Full SAP Calculation Printout

Property Reference	Flat 5	Issued on Date	26/07/2023
Assessment Reference	Flat 5 - PV	Prop Type Ref	
Property	Flat 3, Pier View Hotel, 34 Oldminster Road, Sharpness, Berkeley, GI13 9NA		

SAP Rating	85 B	DER	14.39	TER	10.60
Environmental	87 B	% DER < TER			-35.75
CO_2 Emissions (t/year)	1.11	DFEE	64.53	TFEE	31.10
Compliance Check	See BREL	% DFEE < TFEE			-107.48
% DPER < TPER	-48.05	DPER	82.66	TPER	55.83

Assessor Details	[redacted]	Assessor ID	H055-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.1000 (1b)	x	2.3300 (2b)	=	212.2630	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.2630	(5)

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2. Ventilation rate

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	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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.0942 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.8442 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7809 (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	0.9957	0.9761	0.9566	0.8590	0.8395	0.7419	0.7419	0.7223	0.7809	0.8395	0.8785	0.9176	(22b)
Effective ac	0.9957	0.9764	0.9576	0.8689	0.8524	0.7752	0.7752	0.7609	0.8049	0.8524	0.8859	0.9210	(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	
Door			1.7200	1.4000	2.4080			(26)
New Windows (Uw = 1.40)			5.1200	1.3258	6.7879			(27)
Exposed Floor			4.0200	0.2500	1.0050	20.0000	80.4000	(28b)
External Wall	70.5900	3.9200	66.6700	0.2800	18.6676	9.0000	600.0300	(29a)
Corridor Wall	9.4700	1.7200	7.7500	0.3000	2.3250	9.0000	69.7500	(29a)
Dormer Wall	2.1900	1.2000	0.9900	0.3000	0.2970	9.0000	8.9100	(29a)
Warm Pitched Roof	42.7800		42.7800	0.1700	7.2726	9.0000	385.0200	(30)
Cold Pitched Roof	63.0300		63.0300	0.1500	9.4545	9.0000	567.2700	(30)

Total net area of external elements Aum(A, m2)	192.0800			(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	48.2176		(33)
Party Wall	7.9100	0.0000	0.0000	180.0000	1423.8000 (32)
Party Floor	87.0800			40.0000	3483.2000 (32d)
Internal Wall	160.0000			9.0000	1440.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8058.3800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		88.4564 (35)
Thermal bridges (Default value 0.200 * total exposed area)		38.4160 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	86.6336 (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	69.7431	68.3949	67.0734	60.8663	59.7050	54.2988	54.2988	53.2976	56.3812	59.7050	62.0543	64.5105	(38)
Heat transfer coeff	156.3767	155.0285	153.7070	147.4999	146.3385	140.9324	140.9324	139.9312	143.0147	146.3385	148.6879	151.1440	(39)
Average = Sum(39)m / 12 =												147.4943	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7165	1.7017	1.6872	1.6191	1.6064	1.5470	1.5470	1.5360	1.5699	1.6064	1.6321	1.6591	(40)
HLP (average)												1.6190	
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												2.6405	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	41.6711	40.1558	38.6405	37.1252	35.6099	34.0946	34.0946	35.6099	37.1252	38.6405	40.1558	41.6711	(42c)
Average daily hot water use (litres/day)												37.8829	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	41.6711	40.1558	38.6405	37.1252	35.6099	34.0946	34.0946	35.6099	37.1252	38.6405	40.1558	41.6711	(44)
Energy conte	65.9969	57.1814	59.3890	50.8225	47.9378	41.9233	41.2344	44.0925	45.7791	52.4348	57.2093	65.2469	(45)
Energy content (annual)										Total = Sum(45)m =		629.2480	
Distribution loss (46)m = 0.15 x (45)m													
	9.8995	8.5772	8.9084	7.6234	7.1907	6.2885	6.1852	6.6139	6.8669	7.8652	8.5814	9.7870	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.1650	0.1378	0.1377	0.1132	0.1024	0.0858	0.0844	0.0942	0.1020	0.1216	0.1378	0.1631	(61)
Total heat required for water heating calculated for each month													
	66.1619	57.3191	59.5267	50.9358	48.0402	42.0090	41.3188	44.1867	45.8811	52.5564	57.3472	65.4101	(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													
	66.1619	57.3191	59.5267	50.9358	48.0402	42.0090	41.3188	44.1867	45.8811	52.5564	57.3472	65.4101	(64)
									Total per year (kWh/year) = Sum(64)m =			630.6930	(64)
12Total per year (kWh/year)												631	(64)
Electric shower(s)													
	70.4643	62.7842	68.5580	65.4240	66.6517	63.5793	65.6986	66.6517	65.4240	68.5580	67.2688	70.4643	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						801.5268	(64a)
Heat gains from water heating, kWh/month													
	39.6013	34.7433	36.9208	33.2828	32.6278	29.8557	30.1562	31.3472	31.6031	34.6045	35.8738	39.3515	(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	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	155.5677	172.2357	155.5677	160.7533	155.5677	160.7533	155.5677	155.5677	160.7533	155.5677	160.7533	155.5677	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	241.0869	243.5887	237.2844	223.8633	206.9217	190.9989	180.3615	177.8598	184.1640	197.5851	214.5268	230.4496	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	(71)
Water heating gains (Table 5)													
	53.2275	51.7014	49.6247	46.2261	43.8546	41.4663	40.5325	42.1334	43.8931	46.5114	49.8247	52.8917	(72)
Total internal gains													
	515.4894	533.1329	508.0840	496.4500	471.9512	455.8257	439.0689	438.1681	451.4177	465.2714	490.7120	504.5162	(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
North	1.2200	10.6334	0.6300	0.7000	0.7700	3.9646 (74)
East	2.7000	19.6403	0.6300	0.7000	0.7700	16.2063 (76)
West	1.2000	19.6403	0.6300	0.7000	0.7700	7.2028 (80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	27.3737	53.3697	88.2892	130.6676	162.6517	167.8082	159.2111	134.9331	103.1897	63.3563	34.0792	22.5556	(83)
Total gains	542.8631	586.5026	596.3732	627.1176	634.6030	623.6339	598.2800	573.1012	554.6074	528.6277	524.7912	527.0718	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	14.3144	14.4389	14.5630	15.1759	15.2963	15.8831	15.8831	15.9967	15.6518	15.2963	15.0546	14.8100	
alpha	1.9543	1.9626	1.9709	2.0117	2.0198	2.0589	2.0589	2.0664	2.0435	2.0198	2.0036	1.9873	
util living area	0.9629	0.9548	0.9444	0.9174	0.8730	0.7866	0.6851	0.7121	0.8368	0.9196	0.9513	0.9648	(86)
MIT	16.8573	17.1419	17.6652	18.5242	19.3413	20.1379	20.5594	20.5046	19.9127	18.8709	17.8049	16.8969	(87)
Th 2	19.5290	19.5396	19.5500	19.5994	19.6087	19.6524	19.6524	19.6606	19.6355	19.6087	19.5899	19.5703	(88)
util rest of house	0.9565	0.9469	0.9339	0.8996	0.8397	0.7165	0.5578	0.5947	0.7812	0.8990	0.9417	0.9590	(89)
MIT 2	14.8543	15.2134	15.8739	16.9624	17.9771	18.9445	19.3949	19.3512	18.6867	17.4060	16.0622	14.9114	(90)
Living area fraction									fLA = Living area / (4) =			0.2124	(91)
MIT	15.2797	15.6230	16.2544	17.2942	18.2669	19.1980	19.6423	19.5962	18.9471	17.7172	16.4324	15.3331	(92)
Temperature adjustment												-0.1500	
adjusted MIT	15.1297	15.4730	16.1044	17.1442	18.1169	19.0480	19.4923	19.4462	18.7971	17.5672	16.2824	15.1831	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9238	0.9103	0.8929	0.8521	0.7882	0.6748	0.5387	0.5705	0.7332	0.8518	0.9039	0.9278	(94)
Useful gains	501.5043	533.8851	532.4879	534.3416	500.2044	420.8393	322.2779	326.9478	406.6588	450.3065	474.3712	489.0419	(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	1693.5131	1639.1152	1476.2581	1216.0125	939.0391	626.8616	407.6151	426.2526	671.7565	1019.5650	1365.3078	1660.0320	(97)
Space heating kWh	886.8546	742.7147	702.1651	490.8031	326.4929	0.0000	0.0000	0.0000	0.0000	423.5283	641.4744	871.2166	(98a)
Space heating requirement - total per year (kWh/year)												5085.2497	
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	886.8546	742.7147	702.1651	490.8031	326.4929	0.0000	0.0000	0.0000	0.0000	423.5283	641.4744	871.2166	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5085.2497	
Space heating per m2										(98c) / (4) =		55.8205	(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 %) 89.1000 (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	886.8546	742.7147	702.1651	490.8031	326.4929	0.0000	0.0000	0.0000	0.0000	423.5283	641.4744	871.2166	(98)
Space heating efficiency (main heating system 1)	89.1000	89.1000	89.1000	89.1000	89.1000	0.0000	0.0000	0.0000	0.0000	89.1000	89.1000	89.1000	(210)
Space heating fuel (main heating system)	995.3475	833.5743	788.0640	550.8452	366.4343	0.0000	0.0000	0.0000	0.0000	475.3404	719.9488	977.7965	(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	66.1619	57.3191	59.5267	50.9358	48.0402	42.0090	41.3188	44.1867	45.8811	52.5564	57.3472	65.4101	(64)
Efficiency of water heater												85.0000	(216)
(217)m	88.8026	88.7931	88.7654	88.6977	88.5521	85.0000	85.0000	85.0000	85.0000	88.6281	88.7487	88.8009	(217)
Fuel for water heating, kWh/month	74.5045	64.5536	67.0607	57.4262	54.2507	49.4224	48.6103	51.9843	53.9777	59.2999	64.6175	73.6593	(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	39.7611	31.8978	28.7205	21.0418	16.2533	13.2791	14.8268	19.2725	25.0330	32.8447	37.0980	40.8662	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.7130	-49.2816	-73.4697	-85.9208	-95.7674	-90.8182	-90.1400	-83.9002	-72.8478	-58.3007	-37.8370	-28.9760	(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	-13.8734	-29.7273	-59.9880	-91.2701	-121.6363	-122.2951	-120.4238	-101.0827	-73.2912	-42.4063	-18.5296	-10.8976	(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	5707.3509	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	85.0000	
Water heating fuel used	719.3672	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	320.8950	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1606.3939	(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	6028.7460	(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	5707.3509	0.2100	1198.5437	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	719.3672	0.2100	151.0671	(264)
Energy for instantaneous electric shower(s)	801.5268	0.1391	111.5101	(264a)
Space and water heating			1349.6108	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	320.8950	0.1443	46.3151	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-800.9723	0.1337	-107.1024	
PV Unit electricity exported	-805.4216	0.1256	-101.1561	
Total			-208.2586	(269)
Total CO2, kg/year			1311.1067	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.3900	(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	5707.3509	1.1300	6449.3065	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	719.3672	1.1300	812.8850	(278)
Energy for instantaneous electric shower(s)	801.5268	1.5143	1213.7795	(278a)
Space and water heating			7262.1915	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	320.8950	1.5338	492.1994	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-800.9723	1.4941	-1196.7648	
PV Unit electricity exported	-805.4216	0.4610	-371.3063	
Total			-1568.0711	(283)
Total Primary energy kWh/year			7530.2001	(286)
Dwelling Primary energy Rate (DPER)			82.6600	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.1000 (1b)	x	2.3300 (2b)	=	212.2630 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	212.2630	(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) =	0.1413	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3913	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3620	(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	0.4615	0.4525	0.4434	0.3982	0.3891	0.3439	0.3439	0.3348	0.3620	0.3891	0.4072	0.4253	(22b)
Effective ac	0.6065	0.6024	0.5983	0.5793	0.5757	0.5591	0.5591	0.5561	0.5655	0.5757	0.5829	0.5905	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.7200	1.0000	1.7200			(26)
TER Opening Type (Uw = 1.20)			5.1200	1.1450	5.8626			(27)
Exposed Floor			4.0200	0.1300	0.5226			(28b)
External Wall	70.5900	3.9200	66.6700	0.1800	12.0006			(29a)
Corridor Wall	9.4700	1.7200	7.7500	0.1800	1.3950			(29a)
Dormer Wall	2.1900	1.2000	0.9900	0.1800	0.1782			(29a)
Warm Pitched Roof	42.7800		42.7800	0.1100	4.7058			(30)
Cold Pitched Roof	63.0300		63.0300	0.1100	6.9333			(30)
Total net area of external elements Aum(A, m2)			192.0800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.3181			(33)
Party Wall			7.9100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		88.4564 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		9.6040 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	42.9221 (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	42.4837	42.1940	41.9101	40.5763	40.3268	39.1651	39.1651	38.9500	39.6126	40.3268	40.8316	41.3594	(38)
Heat transfer coeff	85.4058	85.1161	84.8322	83.4984	83.2489	82.0872	82.0872	81.8721	82.5347	83.2489	83.7537	84.2815	(39)
Average = Sum(39)m / 12 =												83.4972	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9375	0.9343	0.9312	0.9166	0.9138	0.9011	0.9011	0.8987	0.9060	0.9138	0.9194	0.9252	(40)
HLP (average)												0.9165	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6405 (42)
Hot water usage for mixer showers	

	87.9887	86.6664	84.7395	81.0528	78.3322	75.2981	73.5735	75.4858	77.5820	80.8397	84.6055	87.6515	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	41.6711	40.1558	38.6405	37.1252	35.6099	34.0946	34.0946	35.6099	37.1252	38.6405	40.1558	41.6711	(42c)
Average daily hot water use (litres/day)												119.0055	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	129.6598	126.8222	123.3800	118.1781	113.9421	109.3927	107.6681	111.0957	114.7072	119.4802	124.7614	129.3227	(44)
Energy conte	205.3495	180.5931	189.6305	161.7798	153.3879	134.5111	130.2152	137.5597	141.4455	162.1335	177.7454	202.4881	(45)
Energy content (annual)											Total = Sum(45)m =	1976.8393	
Distribution loss (46)m = 0.15 x (45)m													
	30.8024	27.0890	28.4446	24.2670	23.0082	20.1767	19.5323	20.6340	21.2168	24.3200	26.6618	30.3732	(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													
	256.3084	226.6205	240.5894	211.0949	204.3468	183.8261	181.1742	188.5186	190.7605	213.0924	227.0605	253.4470	(62)
WWHRS	-40.2247	-35.5751	-37.2522	-30.8463	-28.7476	-24.5995	-23.0582	-24.5200	-25.4516	-30.0047	-33.9917	-39.4798	(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													
	216.0836	191.0454	203.3372	180.2486	175.5992	159.2266	158.1160	163.9985	165.3089	183.0877	193.0688	213.9672	(64)
											Total per year (kWh/year) = Sum(64)m =	2203.0878	(64)
12Total per year (kWh/year)												2203	(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													
	81.0184	71.5541	75.7919	66.1206	63.7412	57.0537	56.0363	58.4783	59.3594	66.6491	71.4291	80.0670	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	132.0240	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	155.5677	172.2357	155.5677	160.7533	155.5677	160.7533	155.5677	155.5677	160.7533	155.5677	160.7533	155.5677	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	241.0869	243.5887	237.2844	223.8633	206.9217	190.9989	180.3615	177.8598	184.1640	197.5851	214.5268	230.4496	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	36.2024	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	-105.6192	(71)
Water heating gains (Table 5)													
	108.8957	106.4793	101.8708	91.8341	85.6737	79.2412	75.3176	78.5999	82.4436	89.5821	99.2071	107.6170	(72)
Total internal gains													
	571.1576	587.9108	560.3301	542.0580	513.7703	493.6007	473.8540	474.6346	489.9682	508.3422	540.0944	559.2414	(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	
North	1.2200	10.6334	0.6300	0.7000	0.7700	3.9646	(74)
East	2.7000	19.6403	0.6300	0.7000	0.7700	16.2063	(76)
West	1.2000	19.6403	0.6300	0.7000	0.7700	7.2028	(80)

Solar gains	27.3737	53.3697	88.2892	130.6676	162.6517	167.8082	159.2111	134.9331	103.1897	63.3563	34.0792	22.5556	(83)
Total gains	598.5313	641.2805	648.6193	672.7256	676.4220	661.4088	633.0651	609.5677	593.1579	571.6985	574.1736	581.7970	(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	26.2094	26.2986	26.3867	26.8082	26.8885	27.2690	27.2690	27.3407	27.1212	26.8885	26.7264	26.5591	
alpha	2.7473	2.7532	2.7591	2.7872	2.7926	2.8179	2.8179	2.8227	2.8081	2.7926	2.7818	2.7706	
util living area													
	0.9444	0.9302	0.9111	0.8631	0.7838	0.6483	0.5134	0.5457	0.7222	0.8655	0.9238	0.9481	(86)
MIT	18.7509	18.9760	19.3263	19.8680	20.3564	20.7440	20.9042	20.8834	20.6267	20.0216	19.3323	18.7309	(87)
Th 2	20.1357	20.1384	20.1411	20.1534	20.1558	20.1666	20.1666	20.1686	20.1624	20.1558	20.1511	20.1462	(88)
util rest of house													
	0.9377	0.9217	0.8996	0.8441	0.7508	0.5913	0.4326	0.4667	0.6719	0.8434	0.9132	0.9418	(89)
MIT 2	17.4836	17.7691	18.2132	18.8966	19.4922	19.9425	20.1023	20.0866	19.8168	19.0954	18.2307	17.4645	(90)

Living area fraction											fLA = Living area / (4) =		0.2124 (91)
MIT	17.7528	18.0255	18.4497	19.1029	19.6758	20.1127	20.2726	20.2558	19.9888	19.2922	18.4647		17.7335 (92)
Temperature adjustment													0.0000
adjusted MIT	17.7528	18.0255	18.4497	19.1029	19.6758	20.1127	20.2726	20.2558	19.9888	19.2922	18.4647		17.7335 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9125	0.8945	0.8708	0.8158	0.7295	0.5873	0.4435	0.4755	0.6603	0.8160	0.8859	0.9176	(94)
Useful gains	546.1883	573.6035	564.8404	548.7852	493.4176	388.4290	280.7329	289.8413	391.6554	466.5059	508.6460	533.8680	(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	1148.9493	1117.1886	1013.7165	851.9268	663.9770	452.5249	301.4732	315.6863	486.0290	723.6133	951.8318	1140.6239	(97)
Space heating kWh	448.4542	365.2892	333.9638	218.2619	126.8962	0.0000	0.0000	0.0000	0.0000	191.2879	319.0938	451.4263	(98a)
Space heating requirement - total per year (kWh/year)												2454.6733	
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	448.4542	365.2892	333.9638	218.2619	126.8962	0.0000	0.0000	0.0000	0.0000	191.2879	319.0938	451.4263	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2454.6733	
Space heating per m2											(98c) / (4) =	26.9448	(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	448.4542	365.2892	333.9638	218.2619	126.8962	0.0000	0.0000	0.0000	0.0000	191.2879	319.0938	451.4263	(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)	485.3400	395.3347	361.4326	236.2142	137.3335	0.0000	0.0000	0.0000	0.0000	207.0216	345.3396	488.5567	(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	216.0836	191.0454	203.3372	180.2486	175.5992	159.2266	158.1160	163.9985	165.3089	183.0877	193.0688	213.9672	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.9083	85.7465	85.4372	84.7925	83.6965	80.3000	80.3000	80.3000	80.3000	84.4755	85.4502	85.9403	(217)
Fuel for water heating, kWh/month	251.5283	222.8027	237.9962	212.5760	209.8047	198.2896	196.9066	204.2323	205.8641	216.7347	225.9432	248.9719	(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	32.3239	25.9314	23.3484	17.1060	13.2132	10.7953	12.0535	15.6676	20.3507	26.7012	30.1589	33.2223	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-30.6657	-44.4302	-65.5740	-75.7254	-83.3297	-78.3574	-77.4171	-72.3113	-63.5058	-51.7547	-34.1474	-26.3756	(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	-13.7971	-29.3925	-59.1234	-89.8346	-119.8034	-120.7670	-119.3251	-100.5291	-73.0405	-42.3417	-18.5193	-10.8807	(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												2656.5729	(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												2631.6503	(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)												260.8724	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1500.9486	(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	4134.1470 (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	2656.5729	0.2100	557.8803	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2631.6503	0.2100	552.6466	(264)
Space and water heating			1110.5269	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	260.8724	0.1443	37.6520	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-703.5943	0.1340	-94.3053	
PV Unit electricity exported	-797.3543	0.1256	-100.1140	
Total			-194.4193	(269)
Total CO2, kg/year			965.6888	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6000	(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	2656.5729	1.1300	3001.9273	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2631.6503	1.1300	2973.7649	(278)
Space and water heating			5975.6922	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	260.8724	1.5338	400.1348	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-703.5943	1.4953	-1052.1090	
PV Unit electricity exported	-797.3543	0.4609	-367.4743	
Total			-1419.5832	(283)
Total Primary energy kWh/year			5086.3446	(286)
Target Primary Energy Rate (TPER)			55.8300	(287)