

Full SAP Calculation Printout



Property Reference	GREEN PLANNING		Issued on Date	12/09/2023	
Assessment Reference	L011 - 01.2 x2_Copy	Prop Type Ref			
Property					
SAP Rating	87 B	DER	12.00	TER	13.34
Environmental	91 B	% DER < TER			10.04
CO ₂ Emissions (t/year)	0.61	DFEE	16.92	TFEE	21.17
Compliance Check	See BREL	% DFEE < TFEE			20.07
% DPER < TPER	6.10	DPER	61.94	TPER	65.97
Assessor Details	Mr. Richard Denteh		Assessor ID	U148-0001	
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	51.9000 (1b)	2.7400 (2b)	142.2060 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.9000		142.2060 (5)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)

2. Ventilation rate

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	3.0000 (17)											
Infiltration rate	0.1500 (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) = 0.1162 (21)											
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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery	0.5000 (23a)											
If mechanical ventilation	0.5000 (23b)											
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	72.8000 (23c)											
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2842	0.2813	0.2784	0.2639	0.2610	0.2464	0.2464	0.2435	0.2522	0.2610	0.2668	0.2726 (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
glazing (Uw = 1.30)			7.7700	1.2357	9.6017		(27)
External Wall 1	19.2348	7.7700	11.4648	0.1400	1.6051	190.0000	2178.3120 (29a)
External Roof 1	51.9000		51.9000	0.1000	5.1900	9.0000	467.1000 (30)

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Total net area of external elements Aum(A, m ²)	71.1348	(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) = 16.3968	(33)
Party Wall 1	58.5300	0.0000
Party Floor 1	51.9000	0.0000
Internal Wall 1	70.2000	0.0000
	180.0000	10535.4000 (32)
	40.0000	2076.0000 (32d)
	75.0000	5265.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 20521.8120	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	395.4106	(35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	3.8400	0.0300	0.1152
E2 Other lintels (including other steel lintels)	1.5600	0.0300	0.0468
E3 Sill	7.7400	0.0300	0.2322
E4 Jamb	7.0100	0.0700	0.4907
E7 Party floor between dwellings (in blocks of flats)	7.0100	0.0200	0.1402
E9 Balcony between dwellings, wall insulation continuous	5.4800	0.0600	0.3288
E18 Party wall between dwellings	7.0100	0.0800	0.5608
E14 Flat roof	21.3500	0.1200	2.5620
P4 Party wall - Roof (insulation at ceiling level)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	4.4767	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 20.8735	(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	13.3378	13.2014	13.0650	12.3831	12.2467	11.5648	11.5648	11.4284	11.8376	12.2467	12.5195	12.7923 (38)
Heat transfer coeff	34.2113	34.0749	33.9385	33.2566	33.1202	32.4383	32.4383	32.3019	32.7111	33.1202	33.3930	33.6658 (39)
Average = Sum(39)m / 12 =	33.2225											

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6592	0.6565	0.6539	0.6408	0.6382	0.6250	0.6250	0.6224	0.6303	0.6382	0.6434	0.6487 (40)
HLP (average)	0.6401											
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	73.5573	72.4519	70.8410	67.7590	65.4846	62.9481	61.5064	63.1051	64.8575	67.5808	70.7290	73.2755 (42a)
Hot water usage for baths	23.1283	22.7849	22.3012	21.4093	20.7415	20.0010	19.6010	20.0813	20.6043	21.3967	22.3069	23.0502 (42b)
Hot water usage for other uses	32.5120	31.3298	30.1475	28.9653	27.7830	26.6007	26.6007	27.7830	28.9653	30.1475	31.3298	32.5120 (42c)
Average daily hot water use (litres/day)	118.8174 (43)											
Daily hot water use	129.1977	126.5665	123.2897	118.1336	114.0091	109.5499	107.7082	110.9694	114.4270	119.1250	124.3657	128.8376 (44)
Energy conte	204.6175	180.2290	189.4917	161.7190	153.4781	134.7043	130.2637	137.4033	141.0999	161.6515	177.1817	201.7286 (45)
Energy content (annual)	Total = Sum(45)m = 1973.5683											
Distribution loss (46)m = 0.15 x (45)m	30.6926	27.0343	28.4238	24.2578	23.0217	20.2057	19.5396	20.6105	21.1650	24.2477	26.5773	30.2593 (46)
Water storage loss:												
Store volume	110.0000 (47)											
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)											
Volume factor from Table 2a	1.0294 (52)											
Temperature factor from Table 2b	0.6000 (53)											
Enter (49) or (54) in (55)	1.0327 (55)											
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (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	259.8943	230.1564	244.7685	215.2126	208.7549	188.1980	185.5405	192.6801	194.5936	216.9283	230.6754	257.0054 (62)
WMHRS	-55.7975	-49.3478	-51.6742	-42.7882	-39.8771	-34.1231	-31.9850	-34.0128	-35.3051	-41.6208	-47.1513	-54.7642 (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	204.0968	180.8086	193.0943	172.4244	168.8778	154.0749	153.5555	158.6672	159.2885	175.3075	183.5241	202.2412 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 2105.9609 (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	112.2568	99.8681	107.2274	96.5665	95.2529	87.5841	87.5341	89.9080	89.7107	97.9706	101.7079	111.2962 (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	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.0664	87.5378	79.0664	81.7020	79.0664	81.7020	79.0664	79.0664	81.7020	79.0664	81.7020	79.0664 (67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.1665	153.7456	149.7665	141.2955	130.6025	120.5525	113.8385	112.2595	116.2386	124.7095	135.4026	145.4526 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306 (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)	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448 (71)
Water heating gains (Table 5)	150.8827	148.6132	144.1229	134.1201	128.0281	121.6446	117.6534	120.8441	124.5982	131.6809	141.2609	149.5917 (72)
Total internal gains	431.3075	439.0884	422.1476	406.3095	386.8888	373.0909	359.7502	361.3619	371.7305	384.6486	407.5573	423.3024 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
South	7.7700	46.7521	0.7600		0.8000		0.7700	153.0589 (78)
Solar gains	153.0589	250.6711	319.3105	360.8901	376.0699	361.9161	353.6140	343.4082
Total gains	584.3664	689.7595	741.4581	767.1996	762.9587	735.0070	713.3642	704.7701

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	166.6264	167.2933	167.9656	171.4097	172.1155	175.7337	175.7337	176.4757	174.2683	172.1155	170.7096	169.3265
alpha	12.1084	12.1529	12.1977	12.4273	12.4744	12.7156	12.7156	12.7650	12.6179	12.4744	12.3806	12.2884
util living area	0.9129	0.7848	0.6622	0.5244	0.4037	0.2825	0.2001	0.2108	0.3200	0.5258	0.7789	0.9327 (86)
MIT	20.9429	20.9890	20.9983	20.9999	21.0000	21.0000	21.0000	21.0000	21.0000	20.9999	20.9919	20.9285 (87)
Th 2	20.3770	20.3794	20.3817	20.3934	20.3958	20.4075	20.4075	20.4099	20.4028	20.3958	20.3911	20.3864 (88)
util rest of house	0.8927	0.7576	0.6345	0.4982	0.3775	0.2563	0.1731	0.1838	0.2923	0.4953	0.7478	0.9155 (89)
MIT 2	20.3343	20.3720	20.3807	20.3934	20.3958	20.4075	20.4075	20.4099	20.4028	20.3957	20.3860	20.3316 (90)
Living area fraction	0.8927	0.7576	0.6345	0.4982	0.3775	0.2563	0.1731	0.1838	0.2923	0.4953	0.7478	0.9155 (91)
MIT	20.6661	20.7083	20.7173	20.7240	20.7251	20.7305	20.7305	20.7316	20.7283	20.7251	20.7163	20.6569 (92)
Temperature adjustment												0.0000
adjusted MIT	20.6661	20.7083	20.7173	20.7240	20.7251	20.7305	20.7305	20.7316	20.7283	20.7251	20.7163	20.6569 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9024	0.7721	0.6496	0.5125	0.3918	0.2706	0.1878	0.1985	0.3074	0.5119	0.7646	0.9235 (94)
Useful gains	527.3587	532.5842	481.6196	393.1784	298.9128	198.8624	133.9858	139.9174	216.8200	335.3060	450.3420	513.0423 (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	559.9040	538.6663	482.5157	393.2258	298.9143	198.8624	133.9858	139.9174	216.8201	335.3446	454.6875	554.0353 (97)
Space heating kWh	24.2137	4.0872	0.6667	0.0341	0.0011	0.0000	0.0000	0.0000	0.0000	0.0287	3.1287	30.4987 (98a)
Space heating requirement - total per year (kWh/year)												62.6590
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	24.2137	4.0872	0.6667	0.0341	0.0011	0.0000	0.0000	0.0000	0.0000	0.0287	3.1287	30.4987 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												62.6590
Space heating per m2										(98c) / (4) =		1.2073 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Combined Heat and Power-Space and Water	0.5580 (303a)
Fraction of heat from community Boilers-Space and Water	0.4420 (303b)
Factor for control and charging method (Table 4c(3)) for space heating	1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating	1.0500 (305a)
Distribution loss factor (Table 12c) for community heating system	1.2500 (306)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)
Space heating requirement	24.2137
Space heat from Combined Heat and Power = (98) x 0.56 x 1.05 x 1.25	17.7335
307a	2.9934
Space heat from Boilers = (98) x 0.44 x 1.05 x 1.25	14.0470
307b	2.3711
Space heating requirement	

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Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	31.7805	5.3644	0.8750	0.0448	0.0015	0.0000	0.0000	0.0000	0.0000	0.0000	0.0377	4.1065	40.0296 (307)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (308)

Water heating

Annual water heating requirement	204.0968	180.8086	193.0943	172.4244	168.8778	154.0749	153.5555	158.6672	159.2885	175.3075	183.5241	202.2412 (64)
Water heat from Combined Heat and Power = (64) x 0.56 x 1.05 x 1.25	149.4754	132.4197	141.4175	126.2793	123.6819	112.8406	112.4602	116.2039	116.6589	128.3908	134.4084	148.1164
Water heat from Boilers = (64) x 0.44 x 1.05 x 1.25	118.4016	104.8916	112.0189	100.0277	97.9702	89.3827	89.0814	92.0468	92.4073	101.7002	106.4669	117.3252
Water heating fuel	267.8770	237.3113	253.4363	226.3070	221.6521	202.2233	201.5416	208.2508	209.0662	230.0911	240.8753	265.4415 (310)

Cooling System Energy Efficiency Ratio

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Pumps and Fa	8.6567	7.8190	8.6567	8.3775	8.6567	8.3775	8.6567	8.6567	8.3775	8.6567	8.3775	8.6567	8.6567 (315)
Lighting	14.5256	11.6530	10.4922	7.6871	5.9377	4.8512	5.4166	7.0407	9.1451	11.9989	13.5527	14.9293	14.9293 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-1.8205	-2.9326	-4.8225	-6.2327	-7.4863	-7.2833	-7.1888	-6.3820	-5.1372	-3.6635	-2.1253	-1.5338	-1.5338 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating	82.2399 (307)
Space heating fuel - secondary	0.0000 (309)
Water heating fuel - community heating	2764.0736 (310)
Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	0.8224 (313)
Space cooling fuel	0.0000 (321)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)	
mechanical ventilation fans (SFP = 0.5875)	101.9262 (330a)
Total electricity for the above, kWh/year	101.9262 (331)
Electricity for lighting (calculated in Appendix L)	117.2302 (332)

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

PV generation	-56.6085 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3008.8614 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Electrical efficiency of CHP unit	32.0000		361 (361)
Heat efficiency of CHP unit	49.9000		362 (362)
Space heating from Combined Heat and Power	91.9637	0.2100	19.3124 (363)
less credit emissions for electricity	-29.4284	0.3480	-10.2411 (364)
Water heating from Combined Heat and Power	3090.8879	0.2100	649.0865 (365)
less credit emissions for electricity	-989.0841	0.3480	-344.2013 (366)
Efficiency of heat source Boilers			93.9000 (367)
Space and Water heating from Boilers	1339.7983	0.2100	8.1294 (368)
Electrical energy for heat distribution (space & water)	0.8224	0.0000	4.0176 (372)
Overall CO2 factor for heat network			0.2106 (386)
Total CO2 associated with community systems			599.3317 (373)
Space and water heating			599.3317 (376)
Pumps, fans and electric keep-hot	101.9262	0.1387	14.1384 (378)
Energy for lighting	117.2302	0.1443	16.9199 (379)

Energy saving/generation technologies

PV Unit electricity used in dwelling	-56.6085	0.1319	-7.4659
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-7.4659 (380)
Total CO2, kg/year			622.9242 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.0000 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Electrical efficiency of CHP unit	32.0000		461 (461)
Heat efficiency of CHP unit	49.9000		462 (462)
Space heating from Combined Heat and Power	91.9637	1.1300	103.9190 (463)
less credit emissions for electricity	-29.4284	2.1490	-63.2416 (464)
Water heating from Combined Heat and Power	3090.8879	1.1300	3492.7034 (465)

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less credit emissions for electricity	-989.0841	2.1490	-2125.5418 (466)
Efficiency of heat source Boilers			93.9000 (467b)
Space and Water heating from Boilers	1339.7983	1.1300	43.7439 (468)
Electrical energy for heat distribution (space & water)	0.8224	0.0000	43.3185 (472)
Overall CO2 factor for heat network			1.0417 (486)
Total CO2 associated with community systems			2965.1296 (473)
Space and water heating			2965.1296 (476)
Pumps, fans and electric keep-hot	101.9262	1.5128	154.1939 (478)
Energy for lighting	117.2302	1.5338	179.8116 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-56.6085	1.4873	-84.1922
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-84.1922 (480)
Total Primary energy kWh/year			3214.9428 (483)
Dwelling Primary energy Rate (DPER)			61.9400 (484)

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

1. Overall dwelling characteristics

Ground floor		Area (m2)	Storey height (m)	Volume (m3)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.9000	51.9000 (1b)	x 2.7400 (2b)	= 142.2060 (1b) - (4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 142.2060 (5)

2. Ventilation rate

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		m3 per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1406 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000 (17)	
Infiltration rate	0.3906 (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) =	0.3027 (21)

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 Opening Type (Uw = 1.20)			7.7700	1.1450	8.8969		(27)
External Wall 1	19.2348	7.7700	11.4648	0.1800	2.0637		(29a)
External Roof 1	51.9000		51.9000	0.1100	5.7090		(30)
Total net area of external elements Aum(A, m2)			71.1348				(31)
Fabric heat loss, W/K = Sum (A x U)					16.6696		(33)
Party Wall 1			58.5300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							395.4106 (35)
List of Thermal Bridges							
K1 Element	Length	Psi-value	Total				

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E2 Other lintels (including other steel lintels)	3.8400	0.0500	0.1920									
E3 Sill	1.5600	0.0500	0.0780									
E4 Jamb	7.7400	0.0500	0.3870									
E7 Party floor between dwellings (in blocks of flats)	7.0100	0.0700	0.4907									
E9 Balcony between dwellings, wall insulation continuous	7.0100	0.0200	0.1402									
E18 Party wall between dwellings	5.4800	0.0600	0.3288									
E14 Flat roof	7.0100	0.0800	0.5608									
P4 Party wall - Roof (insulation at ceiling level)	21.3500	0.1200	2.5620									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.7395 (36)									
Point Thermal bridges			0.0000									
Total fabric heat loss		(33) + (36) + (36a) =	21.4091 (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	26.9601	26.8243	26.6912	26.0662	25.9493	25.4049	25.4049	25.3041	25.6146	25.9493	26.1859	26.4332 (38)
Average = Sum(39)m / 12 =	48.3692	48.2334	48.1004	47.4753	47.3584	46.8140	46.8140	46.7132	47.0237	47.3584	47.5950	47.8423 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9320	0.9294	0.9268	0.9147	0.9125	0.9020	0.9020	0.9001	0.9060	0.9125	0.9171	0.9218 (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		1.7461 (42)										
Hot water usage for mixer showers	53.4962	52.6923	51.5208	49.2793	47.6252	45.7805	44.7320	45.8946	47.1691	49.1497	51.4393	53.2912 (42a)
Hot water usage for baths	23.1283	22.7849	22.3012	21.4093	20.7415	20.0010	19.6010	20.0813	20.6043	21.3967	22.3069	23.0502 (42b)
Hot water usage for other uses	32.5120	31.3298	30.1475	28.9653	27.7830	26.6007	26.6007	27.7830	28.9653	30.1475	31.3298	32.5120 (42c)
Average daily hot water use (litres/day)												100.3217 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	109.1366	106.8069	103.9694	99.6538	96.1496	92.3822	90.9337	93.7589	96.7386	100.6939	105.0759	108.8534 (44)
Energy content (annual)	172.8457	152.0916	159.7971	136.4211	129.4359	113.5947	109.9764	116.0931	119.2884	136.6406	149.6999	170.4382 (45)
Distribution loss = 0.15 x (45)m	25.9268	22.8137	23.9696	20.4632	19.4154	17.0392	16.4965	17.4140	17.8933	20.4961	22.4550	25.5657 (46)
Water storage loss:												0.0000 (47)
Store volume												0.0000 (47)
b) If manufacturer declared loss factor is not known :												1.4400 (51)
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0000 (52)
Volume factor from Table 2a												1.0000 (53)
Temperature factor from Table 2b												1.4400 (55)
Enter (49) or (54) in (55)												1.4400 (55)
Total storage loss	44.6400	40.3200	44.6400	43.2000	44.6400	43.2000	44.6400	44.6400	43.2000	44.6400	43.2000	44.6400 (56)
If cylinder contains dedicated solar storage	44.6400	40.3200	44.6400	43.2000	44.6400	43.2000	44.6400	44.6400	43.2000	44.6400	43.2000	44.6400 (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 (61)
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	217.4857	192.4116	204.4371	179.6211	174.0759	156.7947	154.6164	160.7331	162.4884	181.2806	192.8999	215.0782 (62)
WNHRS	-24.4562	-21.6293	-22.6489	-18.7542	-17.4783	-14.9563	-14.0191	-14.9079	-15.4743	-18.2425	-20.6666	-24.0033 (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	193.0294	170.7823	181.7882	160.8669	156.5976	141.8384	140.5973	145.8252	147.0140	163.0381	172.2334	191.0748 (64)
Total per year (kWh/year)												1964.6856 (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	93.1832	82.8265	88.8445	79.9200	78.7494	72.3302	72.2792	74.3130	74.2234	81.1450	84.3352	92.3827 (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	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060	87.3060 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.1655	89.8619	81.1655	83.8711	81.1655	83.8711	81.1655	81.1655	83.8711	81.1655	83.8711	81.1655 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.1665	153.7456	149.7665	141.2955	130.6025	120.5525	113.8385	112.2595	116.2386	124.7095	135.4026	145.4526 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306	31.7306 (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)	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448	-69.8448 (71)
Water heating gains (Table 5)	125.2462	123.2536	119.4147	111.0000	105.8460	100.4587	97.1494	99.8830	103.0880	109.0659	117.1323	124.1703 (72)
Total internal gains												

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407.7701 416.0529 399.5386 385.3585 366.8059 354.0741 341.3453 342.4999 352.3895 364.1328 385.5977 399.9802 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
South	7.7700	46.7521	0.6300	0.7000	0.7700		111.0181 (78)					
Solar gains	111.0181	181.8190	231.6051	261.7641	272.7744	262.5082	256.4865	249.0839	241.9389	196.1088	131.5943	95.9298 (83)
Total gains	518.7882	597.8718	631.1437	647.1225	639.5802	616.5823	597.8318	591.5838	594.3284	560.2416	517.1920	495.9100 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	117.8540	118.1857	118.5127	120.0729	120.3694	121.7691	121.7691	122.0319	121.2262	120.3694	119.7711	119.1520
alpha	8.8569	8.8790	8.9008	9.0049	9.0246	9.1179	9.1179	9.1355	9.0817	9.0246	8.9847	8.9435
util living area	0.9928	0.9756	0.9378	0.8387	0.6810	0.4856	0.3445	0.3632	0.5449	0.8333	0.9739	0.9949 (86)
MIT	20.5743	20.7188	20.8463	20.9538	20.9929	20.9997	21.0000	21.0000	20.9991	20.9626	20.7699	20.5480 (87)
Th 2	20.1404	20.1426	20.1448	20.1550	20.1569	20.1658	20.1658	20.1674	20.1624	20.1569	20.1530	20.1490 (88)
util rest of house	0.9896	0.9658	0.9157	0.7956	0.6227	0.4225	0.2792	0.2975	0.4793	0.7822	0.9616	0.9925 (89)
MIT 2	19.6686	19.8480	19.9984	20.1186	20.1528	20.1657	20.1658	20.1674	20.1620	20.1300	19.9213	19.6428 (90)
Living area fraction	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (91)
MIT	20.1623	20.3227	20.4606	20.5738	20.6107	20.6203	20.6205	20.6212	20.6183	20.5838	20.3839	20.1362 (92)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (93)
adjusted MIT	20.1623	20.3227	20.4606	20.5738	20.6107	20.6203	20.6205	20.6212	20.6183	20.5838	20.3839	20.1362 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	513.4253	578.8096	583.5107	529.2043	418.5771	281.7124	188.2125	197.1823	306.1516	453.2953	499.2996	492.1567 (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	767.2448	743.8880	671.5091	554.2197	421.9977	281.8340	188.2159	197.1881	306.5150	472.8179	632.2448	762.4245 (97)
Space heating kWh	188.8417	110.9327	65.4708	18.0111	2.5449	0.0000	0.0000	0.0000	0.0000	14.5248	95.7206	201.0792 (98a)
Space heating requirement - total per year (kWh/year)												697.1258
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	188.8417	110.9327	65.4708	18.0111	2.5449	0.0000	0.0000	0.0000	0.0000	14.5248	95.7206	201.0792 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												697.1258
Space heating per m2										(98c) / (4) =		13.4321 (99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Combined Heat and Power-Space and Water	0.5580 (303a)
Fraction of heat from community Boilers-Space and Water	0.4420 (303b)
Factor for control and charging method (Table 4c(3)) for space heating	1.0000 (305)
Factor for charging method (Table 4c(3)) for water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.2500 (306)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)
Space heating:	
Space heating requirement	188.8417 110.9327 65.4708 18.0111 2.5449 0.0000 0.0000 0.0000 0.0000 14.5248 95.7206 201.0792 (98)
Space heat from Combined Heat and Power = (98) x 0.56 x 1.00 x 1.25	131.7171 77.3755 45.6659 12.5628 1.7751 0.0000 0.0000 0.0000 0.0000 10.1310 66.7651 140.2528
Space heat from Boilers = (98) x 0.44 x 1.00 x 1.25	104.3351 61.2903 36.1726 9.9511 1.4061 0.0000 0.0000 0.0000 0.0000 8.0249 52.8856 111.0963
Space heating requirement	236.0522 138.6658 81.8385 22.5139 3.1811 0.0000 0.0000 0.0000 0.0000 18.1560 119.6507 251.3491 (307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)
Water heating	
Annual water heating requirement	193.0294 170.7823 181.7882 160.8669 156.5976 141.8384 140.5973 145.8252 147.0140 163.0381 172.2334 191.0748 (64)
Water heat from Combined Heat and Power = (64) x 0.56 x 1.00 x 1.25	134.6380 119.1207 126.7973 112.2047 109.2268 98.9323 98.0666 101.7131 102.5423 113.7191 120.1328 133.2747

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Water heat from Boilers = (64) x 0.44 x 1.00 x 1.25	106.6488	94.3572	100.4380	88.8790	86.5202	78.3657	77.6800	80.5684	81.2253	90.0785	95.1589	105.5688
Water heating fuel	241.2868	213.4779	227.2352	201.0836	195.7470	177.2980	175.7466	182.2815	183.7675	203.7976	215.2917	238.8435 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (311)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (312)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (313)
Lighting	16.8646	13.5294	12.1817	8.9249	6.8938	5.6323	6.2888	8.1744	10.6177	13.9310	15.7350	17.3333 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	-5.3149	-8.2773	-13.1250	-16.3263	-19.0405	-18.3068	-18.0832	-16.3413	-13.5608	-10.1095	-6.1140	-4.5083 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	-1.0177	-2.2370	-4.6351	-7.2537	-9.8909	-10.0537	-9.9380	-8.2757	-5.8869	-3.2923	-1.3871	-0.7980 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												871.4073 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2455.8570 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												8.7141 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (331)
Electricity for lighting (calculated in Appendix L)												136.1070 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-213.7740 (333)
Wind generation												0.0000 (334)
Hydro-electric generation (Appendix N)												0.0000 (335a)
Electricity generated - Micro CHP (Appendix M)												0.0000 (335)
Appendix Q - special features												
Energy saved or generated												-0.0000 (336)
Energy used												0.0000 (337)
Total delivered energy for all uses												3249.5973 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Electrical efficiency of CHP unit			32.0000 (361)
Heat efficiency of CHP unit			49.9000 (362)
Space heating from Combined Heat and Power	974.4394	0.2100	204.6323 (363)
less credit emissions for electricity	-311.8206	0.3480	-108.5136 (364)
Water heating from Combined Heat and Power	2746.2289	0.2100	576.7081 (365)
less credit emissions for electricity	-878.7932	0.3480	-305.8200 (366)
Efficiency of heat source Boilers			93.9000 (367)
Space and Water heating from Boilers	1566.1883	0.2100	86.1385 (368)
Electrical energy for heat distribution (space & water)	8.7141	0.0000	4.8395 (372)
Overall CO2 factor for heat network			0.2106 (386)
Total CO2 associated with community systems			700.7458 (373)
Space and water heating			700.7458 (376)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (378)
Energy for lighting	136.1070	0.1443	19.6444 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-149.1078	0.1326	-19.7685
PV Unit electricity exported	-64.6661	0.1247	-8.0645
Total			-27.8330 (380)
Total CO2, kg/year			692.5572 (383)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3400 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Electrical efficiency of CHP unit			32.0000 (461)
Heat efficiency of CHP unit			49.9000 (462)
Space heating from Combined Heat and Power	974.4394	1.1300	1101.1166 (463)
less credit emissions for electricity	-311.8206	2.1490	-670.1025 (464)
Water heating from Combined Heat and Power	2746.2289	1.1300	3103.2386 (465)
less credit emissions for electricity	-878.7932	2.1490	-1888.5267 (466)
Efficiency of heat source Boilers			93.9000 (467b)
Space and Water heating from Boilers	1566.1883	1.1300	463.5070 (468)
Electrical energy for heat distribution (space & water)	8.7141	0.0000	51.1726 (472)
Overall CO2 factor for heat network			1.0419 (486)
Total CO2 associated with community systems			3466.6914 (473)
Space and water heating			3466.6914 (476)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (478)
Energy for lighting	136.1070	1.5338	208.7654 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-149.1078	1.4899	-222.1514

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PV Unit electricity exported	-64.6661	0.4577	-29.5986
Total			-251.7500 (480)
Total Primary energy kWh/year			3423.7068 (483)
Target Primary Energy Rate (TPER)			65.9700 (484)

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Property Reference	L01-6.04 SO x6_Copy		Issued on Date	12/09/2023	
Assessment Reference	L00.04 SO_Copy	Prop Type Ref			
Property					
SAP Rating	86 B	DER	2.45	TER	12.48
Environmental	98 A	% DER < TER	80.37		
CO ₂ Emissions (t/year)	0.16	DFEE	27.44	TFEE	27.80
Compliance Check	See BREL	% DFEE < TFEE	1.28		
% DPER < TPER	61.58	DPER	26.06	TPER	67.82
Assessor Details	Mr. Richard Denteh		Assessor ID	U148-0001	
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	72.0000 (1b)	2.7400 (2b)	197.2800 (1b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		197.2800 (4)
Dwelling volume			197.2800 (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)
Air changes per hour	0.0000 / (5) = 0.0000 (8)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	Jan: 1.2750, Feb: 1.2500, Mar: 1.2250, Apr: 1.1000, May: 1.0750, Jun: 0.9500, Jul: 0.9500, Aug: 0.9250, Sep: 1.0000, Oct: 1.0750, Nov: 1.1250, Dec: 1.1750 (22a)
Adj infiltr rate	0.1626, 0.1594, 0.1562, 0.1403, 0.1371, 0.1211, 0.1211, 0.1179, 0.1275, 0.1371, 0.1434, 0.1498 (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) =	72.8000 (23c)
Effective ac	0.2986, 0.2954, 0.2922, 0.2762, 0.2731, 0.2571, 0.2571, 0.2539, 0.2635, 0.2731, 0.2794, 0.2858 (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
window (Uw = 1.30)			14.8000	1.2357	18.2890		(27)
External Wall 1	47.8404	14.8000	33.0404	0.1400	4.6257	190.0000	6277.6760 (29a)
Total net area of external elements Aum(A, m ²)			47.8404				(31)

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Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	22.9146	(33)
Party Wall 1	58.2000	0.0000	0.0000
Party Floor 1	72.0000		180.0000
Party Ceiling 1	72.0000		40.0000
Internal Wall 1	118.3600		2880.0000 (32d)
			30.0000
			2160.0000 (32b)
			75.0000
			8877.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	30670.6760 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		425.9816 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	7.5700	0.0300	0.2271
E2 Other lintels (including other steel lintels)	5.9900	0.0300	0.1797
E3 Sill	17.1000	0.0300	0.5130
E4 Jamb	34.9200	0.0700	2.4444
E7 Party floor between dwellings (in blocks of flats)	5.4800	0.0600	0.3288
E18 Party wall between dwellings	2.7400	0.0900	0.2466
E16 Corner (normal)	5.8000	0.0000	0.0000
E8 Balcony within a dwelling, wall insulation continuous	2.7400	-0.0900	-0.2466
E17 Corner (inverted - internal area greater than external area)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.6930 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 26.6076 (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	19.4371	19.2296	19.0221	17.9845	17.7770	16.7395	16.7395	16.5319	17.1545	17.7770	18.1921	18.6071 (38)
Heat transfer coeff	46.0448	45.8373	45.6297	44.5922	44.3847	43.3471	43.3471	43.1396	43.7621	44.3847	44.7997	45.2147 (39)
Average = Sum(39)m / 12 =	44.5403											

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6395	0.6366	0.6337	0.6193	0.6165	0.6020	0.6020	0.5992	0.6078	0.6165	0.6222	0.6280 (40)
HLP (average)	0.6186											
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	86.1812	84.8860	82.9988	79.3878	76.7230	73.7513	72.0621	73.9351	75.9883	79.1790	82.8675	85.8510 (42a)
Hot water usage for baths	27.0765	26.6744	26.1081	25.0640	24.2822	23.4152	22.9470	23.5093	24.1216	25.0492	26.1148	26.9849 (42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196 (42c)
Average daily hot water use (litres/day)	139.2145 (43)											
Daily hot water use	151.3773	148.2938	144.4541	138.4129	133.5801	128.3553	126.1979	130.0194	134.0709	139.5755	145.7158	150.9555 (44)
Energy conte	239.7446	211.1684	222.0206	189.4803	179.8245	157.8278	152.6254	160.9911	165.3229	189.4026	207.5988	236.3599 (45)
Energy content (annual)	Total = Sum(45)m = 2312.3670											
Distribution loss (46)m = 0.15 x (45)m	35.9617	31.6753	33.3031	28.4221	26.9737	23.6742	22.8938	24.1487	24.7984	28.4104	31.1398	35.4540 (46)
Water storage loss:	180.0000 (47)											
Store volume	1.5200 (48)											
a) If manufacturer declared loss factor is known (kWh/day):	0.6000 (49)											
Temperature factor from Table 2b	0.9120 (55)											
Enter (49) or (54) in (55)												
Total storage loss	28.2720	25.5360	28.2720	27.3600	28.2720	27.3600	28.2720	27.3600	28.2720	27.3600	28.2720	27.3600 (56)
If cylinder contains dedicated solar storage												
Primary loss	28.2720	25.5360	28.2720	27.3600	28.2720	27.3600	28.2720	27.3600	28.2720	27.3600	28.2720	27.3600 (57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	23.2624	23.2624	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month	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)
WMHRS	291.2790	257.7156	273.5550	239.3523	231.3589	207.6998	204.1598	212.5255	215.1949	240.9370	257.4708	287.8943 (62)
PV diverter	-65.3735	-57.8168	-60.5425	-50.1315	-46.7208	-39.9793	-37.4742	-39.8501	-41.3641	-48.7638	-55.2434	-64.1628 (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	225.9055	199.8988	213.0125	189.2208	184.6381	167.7205	166.6856	172.6754	173.8307	192.1732	202.2274	223.7314 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 2311.7201 (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	120.9426	107.4513	115.0494	102.8998	101.0192	92.3754	91.9755	94.7571	94.8675	104.2039	108.9242	119.8172 (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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.8450	112.7570	101.8450	105.2399	101.8450	105.2399	101.8450	101.8450	105.2399	101.8450	105.2399	101.8450 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100 (68)

Full SAP Calculation Printout



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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0000 (1b)	x 2.7400 (2b)	= 197.2800 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 197.2800 (5)
Dwelling volume			

2. Ventilation rate

	Value	Reference
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	30.0000 / (5) = 0.1521	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4021	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3418	(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
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
Adj infilt rate												
Effective ac	0.4357	0.4272	0.4187	0.3759	0.3674	0.3247	0.3247	0.3161	0.3418	0.3674	0.3845	0.4016
	0.5949	0.5912	0.5876	0.5707	0.5675	0.5527	0.5527	0.5500	0.5584	0.5675	0.5739	0.5806

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.20)			14.8000	1.1450	16.9466		(27)
External Wall 1	47.8404	14.8000	33.0404	0.1800	5.9473		(29a)
Total net area of external elements Aum(A, m ²)			47.8404				(31)
Fabric heat loss, W/K = Sum (A x U)					22.8938		(33)
Party Wall 1			58.2000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	Value	Reference
List of Thermal Bridges		
K1 Element	Length	Psi-value
E2 Other lintels (including other steel lintels)	7.5700	0.0500
E3 Sill	5.9900	0.0500
E4 Jamb	17.1000	0.0500
E7 Party floor between dwellings (in blocks of flats)	34.9200	0.0700
E18 Party wall between dwellings	5.4800	0.0600
E16 Corner (normal)	2.7400	0.0900
E8 Balcony within a dwelling, wall insulation continuous	5.8000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.7400	-0.0900
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.3062
Point Thermal bridges		0.0000
Total fabric heat loss	(33) + (36) + (36a) =	27.2000

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	38.7317	38.4917	38.2565	37.1515	36.9448	35.9824	35.9824	35.8042	36.3531	36.9448	37.3630	37.8002
Heat transfer coeff	65.9317	65.6918	65.4565	64.3516	64.1448	63.1825	63.1825	63.0043	63.5532	64.1448	64.5631	65.0003
Average = Sum(39)m / 12 =												64.3506

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9157	0.9124	0.9091	0.8938	0.8909	0.8775	0.8775	0.8751	0.8827	0.8909	0.8967	0.9028
HLP (average)												0.8938
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2937
Hot water usage for mixer showers	62.6772	61.7353	60.3627	57.7366	55.7986	53.6373	52.4088	53.7710	55.2642	57.5847	60.2673	62.4371
Hot water usage for baths	27.0765	26.6744	26.1081	25.0640	24.2822	23.4152	22.9470	23.5093	24.1216	25.0492	26.1148	26.9849
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196
Average daily hot water use (litres/day)												117.5446
Daily hot water use	127.8733	125.1431	121.8181	116.7617	112.6557	108.2413	106.5446	109.8552	113.3469	117.9812	123.1155	127.5416
Energy conte	202.5201	178.2021	187.2299	159.8409	151.6562	133.0953	128.8565	136.0237	139.7680	160.0994	175.4006	199.6994
Energy content (annual)												1952.3920
Distribution loss (46)m = 0.15 x (45)m	30.3780	26.7303	28.0845	23.9761	22.7484	19.9643	19.3285	20.4036	20.9652	24.0149	26.3101	29.9549
Water storage loss:												180.0000
Store volume												1.5520
a) If manufacturer declared loss factor is known (kWh/day):												0.5400
Temperature factor from Table 2b												0.8381
Enter (49) or (54) in (55)												0.8381
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624
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
Total heat required for water heating calculated for each month	251.7627	222.6793	236.4725	207.4951	200.8989	180.7495	178.0991	185.2664	187.4222	209.3420	223.0548	248.9420
WWHRS	-28.6534	-25.3413	-26.5360	-21.9728	-20.4779	-17.5231	-16.4251	-17.4664	-18.1300	-21.3733	-24.2134	-28.1228
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
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
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
Output from w/h	223.1093	197.3380	209.9366	185.5223	180.4210	163.2265	161.6740	167.8000	169.2922	187.9687	198.8415	220.8192
12Total per year (kWh/year)												2265.9493
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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month	106.7321	94.8340	101.6481	91.2705	89.8198	82.3776	82.2389	84.6220	84.5962	92.6272	96.4441	105.7942

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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.2951	113.2553	102.2951	105.7050	102.2951	105.7050	102.2951	102.2951	105.7050	102.2951	105.7050	102.2951
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474
Water heating gains (Table 5)	143.4571	141.1220	136.6237	126.7645	120.7256	114.4133	110.5362	113.7393	117.4948	124.4989	133.9501	142.1965
Total internal gains	508.0767	518.7971	498.0586	480.3686	456.7305	437.4921	421.2960	422.4038	434.8492	452.6841	479.7344	497.9068

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	11.6500	10.6334	0.6300	0.7000	0.7700	37.8590
West	3.1500	19.6403	0.6300	0.7000	0.7700	18.9073
Solar gains	56.7663	109.3373	183.8531	286.3115	374.8894	396.2294
Total gains	564.8430	628.1344	681.9117	766.6801	831.6199	833.7215

