Full SAP Calculation Printout

Property Reference	Flat 04_07 mid N	**Issued on Date**	25/01/2024
Assessment Reference	Flat 04_07 mid N BE LEAN	**Prop Type Ref**	SE_01_009 exposed floor W
Property			

SAP Rating	85 B	**DER**	12.33	**TER**	13.29
Environmental	90 B	**% DER < TER**			7.22
CO_2 Emissions (t/year)	0.79	**DFEE**	29.12	**TFEE**	29.69
Compliance Check	See BREL	**% DFEE < TFEE**			1.93
% DPER < TPER	2.75	**DPER**	70.26	**TPER**	72.24

Assessor Details	Miss Amy Webb	**Assessor ID**	V831-0001
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	69.1900	(1b)	x 2.5300	(2b) =	175.0507	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.1900					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		175.0507	(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	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		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)

	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	0.1482	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

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) =		73.6000 (23c)

Effective ac	0.2802	0.2773	0.2744	0.2599	0.2570	0.2424	0.2424	0.2395	0.2482	0.2570	0.2628	0.2686	(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	
Window (Uw = 1.20)			11.3900	1.1450	13.0420			(27)
Int door			1.7000	1.1000	1.8700			(26)
External Wall 1	51.5200	11.3900	40.1300	0.1500	6.0195	14.0000	561.8200	(29a)
corridor wall	34.8900	1.7000	33.1900	0.1800	5.9742	14.0000	464.6600	(29a)
Total net area of external elements Aum(A, m2)			86.4100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.9057			(33)
Party Wall 1			17.3400	0.0000	0.0000	20.0000	346.8000	(32)
Party Floor			69.1900			40.0000	2767.6000	(32d)
Party Ceiling 1			69.1900			90.0000	6227.1000	(32b)
Internal Wall 1			84.0500			9.0000	756.4500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11124.4300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		160.7809 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	63.6400	0.0400	2.5456	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.7000	0.0000	0.0000	
E16 Corner (normal)	30.3600	0.0900	2.7324	
E18 Party wall between dwellings	5.0600	0.0600	0.3036	
E17 Corner (inverted - internal area greater than external area)	10.1200	0.0000	0.0000	
E3 Sill	5.7900	0.0500	0.2895	
E9 Balcony between dwellings, wall insulation continuous	4.6600	0.1000	0.4660	
E1 Steel lintel with perforated steel base plate	8.3300	0.1000	0.8330	
E4 Jamb	23.6000	0.0500	1.1800	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.3501	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	35.2558	(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	16.1873	16.0194	15.8516	15.0121	14.8442	14.0048	14.0048	13.8369	14.3406	14.8442	15.1800	15.5158	(38)
Heat transfer coeff	51.4431	51.2752	51.1073	50.2679	50.1000	49.2606	49.2606	49.0927	49.5964	50.1000	50.4358	50.7716	(39)
Average = Sum(39)m / 12 =												50.2259	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7435	0.7411	0.7387	0.7265	0.7241	0.7120	0.7120	0.7095	0.7168	0.7241	0.7289	0.7338	(40)
HLP (average)												0.7259	
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												2.2263	(42)
Hot water usage for mixer showers	61.5474	60.6224	59.2746	56.6958	54.7927	52.6704	51.4641	52.8017	54.2680	56.5467	59.1809	61.3116	(42a)
Hot water usage for baths	26.5906	26.1957	25.6396	24.6142	23.8464	22.9951	22.5352	23.0874	23.6887	24.5997	25.6462	26.5007	(42b)
Hot water usage for other uses	37.4295	36.0685	34.7074	33.3463	31.9852	30.6242	30.6242	31.9852	33.3463	34.7074	36.0685	37.4295	(42c)
Average daily hot water use (litres/day)												115.4252	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	125.5675	122.8866	119.6216	114.6564	110.6244	106.2897	104.6235	107.8744	111.3030	115.8538	120.8955	125.2418	(44)
Energy conte	198.8683	174.9889	183.8539	156.9588	148.9217	130.6955	126.5330	133.5710	137.2477	157.2125	172.2379	196.0984	(45)
Energy content (annual)										Total = Sum(45)m =		1917.1877	
Distribution loss (46)m = 0.15 x (45)m	29.8302	26.2483	27.5781	23.5438	22.3383	19.6043	18.9800	20.0357	20.5872	23.5819	25.8357	29.4148	(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	254.1451	224.9163	239.1307	210.4525	204.1985	184.1892	181.8098	188.8478	190.7414	212.4893	225.7315	251.3752	(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	254.1451	224.9163	239.1307	210.4525	204.1985	184.1892	181.8098	188.8478	190.7414	212.4893	225.7315	251.3752	(64)
										Total per year (kWh/year) = Sum(64)m =		2568.0275	(64)
12Total per year (kWh/year)												2568	(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	110.3451	98.1258	105.3529	94.9838	93.7379	86.2512	86.2937	88.6338	88.4298	96.4946	100.0640	109.4242	(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	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.2562	109.8908	99.2562	102.5647	99.2562	102.5647	99.2562	99.2562	102.5647	99.2562	102.5647	99.2562	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	195.3992	197.4269	192.3173	181.4396	167.7085	154.8032	146.1817	144.1541	149.2636	160.1413	173.8724	186.7777	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	(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)	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	(71)
Water heating gains (Table 5)	148.3134	146.0205	141.6033	131.9219	125.9918	119.7934	115.9861	119.1315	122.8192	129.6970	138.9778	147.0755	(72)
Total internal gains	499.3633	509.7326	489.5713	472.3207	449.3510	433.5558	417.8185	418.9362	431.0420	445.4890	471.8094	489.5039	(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	1.9100	19.6403	0.4000	0.8500	0.7700	8.8388	(76)
South	5.7100	46.7521	0.4000	0.8500	0.7700	62.8998	(78)
West	3.7700	19.6403	0.4000	0.8500	0.7700	17.4462	(80)

Solar gains	89.1848	154.4326	215.9009	271.8087	305.9008	303.6681	292.8256	267.8308	235.5620	172.1228	107.3320	75.9667	(83)
Total gains	588.5480	664.1652	705.4722	744.1295	755.2519	737.2239	710.6441	686.7670	666.6041	617.6119	579.1414	565.4706	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.0687	60.2654	60.4633	61.4730	61.6790	62.7300	62.7300	62.9446	62.3053	61.6790	61.2684	60.8632	
alpha	5.0046	5.0177	5.0309	5.0982	5.1119	5.1820	5.1820	5.1963	5.1537	5.1119	5.0846	5.0575	
util living area	0.9471	0.9101	0.8540	0.7419	0.5958	0.4246	0.3045	0.3281	0.5052	0.7581	0.9042	0.9540	(86)
MIT	20.2740	20.4676	20.6661	20.8642	20.9614	20.9946	20.9992	20.9989	20.9868	20.8721	20.5714	20.2436	(87)
Th 2	20.3026	20.3047	20.3068	20.3175	20.3196	20.3303	20.3303	20.3324	20.3260	20.3196	20.3153	20.3111	(88)
util rest of house	0.9387	0.8970	0.8343	0.7122	0.5573	0.3813	0.2584	0.2808	0.4585	0.7238	0.8884	0.9466	(89)
MIT 2	19.4665	19.7049	19.9448	20.1811	20.2855	20.3265	20.3299	20.3318	20.3161	20.1957	19.8439	19.4357	(90)
Living area fraction									fLA = Living area / (4) =			0.5108	(91)
MIT	19.8789	20.0945	20.3132	20.5300	20.6307	20.6678	20.6718	20.6725	20.6587	20.5412	20.2155	19.8483	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8789	20.0945	20.3132	20.5300	20.6307	20.6678	20.6718	20.6725	20.6587	20.5412	20.2155	19.8483	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9328	0.8927	0.8345	0.7217	0.5751	0.4032	0.2820	0.3050	0.4817	0.7354	0.8858	0.9408	(94)
Useful gains	549.0106	592.9071	588.6977	537.0673	434.3470	297.2430	200.3727	209.4430	321.1093	454.1753	513.0247	532.0105	(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	801.4289	779.0999	705.9570	584.6173	447.4307	298.9013	200.5776	209.7499	325.2871	498.0543	661.4894	794.4896	(97)
Space heating kWh	187.7992	125.1216	87.2409	34.2360	9.7343	0.0000	0.0000	0.0000	0.0000	32.6460	106.8946	195.2845	(98a)
Space heating requirement - total per year (kWh/year)												778.9570	
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	187.7992	125.1216	87.2409	34.2360	9.7343	0.0000	0.0000	0.0000	0.0000	32.6460	106.8946	195.2845	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												778.9570	
Space heating per m2											(98c) / (4) =	11.2582	(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 Boilers-Space and Water												1.0000	(303a)
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												1.0500	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	187.7992	125.1216	87.2409	34.2360	9.7343	0.0000	0.0000	0.0000	0.0000	32.6460	106.8946	195.2845	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05													
307a	197.1892	131.3777	91.6029	35.9478	10.2210	0.0000	0.0000	0.0000	0.0000	34.2783	112.2393	205.0487	
Space heating requirement	197.1892	131.3777	91.6029	35.9478	10.2210	0.0000	0.0000	0.0000	0.0000	34.2783	112.2393	205.0487	(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	254.1451	224.9163	239.1307	210.4525	204.1985	184.1892	181.8098	188.8478	190.7414	212.4893	225.7315	251.3752	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05													
310a	266.8523	236.1621	251.0873	220.9751	214.4084	193.3987	190.9003	198.2902	200.2785	223.1138	237.0181	263.9440	
Water heating fuel	266.8523	236.1621	251.0873	220.9751	214.4084	193.3987	190.9003	198.2902	200.2785	223.1138	237.0181	263.9440	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
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	(315)
Pumps and Fa	13.2046	11.9267	13.2046	12.7786	13.2046	12.7786	13.2046	13.2046	12.7786	13.2046	12.7786	13.2046	(331)
Lighting	20.6235	16.5449	14.8969	10.9141	8.4303	6.8877	7.6904	9.9963	12.9842	17.0360	19.2422	21.1967	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)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	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)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	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)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	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)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	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)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	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)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	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												817.9049	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2696.4289	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.1790	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7280)													
mechanical ventilation fans (SFP = 0.7280)												155.4730	(330a)
Total electricity for the above, kWh/year												155.4730	(331)
Electricity for lighting (calculated in Appendix L)												166.4432	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(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	3836.2500	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			92.0000	(367)
Space and Water heating from Boilers	3819.9280	0.2100	186.6957	(367)
Electrical energy for heat distribution (space & water)	8.1790	0.0000	5.0850	(372)
Overall CO2 factor for heat network			0.2297	(386)
Total CO2 associated with community systems			807.2699	(373)
Space and water heating			807.2699	(376)
Pumps, fans and electric keep-hot	155.4730	0.1387	21.5660	(378)
Energy for lighting	166.4432	0.1443	24.0229	(379)
Total CO2, kg/year			852.8588	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.3300	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Boilers			92.0000	(467a)
Space and Water heating from Boilers	3819.9280	1.1300	1004.6006	(467)
Electrical energy for heat distribution (space & water)	8.1790	0.0000	53.9511	(472)
Overall CO2 factor for heat network			1.2436	(486)
Total CO2 associated with community systems			4370.4697	(473)
Space and water heating			4370.4697	(476)
Pumps, fans and electric keep-hot	155.4730	1.5128	235.1996	(478)
Energy for lighting	166.4432	1.5338	255.2962	(479)
Total Primary energy kWh/year			4860.9656	(483)
Dwelling Primary energy Rate (DPER)			70.2600	(484)

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	69.1900	(1b) x	2.5300	(2b) =	175.0507	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.1900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.0507	(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	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) =	0.1143	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3643	(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) =	0.2823	(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	0.3599	0.3529	0.3458	0.3105	0.3035	0.2682	0.2682	0.2611	0.2823	0.3035	0.3176	0.3317	(22b)
Effective ac	0.5648	0.5623	0.5598	0.5482	0.5460	0.5360	0.5360	0.5341	0.5398	0.5460	0.5504	0.5550	(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			1.7000	1.0000	1.7000	(26)
TER Opening Type (Uw = 1.20)			11.3900	1.1450	13.0420	(27)
External Wall 1	51.5200	11.3900	40.1300	0.1800	7.2234	(29a)
corridor wall	34.8900	1.7000	33.1900	0.1800	5.9742	(29a)
Total net area of external elements Aum(A, m2)			86.4100			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.9396	(33)
Party Wall 1			17.3400	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 134.7809 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	63.6400	0.0700	4.4548
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.7000	0.0000	0.0000
E16 Corner (normal)	30.3600	0.0900	2.7324
E18 Party wall between dwellings	5.0600	0.0600	0.3036
E17 Corner (inverted - internal area greater than external area)	10.1200	-0.0900	-0.9108
E3 Sill	5.7900	0.0500	0.2895
E9 Balcony between dwellings, wall insulation continuous	4.6600	0.0200	0.0932
E1 Steel lintel with perforated steel base plate	8.3300	0.0500	0.4165
E4 Jamb	23.6000	0.0500	1.1800

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.5592 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 36.4988 (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	32.6251	32.4798	32.3374	31.6685	31.5433	30.9607	30.9607	30.8528	31.1851	31.5433	31.7965	32.0612	(38)

Heat transfer coeff

	69.1239	68.9786	68.8362	68.1673	68.0421	67.4595	67.4595	67.3516	67.6839	68.0421	68.2953	68.5600	(39)

Average = Sum(39)m / 12 = 68.1667

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9990	0.9969	0.9949	0.9852	0.9834	0.9750	0.9750	0.9734	0.9782	0.9834	0.9871	0.9909	(40)
HLP (average)												0.9852	
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 2.2263 (42)

Hot water usage for mixer showers

61.5474	60.6224	59.2746	56.6958	54.7927	52.6704	51.4641	52.8017	54.2680	56.5467	59.1809	61.3116	(42a)

Hot water usage for baths

26.5906	26.1957	25.6396	24.6142	23.8464	22.9951	22.5352	23.0874	23.6887	24.5997	25.6462	26.5007	(42b)

Hot water usage for other uses

37.4295	36.0685	34.7074	33.3463	31.9852	30.6242	30.6242	31.9852	33.3463	34.7074	36.0685	37.4295	(42c)

Average daily hot water use (litres/day) 115.4252 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	125.5675	122.8866	119.6216	114.6564	110.6244	106.2897	104.6235	107.8744	111.3030	115.8538	120.8955	125.2418	(44)
Energy conte	198.8683	174.9889	183.8539	156.9588	148.9217	130.6955	126.5330	133.5710	137.2477	157.2125	172.2379	196.0984	(45)

Energy content (annual) Total = Sum(45)m = 1917.1877

Distribution loss (46)m = 0.15 x (45)m

29.8302	26.2483	27.5781	23.5438	22.3383	19.6043	18.9800	20.0357	20.5872	23.5819	25.8357	29.4148	(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

245.4632	217.0746	230.4488	202.0507	195.5166	175.7874	173.1279	180.1659	182.3396	203.8074	217.3297	242.6933	(62)
WWHRS -28.1369	-24.8845	-26.0576	-21.5767	-20.1087	-17.2072	-16.1290	-17.1516	-17.8032	-20.9880	-23.7769	-27.6158	(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

217.3263	192.1901	204.3912	180.4739	175.4079	158.5802	156.9989	163.0144	164.5364	182.8194	193.5528	215.0775	(64)

Total per year (kWh/year) = Sum(64)m = 2204.3689 (64)

12Total per year (kWh/year) 2204 (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

103.3996	91.8524	98.4074	88.2623	86.7924	79.5297	79.3482	81.6883	81.7083	89.5491	93.3426	102.4786	(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	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	111.3150	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

102.2563	113.2124	102.2563	105.6649	102.2563	105.6649	102.2563	102.2563	105.6649	102.2563	105.6649	102.2563	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

195.3992	197.4269	192.3173	181.4396	167.7085	154.8032	146.1817	144.1541	149.2636	160.1413	173.8724	186.7777	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	34.1315	(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)

-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	-89.0520	(71)

Water heating gains (Table 5)

138.9780	136.6851	132.2680	122.5865	116.6564	110.4580	106.6507	109.7961	113.4838	120.3617	129.6424	137.7401	(72)

Total internal gains

496.0280	506.7188	486.2361	469.0855	446.0158	427.3206	411.4833	412.6010	424.8068	442.1538	468.5742	486.1686	(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	1.9100	19.6403	0.6300	0.7000	0.7700	11.4644	(76)
South	5.7100	46.7521	0.6300	0.7000	0.7700	81.5847	(78)
West	3.7700	19.6403	0.6300	0.7000	0.7700	22.6287	(80)

Solar gains	115.6779	200.3082	280.0361	352.5519	396.7714	393.8754	379.8121	347.3923	305.5378	223.2535	139.2159	98.5333	(83)
Total gains	611.7059	707.0270	766.2722	821.6374	842.7872	821.1959	791.2953	759.9933	730.3446	665.4072	607.7901	584.7019	(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	37.4749	37.5539	37.6316	38.0009	38.0708	38.3996	38.3996	38.4611	38.2722	38.0708	37.9296	37.7832	
alpha	3.4983	3.5036	3.5088	3.5334	3.5381	3.5600	3.5600	3.5641	3.5515	3.5381	3.5286	3.5189	
util living area	0.9459	0.9141	0.8681	0.7809	0.6575	0.4990	0.3679	0.3976	0.5853	0.8030	0.9140	0.9525	(86)
MIT	19.5333	19.8165	20.1507	20.5314	20.7988	20.9437	20.9853	20.9804	20.8985	20.5564	19.9932	19.4808	(87)
Th 2	20.0841	20.0859	20.0876	20.0957	20.0972	20.1042	20.1042	20.1055	20.1015	20.0972	20.0941	20.0909	(88)
util rest of house	0.9373	0.9012	0.8486	0.7498	0.6113	0.4371	0.2959	0.3242	0.5232	0.7681	0.8989	0.9448	(89)
MIT 2	18.3918	18.7436	19.1545	19.6128	19.9128	20.0634	20.0968	20.0950	20.0222	19.6534	18.9751	18.3311	(90)
Living area fraction										fLA = Living area / (4) =		0.5108	(91)
MIT	18.9748	19.2916	19.6633	20.0820	20.3653	20.5131	20.5506	20.5473	20.4698	20.1146	19.4951	18.9183	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9748	19.2916	19.6633	20.0820	20.3653	20.5131	20.5506	20.5473	20.4698	20.1146	19.4951	18.9183	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9246	0.8881	0.8384	0.7493	0.6256	0.4659	0.3321	0.3609	0.5494	0.7688	0.8872	0.9326	(94)
Useful gains	565.5786	627.9066	642.4419	615.6516	527.2391	382.5953	262.8103	274.2857	401.2512	511.5791	539.2560	545.3145	(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	1014.3824	992.7130	906.1135	762.2438	589.6075	398.8921	266.5074	279.3251	431.1332	647.3941	846.5288	1009.0874	(97)
Space heating kWh	333.9100	245.1499	196.1717	105.5464	46.4021	0.0000	0.0000	0.0000	0.0000	101.0464	221.2364	345.0471	(98a)
Space heating requirement - total per year (kWh/year)												1594.5099	
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	333.9100	245.1499	196.1717	105.5464	46.4021	0.0000	0.0000	0.0000	0.0000	101.0464	221.2364	345.0471	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1594.5099	
Space heating per m2											(98c) / (4) =	23.0454	(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	333.9100	245.1499	196.1717	105.5464	46.4021	0.0000	0.0000	0.0000	0.0000	101.0464	221.2364	345.0471	(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)	361.7660	265.6012	212.5370	114.3515	50.2731	0.0000	0.0000	0.0000	0.0000	109.4760	239.6927	373.8321	(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	217.3263	192.1901	204.3912	180.4739	175.4079	158.5802	156.9989	163.0144	164.5364	182.8194	193.5528	215.0775	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0196	84.6067	83.9678	82.9005	81.5286	79.8000	79.8000	79.8000	79.8000	82.7867	84.3603	85.1140	(217)
Fuel for water heating, kWh/month	255.6189	227.1571	243.4162	217.6994	215.1489	198.7220	196.7405	204.2787	206.1859	220.8317	229.4358	252.6933	(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	21.2468	17.0450	15.3471	11.2440	8.6852	7.0959	7.9229	10.2985	13.3767	17.5510	19.8238	21.8374	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.6511	-11.8714	-18.7573	-23.2504	-27.0470	-25.9854	-25.6727	-23.2345	-19.3289	-14.4693	-8.7878	-6.4947	(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	-1.5587	-3.4199	-7.0719	-11.0428	-15.0290	-15.2602	-15.0795	-12.5668	-8.9546	-5.0213	-2.1213	-1.2223	(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	1727.5297	(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	2667.9284	(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)	171.4742	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-310.8990	(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	4342.0333	(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	1727.5297	0.2100	362.7812	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2667.9284	0.2100	560.2650	(264)
Space and water heating			923.0462	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	171.4742	0.1443	24.7490	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-212.5506	0.1326	-28.1932	
PV Unit electricity exported	-98.3484	0.1248	-12.2720	
Total			-40.4652	(269)
Total CO2, kg/year			919.2593	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.2900	(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	1727.5297	1.1300	1952.1086	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2667.9284	1.1300	3014.7591	(278)
Space and water heating			4966.8676	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	171.4742	1.5338	263.0128	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-212.5506	1.4901	-316.7240	
PV Unit electricity exported	-98.3484	0.4580	-45.0413	
Total			-361.7653	(283)
Total Primary energy kWh/year			4998.2160	(286)
Target Primary Energy Rate (TPER)			72.2400	(287)