5.0840	5.0997	5.1804	5.1804	5.1969	5.1477	5.0997	5.0684	5.0374	
util living area	0.9852	0.9632	0.9084	0.7690	0.5857	0.4083	0.2950	0.3345	0.5573	0.8559	0.9676	0.9883 (86)	
MIT	19.9244	20.1931	20.5237	20.8383	20.9639	20.9955	20.9993	20.9988	20.9794	20.7661	20.2949	19.8886 (87)	
Th 2	20.0670	20.0702	20.0734	20.0893	20.0924	20.1084	20.1084	20.1116	20.1020	20.0924	20.0861	20.0797 (88)	
util rest of house	0.9813	0.9542	0.8882	0.7299	0.5344	0.3525	0.2354	0.2703	0.4902	0.8179	0.9581	0.9852 (89)	
MIT 2	18.8307	19.1686	19.5716	19.9385	20.0646	20.1059	20.1082	20.1111	20.0891	19.8752	19.3122	18.7949 (90)	
Living area fraction									FLA = Living area / (4) =				0.3888 (91)
MIT	19.2559	19.5670	19.9418	20.2883	20.4143	20.4518	20.4547	20.4563	20.4352	20.2215	19.6943	19.2202 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	19.1059	19.4170	19.7918	20.1383	20.2643	20.3018	20.3047	20.3063	20.2852	20.0715	19.5443	19.0702 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9760	0.9464	0.8812	0.7321	0.5443	0.3646	0.2486	0.2844	0.5041	0.8169	0.9511	0.9806 (94)
Useful gains	596.6182	702.2415	766.3452	746.4772	606.5755	403.9975	263.2618	276.3600	436.2168	586.4714	584.0153	567.1078 (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	1106.5578	1080.9006	985.9594	817.9240	620.9097	405.4069	263.4084	276.6492	443.2403	686.6885	909.1729	1094.7226 (97)
Space heating kWh	379.3950	254.4589	163.3930	51.4417	10.6646	0.0000	0.0000	0.0000	0.0000	74.5615	234.1135	392.5454 (98a)
Space heating requirement - total per year (kWh/year)												1560.5736
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	379.3950	254.4589	163.3930	51.4417	10.6646	0.0000	0.0000	0.0000	0.0000	74.5615	234.1135	392.5454 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1560.5736
Space heating per m2										(98c) / (4) =		21.2902 (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 %)													88.9000 (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	379.3950	254.4589	163.3930	51.4417	10.6646	0.0000	0.0000	0.0000	0.0000	74.5615	234.1135	392.5454 (98)	
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)	
Space heating fuel (main heating system)	426.7661	286.2305	183.7941	57.8647	11.9962	0.0000	0.0000	0.0000	0.0000	83.8712	263.3447	441.5584 (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	255.0950	225.6514	239.6827	210.4314	203.8252	183.4724	180.8435	188.0680	190.1984	212.3358	226.1153	252.2518 (64)	
Efficiency of water heater												80.3000 (216)	
(217)m	85.2301	84.6396	83.5774	81.8555	80.6881	80.3000	80.3000	80.3000	80.3000	82.3709	84.4560	85.3250 (217)	
Fuel for water heating, kWh/month	299.3015	266.6027	286.7793	257.0766	252.6087	228.4836	225.2099	234.2068	236.8597	257.7801	267.7314	295.6363 (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	22.8835	20.6690	22.8835	22.1453	22.8835	22.1453	22.8835	22.8835	22.1453	22.8835	22.1453	22.8835 (231)	
Lighting	21.4747	17.2278	15.5117	11.3646	8.7783	7.1720	8.0079	10.4089	13.5202	17.7392	20.0364	22.0715 (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													1755.4258 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													3108.2765 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6875)													
mechanical ventilation fans (SFP = 0.6875)													183.4346 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													269.4346 (231)
Electricity for lighting (calculated in Appendix L)													173.3131 (232)

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Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	5306.4500 (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	1755.4258	0.2100	368.6394 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	3108.2765	0.2100	652.7381 (264)
Space and water heating			1021.3775 (265)
Pumps, fans and electric keep-hot	269.4346	0.1387	37.3739 (267)
Energy for lighting	173.3131	0.1443	25.0144 (268)
Total CO2, kg/year			1083.7658 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.7900 (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	1755.4258	1.1300	1983.6312 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3108.2765	1.1300	3512.3525 (278)
Space and water heating			5495.9836 (279)
Pumps, fans and electric keep-hot	269.4346	1.5128	407.6007 (281)
Energy for lighting	173.3131	1.5338	265.8334 (282)
Total Primary energy kWh/year			6169.4177 (286)
Dwelling Primary energy Rate (DPER)			84.1700 (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	35.5000 (1b)	x 2.7000 (2b)	= 95.8500 (1b) - (3b)
First floor	37.8000 (1c)	x 3.2500 (2c)	= 122.8500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 218.7000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

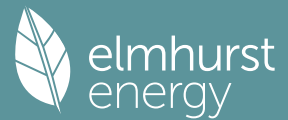
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1372 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3872	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3001 (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	0.3826	0.3751	0.3676	0.3301	0.3226	0.2851	0.2851	0.2776	0.3001	0.3226	0.3376	0.3526 (22b)
Effective ac	0.5732	0.5703	0.5676	0.5545	0.5520	0.5406	0.5406	0.5385	0.5450	0.5520	0.5570	0.5622 (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			1.9800	1.0000	1.9800		(26)
TER Opening Type (Uw = 1.20)			11.9200	1.1450	13.6489		(27)
1			1.6150	1.9373	3.1384		(27a)
2			1.9550	1.9373	3.7970		(27a)
ground			35.5000	0.1300	4.6150		(28a)
exposed below 1F			1.0000	0.1300	0.1300		(28b)
exposed	99.3000	13.9000	85.4000	0.1800	15.3720		(29a)
pitched (rafters)	46.1000	3.5700	42.5300	0.1100	4.6783		(30)
Total net area of external elements Aum(A, m2)			181.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.3596		(33)
pw			38.4000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							218.9700 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				181.9000	0.0500	9.0950	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						9.0950	(36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	56.4546 (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	41.3671	41.1621	40.9610	40.0168	39.8401	39.0177	39.0177	38.8654	39.3345	39.8401	40.1975	40.5711	(38)
Average = Sum(39)m / 12 =	97.8217	97.6166	97.4156	96.4714	96.2947	95.4723	95.4723	95.3200	95.7891	96.2947	96.6521	97.0257	(39)
												96.4705	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3345	1.3317	1.3290	1.3161	1.3137	1.3025	1.3025	1.3004	1.3068	1.3137	1.3186	1.3237	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3235 (42)
Hot water usage for mixer showers													
Hot water usage for baths	63.1772	62.2278	60.8442	58.1972	56.2437	54.0652	52.8269	54.1999	55.7050	58.0441	60.7480	62.9351	(42a)
Hot water usage for other uses	27.2915	26.8862	26.3154	25.2630	24.4750	23.6012	23.1292	23.6960	24.3131	25.2481	26.3222	27.1992	(42b)
Average daily hot water use (litres/day)	38.4250	37.0277	35.6305	34.2332	32.8359	31.4386	31.4386	32.8359	34.2332	35.6305	37.0277	38.4250	(42c)
												118.4826	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	128.8937	126.1416	122.7901	117.6933	113.5546	109.1050	107.3947	110.7318	114.2513	118.9226	124.0979	128.5593	(44)
Energy content (annual)	204.1361	179.6240	188.7238	161.1163	152.8663	134.1573	129.8846	137.1091	140.8833	161.3769	176.8002	201.2929	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	30.6204	26.9436	28.3086	24.1674	22.9299	20.1236	19.4827	20.5664	21.1325	24.2065	26.5200	30.1939	(46)
Total storage loss													
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
WWHRS	255.0950	225.6514	239.6827	210.4314	203.8252	183.4724	180.8435	188.0680	190.1984	212.3358	226.1153	252.2518	(62)
PV diverter	-28.8820	-25.5435	-26.7476	-22.1481	-20.6412	-17.6628	-16.5561	-17.6058	-18.2747	-21.5438	-24.4065	-28.3471	(63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Total per year (kWh/year)	226.2130	200.1080	212.9351	188.2833	183.1839	165.8095	164.2874	170.4623	171.9237	190.7920	201.7088	223.9046	(64)
Electric shower(s)													
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)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	(64a)
Heat gains from water heating, kWh/month	80.6150	71.2318	75.4904	65.8999	63.5678	56.9361	55.9264	58.3285	59.1725	66.3975	71.1148	79.6696	(65)

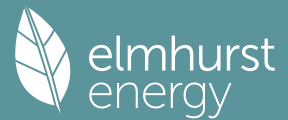
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	116.1752	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	103.3529	114.4264	103.3529	106.7980	103.3529	106.7980	103.3529	103.3529	106.7980	103.3529	106.7980	103.3529	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	204.8733	206.9993	201.6420	190.2369	175.8400	162.3090	153.2695	151.1435	156.5008	167.9059	182.3028	195.8338	(68)
Pumps, fans	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	34.6175	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	-92.9401	(71)
Total internal gains	108.3534	105.9998	101.4656	91.5277	85.4405	79.0779	75.1698	78.3985	82.1840	89.2440	98.7706	107.0828	(72)
	477.4323	488.2780	467.3130	449.4151	425.4860	406.0374	389.6448	390.7475	403.3354	421.3554	448.7239	467.1221	(73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
East		2.5600	19.6403	0.6300	0.7000	0.7700	15.3659 (76)
West		9.3600	19.6403	0.6300	0.7000	0.7700	56.1817 (80)
South		3.5700	43.9921	0.6300	0.7000	1.0000	62.3338 (82)

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Solar gains	133.8815	253.7009	402.3962	570.2202	688.8679	701.8950	669.5066	580.9233	461.9185	296.5386	165.3423	111.1814 (83)
Total gains	611.3137	741.9789	869.7092	1019.6354	1114.3539	1107.9324	1059.1514	971.6708	865.2538	717.8940	614.0662	578.3035 (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	45.5775	45.6733	45.7675	46.2155	46.3003	46.6991	46.6991	46.7737	46.5447	46.3003	46.1291	45.9514	
alpha	4.0385	4.0449	4.0512	4.0810	4.0867	4.1133	4.1133	4.1182	4.1030	4.0867	4.0753	4.0634	
util living area	0.9881	0.9741	0.9410	0.8534	0.7074	0.5290	0.3912	0.4417	0.6839	0.9110	0.9772	0.9904 (86)	
MIT	19.3905	19.6722	20.0702	20.5339	20.8317	20.9609	20.9910	20.9855	20.8913	20.4546	19.8343	19.3436 (87)	
Th 2	19.8139	19.8161	19.8182	19.8282	19.8301	19.8389	19.8389	19.8405	19.8355	19.8301	19.8263	19.8223 (88)	
util rest of house	0.9847	0.9668	0.9248	0.8164	0.6433	0.4419	0.2906	0.3349	0.5951	0.8787	0.9696	0.9876 (89)	
MIT 2	17.9771	18.3334	18.8280	19.3816	19.6972	19.8175	19.8361	19.8355	19.7659	19.3105	18.5493	17.9234 (90)	
Living area fraction									fLA = Living area / (4) =				0.3888 (91)
MIT	18.5266	18.8540	19.3110	19.8296	20.1383	20.2620	20.2851	20.2826	20.2035	19.7553	19.0489	18.4756 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.5266	18.8540	19.3110	19.8296	20.1383	20.2620	20.2851	20.2826	20.2035	19.7553	19.0489	18.4756 (93)	

8. Space heating requirement

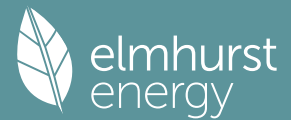
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9794	0.9591	0.9163	0.8164	0.6612	0.4745	0.3298	0.3764	0.6250	0.8763	0.9628	0.9831 (94)
Useful gains	598.7502	711.6212	796.9269	832.4451	736.8447	525.7279	349.2953	365.7576	540.7477	629.0750	591.2233	568.5013 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1391.6724	1362.1379	1247.9913	1054.3932	812.5650	540.5688	351.8294	370.0905	584.6444	881.6115	1154.8849	1385.0988 (97)
Space heating kWh	589.9341	437.1472	335.5919	159.8026	56.3359	0.0000	0.0000	0.0000	0.0000	187.8871	405.8364	607.5485 (98a)
Space heating requirement - total per year (kWh/year)												2780.0837
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	589.9341	437.1472	335.5919	159.8026	56.3359	0.0000	0.0000	0.0000	0.0000	187.8871	405.8364	607.5485 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2780.0837
Space heating per m2										(98c) / (4) =		37.9275 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	589.9341	437.1472	335.5919	159.8026	56.3359	0.0000	0.0000	0.0000	0.0000	187.8871	405.8364	607.5485 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	638.4568	473.1030	363.1947	172.9465	60.9696	0.0000	0.0000	0.0000	0.0000	203.3410	439.2169	657.5201 (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	226.2130	200.1080	212.9351	188.2833	183.1839	165.8095	164.2874	170.4623	171.9237	190.7920	201.7088	223.9046 (64)
Efficiency of water heater (217)m	86.3371	86.0075	85.3515	84.0320	82.1696	80.3000	80.3000	80.3000	80.3000	84.3486	85.8475	80.3000 (216)
Fuel for water heating, kWh/month	262.0113	232.6633	249.4801	224.0615	222.9339	206.4876	204.5921	212.2818	214.1017	226.1947	234.9618	259.1251 (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	21.4747	17.2278	15.5117	11.3646	8.7783	7.1720	8.0079	10.4089	13.5202	17.7392	20.0364	22.0715 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-33.4873	-47.3558	-68.2869	-77.0454	-83.3175	-77.8637	-76.9027	-72.4780	-64.7127	-54.2658	-36.8665	-28.9348 (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	-18.4917	-38.9463	-77.4900	-116.5017	-154.1542	-154.9215	-153.0979	-129.5802	-94.9160	-55.7372	-24.7031	-14.6194 (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												3008.7486 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2748.8950 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

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Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	173.3131 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1754.6764 (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	4262.2802 (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	3008.7486	0.2100	631.8372 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2748.8950	0.2100	577.2679 (264)
Space and water heating			1209.1051 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	173.3131	0.1443	25.0144 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-721.5172	0.1345	-97.0544
PV Unit electricity exported	-1033.1592	0.1259	-130.0406
Total			-227.0949 (269)
Total CO2, kg/year			1018.9539 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.9000 (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	3008.7486	1.1300	3399.8859 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2748.8950	1.1300	3106.2513 (278)
Space and water heating			6506.1372 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	173.3131	1.5338	265.8334 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-721.5172	1.4971	-1080.2108
PV Unit electricity exported	-1033.1592	0.4620	-477.3370
Total			-1557.5478 (283)
Total Primary energy kWh/year			5344.5236 (286)
Target Primary Energy Rate (TPER)			72.9100 (287)