Full SAP Calculation Printout

Property Reference	HOUSE	**Issued on Date**	13/08/2024
Assessment Reference	Be Green	**Prop Type Ref**	
Property	Gondar Gardens, NW6 1EW		

SAP Rating	96 A	**DER**	-0.51	**TER**	13.44
Environmental	101 A	**% DER < TER**			103.79
CO_2 Emissions (t/year)	-0.15	**DFEE**	41.97	**TFEE**	44.69
Compliance Check	See BREL	**% DFEE < TFEE**			6.09
% DPER < TPER	74.52	**DPER**	17.94	**TPER**	70.43

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 (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	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

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

	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	0.1976	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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	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, m2)			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)

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

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

	Length	Psi-value	Total	
K1 Element				
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)

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

Heat transfer coeff

	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)

Average = Sum(39)m / 12 = 72.7099

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												0.9919	
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:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	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													
	231.0875	203.9672	215.6752	187.1983	179.8177	160.2393	156.8360	164.0605	166.9653	188.3283	202.8822	228.2443	(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													
	231.0875	203.9672	215.6752	187.1983	179.8177	160.2393	156.8360	164.0605	166.9653	188.3283	202.8822	228.2443	(64)
										Total per year (kWh/year) = Sum(64)m =		2285.3018	(64)
12Total per year (kWh/year)												2285	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						0.0000	(64a)
Heat gains from water heating, kWh/month													
	67.8752	59.7250	62.7507	53.5712	50.8280	44.6073	43.1866	45.5888	46.8437	53.6578	58.7861	66.9299	(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	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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-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)													
	91.2302	88.8765	84.3423	74.4044	68.3172	61.9546	58.0466	61.2752	65.0607	72.1207	81.6473	89.9595	(72)
Total internal gains													
	457.3090	468.1547	447.1897	429.2919	405.3627	388.9142	372.5215	373.6242	386.2121	401.2321	428.6007	446.9988	(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	
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	591.1904	721.8556	849.5860	999.5121	1094.2307	1090.8092	1042.0281	954.5475	848.1305	697.7707	593.9429	558.1802	(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, ni1,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	0.9871	0.9668	0.9149	0.7786	0.5951	0.4145	0.2998	0.3405	0.5673	0.8667	0.9715	0.9899	(86)
MIT	19.8932	20.1651	20.5024	20.8285	20.9613	20.9952	20.9993	20.9986	20.9776	20.7498	20.2662	19.8569	(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	0.9836	0.9586	0.8956	0.7400	0.5433	0.3579	0.2393	0.2751	0.4994	0.8302	0.9630	0.9872	(89)
MIT 2	18.7915	19.1343	19.5470	19.9287	20.0625	20.1057	20.1082	20.1111	20.0879	19.8583	19.2770	18.7549	(90)
Living area fraction										fLA = Living area / (4) =		0.3888	(91)
MIT	19.2199	19.5351	19.9184	20.2785	20.4119	20.4515	20.4546	20.4562	20.4339	20.2049	19.6617	19.1833	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2199	19.5351	19.9184	20.2785	20.4119	20.4515	20.4546	20.4562	20.4339	20.2049	19.6617	19.1833	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9796	0.9528	0.8920	0.7484	0.5619	0.3798	0.2628	0.3005	0.5250	0.8352	0.9581	0.9838	(94)
Useful gains	579.1119	687.7799	757.8404	748.0614	614.8299	414.3044	273.8714	286.8761	445.2621	582.7848	569.0756	549.1134	(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	1115.0729	1089.6968	995.3549	828.1269	631.6166	416.0550	274.0713	287.2677	453.8916	696.3571	917.7475	1103.0548	(97)
Space heating kWh	398.7550	270.0881	176.7108	57.6471	12.4893	0.0000	0.0000	0.0000	0.0000	84.4978	251.0438	412.1324	(98a)
Space heating requirement - total per year (kWh/year)												1663.3642	
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	398.7550	270.0881	176.7108	57.6471	12.4893	0.0000	0.0000	0.0000	0.0000	84.4978	251.0438	412.1324	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1663.3642	
Space heating per m2											(98c) / (4) =	22.6926	(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)
Fraction of main heating from main system 2												0.0000	(203)
Fraction of total heating from main system 1												1.0000	(204)
Fraction of total heating from main system 2												0.0000	(205)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	398.7550	270.0881	176.7108	57.6471	12.4893	0.0000	0.0000	0.0000	0.0000	84.4978	251.0438	412.1324	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	398.7550	270.0881	176.7108	57.6471	12.4893	0.0000	0.0000	0.0000	0.0000	84.4978	251.0438	412.1324	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	231.0875	203.9672	215.6752	187.1983	179.8177	160.2393	156.8360	164.0605	166.9653	188.3283	202.8822	228.2443	(64)
Efficiency of water heater												343.6205	(216)
(217)m	343.6205	343.6205	343.6205	343.6205	343.6205	343.6205	343.6205	343.6205	343.6205	343.6205	343.6205	343.6205	(217)
Fuel for water heating, kWh/month	67.2508	59.3583	62.7655	54.4782	52.3303	46.6326	45.6422	47.7447	48.5900	54.8071	59.0425	66.4234	(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	15.5794	14.0717	15.5794	15.0768	15.5794	15.0768	15.5794	15.5794	15.0768	15.5794	15.0768	15.5794	(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	-69.3504	-97.2108	-132.9774	-132.3713	-129.7173	-116.5733	-115.0695	-110.8268	-101.6273	-99.0176	-74.5537	-59.9639	(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	-30.8226	-69.9491	-151.7151	-249.1728	-341.6483	-346.8542	-342.2335	-288.7212	-211.2989	-114.6742	-44.2659	-23.8638	(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												1663.3642	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												343.6205	
Water heating fuel used												665.0656	(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)
Total electricity for the above, kWh/year	183.4346	(231)
Electricity for lighting (calculated in Appendix L)	173.3131	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3454.4788	(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	-769.3013	(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	1663.3642	0.1573	261.7169	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	665.0656	0.1412	93.8941	(264)
Space and water heating			355.6110	(265)
Pumps, fans and electric keep-hot	183.4346	0.1387	25.4446	(267)
Energy for lighting	173.3131	0.1443	25.0144	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1239.2592	0.1366	-169.3259	
PV Unit electricity exported	-2215.2196	0.1239	-274.4309	
Total			-443.7568	(269)
Total CO2, kg/year			-37.6867	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-0.5100	(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	1663.3642	1.5824	2632.1812	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	665.0656	1.5220	1012.2611	(278)
Space and water heating			3644.4423	(279)
Pumps, fans and electric keep-hot	183.4346	1.5128	277.4999	(281)
Energy for lighting	173.3131	1.5338	265.8334	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1239.2592	1.5051	-1865.2278	
PV Unit electricity exported	-2215.2196	0.4547	-1007.2273	
Total			-2872.4551	(283)
Total Primary energy kWh/year			1315.3205	(286)
Dwelling Primary energy Rate (DPER)			17.9400	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1372	(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)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
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

	Length	Psi-value	Total	
K1 Element				
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												96.4705	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												1.3161	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3235 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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:													
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	250.7310	221.7097	235.3187	206.2081	199.4612	179.2491	176.4795	183.7040	185.9751	207.9718	221.8921	247.8878	(62)
WWHRS	-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)
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	221.8490	196.1663	208.5711	184.0600	178.8199	161.5863	159.9234	166.0983	167.7005	186.4280	197.4856	219.5406	(64)
										Total per year (kWh/year) = Sum(64)m =		2248.2290	(64)
12Total per year (kWh/year)												2248	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	105.1512	93.3936	100.0266	89.6446	88.1040	80.6808	80.4626	82.8647	82.9172	90.9337	94.8596	104.2058	(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	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)
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)													
	141.3322	138.9785	134.4443	124.5064	118.4193	112.0566	108.1486	111.3773	115.1627	122.2228	131.7494	140.0616	(72)
Total internal gains													
	510.4110	521.2568	500.2918	482.3939	458.4648	439.0162	422.6235	423.7263	436.3141	454.3341	481.7027	500.1008	(73)

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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	
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)

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	644.2925	774.9576	902.6880	1052.6141	1147.3327	1140.9112	1092.1301	1004.6496	898.2326	750.8727	647.0450	611.2822	(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, ni1,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													
	0.9857	0.9701	0.9343	0.8424	0.6937	0.5157	0.3800	0.4282	0.6660	0.8997	0.9729	0.9883	(86)
MIT	19.4390	19.7177	20.1093	20.5598	20.8436	20.9643	20.9920	20.9870	20.9015	20.4884	19.8804	19.3928	(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													
	0.9817	0.9619	0.9167	0.8038	0.6293	0.4300	0.2820	0.3242	0.5772	0.8647	0.9640	0.9849	(89)
MIT 2	18.0383	18.3898	18.8745	19.4092	19.7075	19.8195	19.8364	19.8361	19.7732	19.3477	18.6064	17.9856	(90)
Living area fraction										fLA = Living area / (4) =		0.3888	(91)
MIT	18.5829	18.9061	19.3546	19.8565	20.1492	20.2646	20.2857	20.2836	20.2119	19.7912	19.1018	18.5327	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5829	18.9061	19.3546	19.8565	20.1492	20.2646	20.2857	20.2836	20.2119	19.7912	19.1018	18.5327	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9759	0.9538	0.9083	0.8049	0.6478	0.4622	0.3201	0.3646	0.6076	0.8634	0.9568	0.9798	(94)
Useful gains	628.7393	739.1365	819.9391	847.1996	743.2858	527.3217	349.6132	366.3291	545.7799	648.2793	619.0920	598.9500	(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													
	1397.1824	1367.2295	1252.2408	1056.9922	813.6162	540.8157	351.8810	370.1819	585.4499	885.0675	1159.9949	1390.6451	(97)
Space heating kWh													
	571.7217	422.0785	321.6325	151.0507	52.3258	0.0000	0.0000	0.0000	0.0000	176.1704	389.4501	589.0211	(98a)
Space heating requirement - total per year (kWh/year)												2673.4508	
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													
	571.7217	422.0785	321.6325	151.0507	52.3258	0.0000	0.0000	0.0000	0.0000	176.1704	389.4501	589.0211	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2673.4508	
Space heating per m2											(98c) / (4) =	36.4727	(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													
	571.7217	422.0785	321.6325	151.0507	52.3258	0.0000	0.0000	0.0000	0.0000	176.1704	389.4501	589.0211	(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)													
	619.4168	457.2898	348.4642	163.6519	56.6911	0.0000	0.0000	0.0000	0.0000	190.8672	421.9395	638.1594	(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													
	221.8490	196.1663	208.5711	184.0600	178.8199	161.5863	159.9234	166.0983	167.7005	186.4280	197.4856	219.5406	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0858	85.7321	85.0277	83.6201	81.6739	79.8000	79.8000	79.8000	79.8000	83.9330	85.5535	86.1615	(217)
Fuel for water heating, kWh/month													
	257.7069	228.8132	245.2979	220.1146	218.9438	202.4891	200.4053	208.1432	210.1510	222.1151	230.8330	254.8013	(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	2896.4798	(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	2699.8143	(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)	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	4100.9307	(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	2896.4798	0.2100	608.2607	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2699.8143	0.2100	566.9610	(264)
Space and water heating			1175.2218	(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			985.0705	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4400	(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	2896.4798	1.1300	3273.0221	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2699.8143	1.1300	3050.7902	(278)
Space and water heating			6323.8123	(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			5162.1987	(286)
Target Primary Energy Rate (TPER)			70.4300	(287)