Full SAP Calculation Printout

Property Reference	Flat 04_08 mid N	**Issued on Date**	25/01/2024
Assessment Reference	Flat 04_08 mid N BE LEAN	**Prop Type Ref**	SE_01_009 exposed floor W
Property			

SAP Rating	86 B	**DER**	10.72	**TER**	11.86
Environmental	91 B	**% DER < TER**			9.61
CO_2 Emissions (t/year)	0.72	**DFEE**	22.42	**TFEE**	23.09
Compliance Check	See BREL	**% DFEE < TFEE**			2.90
% DPER < TPER	4.69	**DPER**	61.61	**TPER**	64.64

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	70.9300 (1b)	x	2.5300 (2b)	=	179.4529	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.4529	(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)			9.4600	1.1450	10.8321			(27)
Int door			1.7000	1.1000	1.8700			(26)
External Wall 1	36.3500	11.1600	25.1900	0.1500	3.7785	14.0000	352.6600	(29a)
stair wall	10.2600		10.2600	0.1800	1.8468	14.0000	143.6400	(29a)
Total net area of external elements Aum(A, m2)			46.6100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.3274			(33)
Party Wall 1			36.9200	0.0000	0.0000	20.0000	738.4000	(32)
Party Floor			70.9300			40.0000	2837.2000	(32d)
Party Ceiling 1			70.9300			90.0000	6383.7000	(32b)
Internal Wall 1			115.6200			9.0000	1040.5800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11496.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		162.0778 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	43.8900	0.0400	1.7556	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.1800	0.0000	0.0000	
E16 Corner (normal)	10.1200	0.0900	0.9108	
E18 Party wall between dwellings	10.1200	0.0600	0.6072	
E17 Corner (inverted - internal area greater than external area)	7.5900	0.0000	0.0000	
E3 Sill	3.5000	0.0500	0.1750	
E9 Balcony between dwellings, wall insulation continuous	5.4300	0.1000	0.5430	
E1 Steel lintel with perforated steel base plate	6.0300	0.1000	0.6030	
E4 Jamb	19.6000	0.0500	0.9800	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.5746 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 23.9020 (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	16.5944	16.4223	16.2502	15.3897	15.2175	14.3570	14.3570	14.1849	14.7012	15.2175	15.5618	15.9060	(38)
Heat transfer coeff	40.4964	40.3243	40.1522	39.2916	39.1195	38.2590	38.2590	38.0869	38.6032	39.1195	39.4637	39.8079	(39)

Average = Sum(39)m / 12 = 39.2486

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5709	0.5685	0.5661	0.5539	0.5515	0.5394	0.5394	0.5370	0.5442	0.5515	0.5564	0.5612	(40)
HLP (average)												0.5533	
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 2.2685 (42)

Hot water usage for mixer showers

62.2548	61.3192	59.9559	57.3475	55.4225	53.2758	52.0556	53.4086	54.8917	57.1966	59.8611	62.0162	(42a)

Hot water usage for baths

26.8948	26.4954	25.9329	24.8958	24.1192	23.2581	22.7930	23.3516	23.9597	24.8811	25.9396	26.8039	(42b)

Hot water usage for other uses

37.8616	36.4848	35.1080	33.7312	32.3545	30.9777	30.9777	32.3545	33.7312	35.1080	36.4848	37.8616	(42c)

Average daily hot water use (litres/day) 116.7522 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.0112	124.2994	120.9968	115.9745	111.8962	107.5116	105.8263	109.1146	112.5827	117.1858	122.2855	126.6817	(44)
Energy conte	201.1547	177.0007	185.9676	158.7633	150.6338	132.1981	127.9877	135.1067	138.8257	159.0200	174.2181	198.3530	(45)
Energy content (annual)										Total = Sum(45)m =		1939.2293	
Distribution loss (46)m = 0.15 x (45)m	30.1732	26.5501	27.8951	23.8145	22.5951	19.8297	19.1982	20.2660	20.8239	23.8530	26.1327	29.7529	(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

256.4315	226.9281	241.2444	212.2570	205.9106	185.6917	183.2645	190.3835	192.3194	214.2968	227.7118	253.6298	(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	256.4315	226.9281	241.2444	212.2570	205.9106	185.6917	183.2645	190.3835	192.3194	214.2968	227.7118	253.6298	(64)

Total per year (kWh/year) = Sum(64)m = 2590.0691 (64)

12Total per year (kWh/year) 2590 (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

111.1054	98.7947	106.0557	95.5837	94.3072	86.7508	86.7774	89.1444	88.9545	97.0956	100.7225	110.1738	(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	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.7089	115.9277	104.7089	108.1992	104.7089	108.1992	104.7089	104.7089	108.1992	104.7089	108.1992	104.7089	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.4578	201.5276	196.3119	185.2083	171.1920	158.0186	149.2180	147.1482	152.3639	163.4675	177.4839	190.6572	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	(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)	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	(71)
Water heating gains (Table 5)	149.3352	147.0159	142.5480	132.7552	126.7570	120.4872	116.6362	119.8178	123.5479	130.5048	139.8923	148.0831	(72)
Total internal gains	510.5292	521.4985	500.5960	483.1900	459.6851	443.7323	427.5905	428.7022	441.1384	455.7086	482.6027	500.4765	(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	5.6000	10.6334	0.4000	0.8500	0.7700	14.0305	(74)
South	3.8600	46.7521	0.4000	0.8500	0.7700	42.5207	(78)

Solar gains	56.5511	96.4509	134.2681	173.4413	203.0598	206.0809	196.7698	173.5748	147.4442	107.0283	67.7099	48.4383 (83)
Total gains	567.0804	617.9493	634.8641	656.6312	662.7449	649.8133	624.3602	602.2770	588.5826	562.7369	550.3126	548.9148 (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	78.8561	79.1926	79.5321	81.2739	81.6315	83.4676	83.4676	83.8447	82.7233	81.6315	80.9195	80.2198	
alpha	6.2571	6.2795	6.3021	6.4183	6.4421	6.5645	6.5645	6.5896	6.5149	6.4421	6.3946	6.3480	
util living area	0.9256	0.8830	0.8230	0.6964	0.5437	0.3764	0.2696	0.2908	0.4511	0.6958	0.8634	0.9332	(86)
MIT	20.6289	20.7459	20.8534	20.9552	20.9914	20.9994	20.9999	20.9999	20.9979	20.9622	20.8192	20.6152	(87)
Th 2	20.4562	20.4584	20.4606	20.4716	20.4738	20.4849	20.4849	20.4871	20.4804	20.4738	20.4694	20.4650	(88)
util rest of house	0.9157	0.8691	0.8040	0.6709	0.5143	0.3463	0.2380	0.2584	0.4176	0.6661	0.8459	0.9241	(89)
MIT 2	20.0315	20.1741	20.3027	20.4269	20.4662	20.4844	20.4848	20.4870	20.4789	20.4377	20.2732	20.0226	(90)
Living area fraction									fLA = Living area / (4) =			0.4703	(91)
MIT	20.3125	20.4430	20.5617	20.6754	20.7132	20.7266	20.7271	20.7282	20.7230	20.6844	20.5300	20.3013	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3125	20.4430	20.5617	20.6754	20.7132	20.7266	20.7271	20.7282	20.7230	20.6844	20.5300	20.3013	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9128	0.8687	0.8076	0.6808	0.5277	0.3604	0.2529	0.2737	0.4333	0.6781	0.8480	0.9211	(94)
Useful gains	517.6456	536.7863	512.7444	447.0642	349.7362	234.2121	157.8843	164.8257	255.0355	381.6162	466.6469	505.5789	(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	648.4480	626.7597	564.6072	462.6743	352.5930	234.3979	157.8985	164.8492	255.6691	394.4968	529.9984	640.9601	(97)
Space heating kWh	97.3170	60.4622	38.5859	11.2392	2.1255	0.0000	0.0000	0.0000	0.0000	9.5832	45.6131	100.7236	(98a)
Space heating requirement - total per year (kWh/year)												365.6496	
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	97.3170	60.4622	38.5859	11.2392	2.1255	0.0000	0.0000	0.0000	0.0000	9.5832	45.6131	100.7236	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												365.6496	
Space heating per m2										(98c) / (4) =		5.1551	(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	97.3170	60.4622	38.5859	11.2392	2.1255	0.0000	0.0000	0.0000	0.0000	9.5832	45.6131	100.7236	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05													
307a	102.1829	63.4853	40.5152	11.8012	2.2317	0.0000	0.0000	0.0000	0.0000	10.0623	47.8937	105.7598	
Space heating requirement	102.1829	63.4853	40.5152	11.8012	2.2317	0.0000	0.0000	0.0000	0.0000	10.0623	47.8937	105.7598	(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	256.4315	226.9281	241.2444	212.2570	205.9106	185.6917	183.2645	190.3835	192.3194	214.2968	227.7118	253.6298	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05													
310a	269.2530	238.2745	253.3067	222.8698	216.2061	194.9763	192.4278	199.9027	201.9353	225.0116	239.0974	266.3113	
Water heating fuel	269.2530	238.2745	253.3067	222.8698	216.2061	194.9763	192.4278	199.9027	201.9353	225.0116	239.0974	266.3113	(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	13.5366	12.2266	13.5366	13.1000	13.5366	13.1000	13.5366	13.5366	13.1000	13.5366	13.1000	13.5366	(331)
Lighting	21.7564	17.4538	15.7152	11.5137	8.8935	7.2660	8.1129	10.5455	13.6975	17.9719	20.2992	22.3611	(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												383.9321	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2719.5726	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.8393	(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)												159.3829	(330a)
Total electricity for the above, kWh/year												159.3829	(331)
Electricity for lighting (calculated in Appendix L)												175.5869	(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	3438.4745	(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	3373.3747	0.2100	87.6367	(367)
Electrical energy for heat distribution (space & water)	3.8393	0.0000	4.4391	(372)
Overall CO2 factor for heat network			0.2297	(386)
Total CO2 associated with community systems			712.8477	(373)
Space and water heating			712.8477	(376)
Pumps, fans and electric keep-hot	159.3829	0.1387	22.1084	(378)
Energy for lighting	175.5869	0.1443	25.3426	(379)
Total CO2, kg/year			760.2987	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.7200	(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	3373.3747	1.1300	471.5688	(467)
Electrical energy for heat distribution (space & water)	3.8393	0.0000	47.4516	(472)
Overall CO2 factor for heat network			1.2436	(486)
Total CO2 associated with community systems			3859.3649	(473)
Space and water heating			3859.3649	(476)
Pumps, fans and electric keep-hot	159.3829	1.5128	241.1144	(478)
Energy for lighting	175.5869	1.5338	269.3211	(479)
Total Primary energy kWh/year			4369.8004	(483)
Dwelling Primary energy Rate (DPER)			61.6100	(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		70.9300 (1b)	x	2.5300 (2b)	=	179.4529	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.4529	(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) =	0.1672	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4172	(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) =	0.3233	(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	0.4122	0.4041	0.3961	0.3556	0.3476	0.3071	0.3071	0.2991	0.3233	0.3476	0.3637	0.3799	(22b)
Effective ac	0.5850	0.5817	0.5784	0.5632	0.5604	0.5472	0.5472	0.5447	0.5523	0.5604	0.5661	0.5722	(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)			9.4600	1.1450	10.8321	(27)
External Wall 1	36.3500	11.1600	25.1900	0.1800	4.5342	(29a)
stair wall	10.2600		10.2600	0.1800	1.8468	(29a)
Total net area of external elements Aum(A, m2)			46.6100			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.9131	(33)
Party Wall 1			36.9200	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 136.0778 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	43.8900	0.0700	3.0723
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.1800	0.0000	0.0000
E16 Corner (normal)	10.1200	0.0900	0.9108
E18 Party wall between dwellings	10.1200	0.0600	0.6072
E17 Corner (inverted - internal area greater than external area)	7.5900	-0.0900	-0.6831
E3 Sill	3.5000	0.0500	0.1750
E9 Balcony between dwellings, wall insulation continuous	5.4300	0.0200	0.1086
E1 Steel lintel with perforated steel base plate	6.0300	0.0500	0.3015
E4 Jamb	19.6000	0.0500	0.9800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.4723 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	24.3854 (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	34.6412	34.4458	34.2543	33.3548	33.1865	32.4031	32.4031	32.2580	32.7048	33.1865	33.5270	33.8829	(38)
Heat transfer coeff	59.0266	58.8312	58.6397	57.7402	57.5719	56.7884	56.7884	56.6433	57.0902	57.5719	57.9123	58.2683	(39)
Average = Sum(39)m / 12 =												57.7393	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8322	0.8294	0.8267	0.8140	0.8117	0.8006	0.8006	0.7986	0.8049	0.8117	0.8165	0.8215	(40)
HLP (average)												0.8140	
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											2.2685	(42)
Hot water usage for mixer showers												
62.2548	61.3192	59.9559	57.3475	55.4225	53.2758	52.0556	53.4086	54.8917	57.1966	59.8611	62.0162	(42a)
Hot water usage for baths												
26.8948	26.4954	25.9329	24.8958	24.1192	23.2581	22.7930	23.3516	23.9597	24.8811	25.9396	26.8039	(42b)
Hot water usage for other uses												
37.8616	36.4848	35.1080	33.7312	32.3545	30.9777	30.9777	32.3545	33.7312	35.1080	36.4848	37.8616	(42c)
Average daily hot water use (litres/day)												116.7522	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.0112	124.2994	120.9968	115.9745	111.8962	107.5116	105.8263	109.1146	112.5827	117.1858	122.2855	126.6817	(44)
Energy conte	201.1547	177.0007	185.9676	158.7633	150.6338	132.1981	127.9877	135.1067	138.8257	159.0200	174.2181	198.3530	(45)
Energy content (annual)										Total = Sum(45)m =		1939.2293	
Distribution loss (46)m = 0.15 x (45)m													
	30.1732	26.5501	27.8951	23.8145	22.5951	19.8297	19.1982	20.2660	20.8239	23.8530	26.1327	29.7529	(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													
	247.7496	219.0864	232.5625	203.8551	197.2287	177.2899	174.5826	181.7016	183.9175	205.6149	219.3099	244.9479	(62)
WWHRS	-28.4603	-25.1705	-26.3571	-21.8247	-20.3399	-17.4050	-16.3144	-17.3487	-18.0078	-21.2293	-24.0502	-27.9332	(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													
	219.2893	193.9159	206.2054	182.0304	176.8888	159.8849	158.2683	164.3529	165.9097	184.3856	195.2598	217.0147	(64)
										Total per year (kWh/year) = Sum(64)m =		2223.4057	(64)
12Total per year (kWh/year)												2223	(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													
	104.1598	92.5213	99.1102	88.8623	87.3617	80.0293	79.8318	82.1989	82.2330	90.1501	94.0010	103.2283	(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	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	113.4245	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	109.0830	120.7704	109.0830	112.7191	109.0830	112.7191	109.0830	109.0830	112.7191	109.0830	112.7191	109.0830	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	199.4578	201.5276	196.3119	185.2083	171.1920	158.0186	149.2180	147.1482	152.3639	163.4675	177.4839	190.6572	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	34.3424	(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)													
	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	-90.7396	(71)
Water heating gains (Table 5)													
	139.9998	137.6805	133.2126	123.4198	117.4216	111.1518	107.3009	110.4824	114.2125	121.1694	130.5569	138.7477	(72)
Total internal gains													
	508.5679	520.0059	498.6348	481.3745	457.7239	438.9169	422.6292	423.7410	436.3229	453.7473	480.7872	498.5152	(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	5.6000	10.6334	0.6300	0.7000	0.7700	18.1983	(74)
South	3.8600	46.7521	0.6300	0.7000	0.7700	55.1518	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	73.3502	125.1024	174.1536	224.9635	263.3805	267.2991	255.2220	225.1367	191.2438	138.8220	87.8237	62.8273	(83)
Total gains	581.9181	645.1083	672.7884	706.3380	721.1043	706.2160	677.8511	648.8776	627.5667	592.5694	568.6109	561.3425	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.4221	45.5730	45.7218	46.4341	46.5698	47.2123	47.2123	47.3332	46.9627	46.5698	46.2960	46.0132	
alpha	4.0281	4.0382	4.0481	4.0956	4.1047	4.1475	4.1475	4.1555	4.1308	4.1047	4.0864	4.0675	
util living area	0.9473	0.9210	0.8833	0.7993	0.6704	0.4982	0.3649	0.3961	0.5901	0.8082	0.9145	0.9528	(86)
MIT	19.8714	20.0822	20.3340	20.6498	20.8641	20.9696	20.9934	20.9907	20.9382	20.6868	20.2561	19.8427	(87)
Th 2	20.2255	20.2279	20.2302	20.2412	20.2432	20.2528	20.2528	20.2546	20.2491	20.2432	20.2391	20.2347	(88)
util rest of house	0.9394	0.9097	0.8667	0.7722	0.6295	0.4450	0.3045	0.3341	0.5358	0.7771	0.9006	0.9456	(89)
MIT 2	18.9144	19.1775	19.4890	19.8745	20.1161	20.2300	20.2492	20.2493	20.1994	19.9255	19.4056	18.8855	(90)
Living area fraction									fLA = Living area / (4) =			0.4703	(91)
MIT	19.3645	19.6030	19.8864	20.2391	20.4679	20.5778	20.5992	20.5980	20.5469	20.2836	19.8056	19.3357	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3645	19.6030	19.8864	20.2391	20.4679	20.5778	20.5992	20.5980	20.5469	20.2836	19.8056	19.3357	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9289	0.8992	0.8585	0.7721	0.6421	0.4684	0.3326	0.3629	0.5579	0.7788	0.8915	0.9356	(94)
Useful gains	540.5665	580.1103	577.5741	545.3834	462.9878	330.8243	225.4832	235.4497	350.1004	461.5123	506.9241	525.1965	(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	889.2061	864.9936	784.9733	654.7236	504.7850	339.4719	227.1085	237.7870	368.0536	557.5008	735.8112	881.9290	(97)
Space heating kWh	259.3879	191.4416	154.3050	78.7249	31.0971	0.0000	0.0000	0.0000	0.0000	71.4155	164.7987	265.4090	(98a)
Space heating requirement - total per year (kWh/year)												1216.5798	
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	259.3879	191.4416	154.3050	78.7249	31.0971	0.0000	0.0000	0.0000	0.0000	71.4155	164.7987	265.4090	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1216.5798	
Space heating per m2										(98c) / (4) =		17.1518	(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	259.3879	191.4416	154.3050	78.7249	31.0971	0.0000	0.0000	0.0000	0.0000	71.4155	164.7987	265.4090	(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)	281.0269	207.4123	167.1777	85.2925	33.6914	0.0000	0.0000	0.0000	0.0000	77.3732	178.5468	287.5504	(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	219.2893	193.9159	206.2054	182.0304	176.8888	159.8849	158.2683	164.3529	165.9097	184.3856	195.2598	217.0147	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4374	84.0310	83.4187	82.3189	81.0279	79.8000	79.8000	79.8000	79.8000	82.1237	83.6819	84.5123	(217)
Fuel for water heating, kWh/month	259.7065	230.7671	247.1932	221.1284	218.3062	200.3571	198.3312	205.9560	207.9069	224.5217	233.3358	256.7846	(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	22.6653	18.1829	16.3717	11.9946	9.2650	7.5696	8.4518	10.9860	14.2697	18.7227	21.1472	23.2952	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-7.8419	-12.1659	-19.2192	-23.8174	-27.7002	-26.6099	-26.2904	-23.7981	-19.8028	-14.8276	-9.0068	-6.6569	(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	-1.5995	-3.5099	-7.2596	-11.3383	-15.4339	-15.6729	-15.4866	-12.9036	-9.1920	-5.1532	-2.1767	-1.2542	(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												1318.0712	(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	2704.2946	(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)	182.9219	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-318.7175	(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	3972.5701	(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	1318.0712	0.2100	276.7950	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2704.2946	0.2100	567.9019	(264)
Space and water heating			844.6968	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	182.9219	0.1443	26.4013	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-217.7372	0.1326	-28.8820	
PV Unit electricity exported	-100.9804	0.1248	-12.5999	
Total			-41.4819	(269)
Total CO2, kg/year			841.5454	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8600	(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	1318.0712	1.1300	1489.4205	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2704.2946	1.1300	3055.8529	(278)
Space and water heating			4545.2734	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	182.9219	1.5338	280.5717	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-217.7372	1.4901	-324.4559	
PV Unit electricity exported	-100.9804	0.4580	-46.2446	
Total			-370.7005	(283)
Total Primary energy kWh/year			4585.2453	(286)
Target Primary Energy Rate (TPER)			64.6400	(287)