Full SAP Calculation Printout

Property Reference	Flat 02_04 exposed floor N	**Issued on Date**	25/01/2024
Assessment Reference	Flat 02_04 EF N BE GREEN	**Prop Type Ref**	SE_01_009 exposed floor W
Property			

SAP Rating	83 B	**DER**	3.16	**TER**	13.76
Environmental	97 A	**% DER < TER**			77.03
CO_2 Emissions (t/year)	0.25	**DFEE**	34.34	**TFEE**	37.28
Compliance Check	See BREL	**% DFEE < TFEE**			7.90
% DPER < TPER	55.53	**DPER**	33.13	**TPER**	74.49

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	86.4700 (1b)	x	2.5300 (2b)	=	218.7691	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.4700					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	218.7691	(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)			16.9700	1.1450	19.4313			(27)
Int door			1.7000	1.1000	1.8700			(26)
Exposed floor			86.4700	0.1200	10.3764			(28b)
External Wall 1	65.3800	18.6700	46.7100	0.1500	7.0065	14.0000	653.9400	(29a)
stair wall	28.4100		28.4100	0.1800	5.1138	14.0000	397.7400	(29a)
Total net area of external elements Aum(A, m2)			180.2600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.7980			(33)
Party Wall 1			23.0600	0.0000	0.0000	20.0000	461.2000	(32)
Party Ceiling 1			86.4700			90.0000	7782.3000	(32b)
Internal Wall 1			186.9700			9.0000	1682.7300	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10977.9100	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							126.9563	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	37.0700	0.0400	1.4828	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.1100	0.0000	0.0000	
E16 Corner (normal)	10.1200	0.0900	0.9108	
E18 Party wall between dwellings	5.0600	0.0600	0.3036	
E17 Corner (inverted - internal area greater than external area)	5.0600	0.0000	0.0000	
P7 Party Wall - Exposed floor (normal)	9.1100	0.2000	1.8220	
E20 Exposed floor (normal)	25.8600	0.1000	2.5860	
E3 Sill	7.0000	0.0500	0.3500	
E9 Balcony between dwellings, wall insulation continuous	11.2100	0.1000	1.1210	
E1 Steel lintel with perforated steel base plate	10.4400	0.1000	1.0440	
E4 Jamb	30.2000	0.0500	1.5100	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.1302 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.9282 (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	20.2301	20.0202	19.8104	18.7614	18.5516	17.5025	17.5025	17.2927	17.9221	18.5516	18.9712	19.3908	(38)
Heat transfer coeff	75.1583	74.9484	74.7386	73.6896	73.4797	72.4307	72.4307	72.2209	72.8503	73.4797	73.8994	74.3190	(39)

Average = Sum(39)m / 12 = 73.6371

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8692	0.8668	0.8643	0.8522	0.8498	0.8376	0.8376	0.8352	0.8425	0.8498	0.8546	0.8595	(40)
HLP (average)												0.8516	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5743 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.3815	66.3689	64.8934	62.0701	59.9866	57.6631	56.3425	57.8069	59.4121	61.9069	64.7907	67.1234	(42a)
Hot water usage for baths	29.0995	28.6673	28.0587	26.9366	26.0964	25.1647	24.6615	25.2658	25.9238	26.9207	28.0660	29.0011	(42b)
Hot water usage for other uses	40.9930	39.5023	38.0116	36.5210	35.0303	33.5397	33.5397	35.0303	36.5210	38.0116	39.5023	40.9930	(42c)

Average daily hot water use (litres/day) 126.3697 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.4740	134.5386	130.9637	125.5277	121.1134	116.3675	114.5436	118.1030	121.8569	126.8392	132.3590	137.1175	(44)
Energy conte	217.7252	191.5811	201.2864	171.8412	163.0419	143.0875	138.5306	146.2362	150.2618	172.1196	188.5697	214.6928	(45)

Energy content (annual) Total = Sum(45)m = 2098.9739

Distribution loss (46)m = 0.15 x (45)m	32.6588	28.7372	30.1930	25.7762	24.4563	21.4631	20.7796	21.9354	22.5393	25.8179	28.2854	32.2039	(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	273.0020	241.5086	256.5632	225.3349	218.3187	196.5811	193.8074	201.5130	203.7555	227.3964	242.0633	269.9696	(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	273.0020	241.5086	256.5632	225.3349	218.3187	196.5811	193.8074	201.5130	203.7555	227.3964	242.0633	269.9696	(64)

Total per year (kWh/year) = Sum(64)m = 2749.8136 (64)

12Total per year (kWh/year) 2750 (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	116.6151	103.6427	111.1492	99.9321	98.4329	90.3715	90.2829	92.8450	92.7570	101.4512	105.4944	115.6068	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.2350	129.7959	117.2350	121.1429	117.2350	121.1429	117.2350	117.2350	121.1429	117.2350	121.1429	117.2350	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.4315	234.8435	228.7655	215.8263	199.4929	184.1417	173.8862	171.4743	177.5523	190.4915	206.8249	222.1760	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	(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)	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	(71)
Water heating gains (Table 5)	156.7407	154.2302	149.3940	138.7946	132.3022	125.5160	121.3479	124.7916	128.8291	136.3592	146.5199	155.3855	(72)
Total internal gains	568.0211	580.4834	557.0084	537.3776	510.6439	492.4144	474.0830	475.1148	489.1381	505.6995	536.1015	556.4104	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8000	10.6334	0.4000	0.8500	0.7700	7.0152	(74)
South	14.1700	46.7521	0.4000	0.8500	0.7700	156.0928	(78)

Solar gains	163.1080	269.0462	348.4205	404.6354	432.8168	421.8590	409.8900	389.3020	367.5591	291.6901	193.6774	140.7268	(83)
Total gains	731.1291	849.5296	905.4290	942.0131	943.4607	914.2735	883.9730	864.4168	856.6972	797.3896	729.7789	697.1371	(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	40.5733	40.6869	40.8011	41.3820	41.5001	42.1012	42.1012	42.2235	41.8587	41.5001	41.2645	41.0315	
alpha	3.7049	3.7125	3.7201	3.7588	3.7667	3.8067	3.8067	3.8149	3.7906	3.7667	3.7510	3.7354	
util living area	0.9388	0.9005	0.8526	0.7676	0.6488	0.4874	0.3557	0.3781	0.5519	0.7731	0.9000	0.9465	(86)
MIT	19.7404	20.0211	20.3085	20.6247	20.8413	20.9599	20.9905	20.9880	20.9333	20.6707	20.1757	19.6921	(87)
Th 2	20.1938	20.1958	20.1979	20.2083	20.2104	20.2208	20.2208	20.2229	20.2167	20.2104	20.2062	20.2021	(88)
util rest of house	0.9301	0.8875	0.8336	0.7390	0.6076	0.4337	0.2946	0.3166	0.4982	0.7398	0.8847	0.9388	(89)
MIT 2	18.7317	19.0796	19.4324	19.8163	20.0613	20.1904	20.2156	20.2159	20.1629	19.8778	19.2842	18.6776	(90)
Living area fraction									fLA = Living area / (4) =			0.3277	(91)
MIT	19.0623	19.3882	19.7195	20.0812	20.3169	20.4426	20.4696	20.4690	20.4154	20.1377	19.5764	19.0101	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0623	19.3882	19.7195	20.0812	20.3169	20.4426	20.4696	20.4690	20.4154	20.1377	19.5764	19.0101	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9154	0.8723	0.8211	0.7340	0.6133	0.4493	0.3143	0.3363	0.5122	0.7365	0.8707	0.9248	(94)
Useful gains	669.2601	741.0865	743.4463	691.4782	578.6639	410.7699	277.8529	290.6834	438.8143	587.2509	635.4026	644.6897	(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	1109.5058	1085.8692	988.0094	823.9393	633.1702	423.1842	280.2779	293.8644	460.0767	700.8275	921.9974	1100.6711	(97)
Space heating kWh	327.5428	231.6940	181.9549	95.3720	40.5527	0.0000	0.0000	0.0000	0.0000	84.5010	206.3482	339.2502	(98a)
Space heating requirement - total per year (kWh/year)												1507.2158	
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	327.5428	231.6940	181.9549	95.3720	40.5527	0.0000	0.0000	0.0000	0.0000	84.5010	206.3482	339.2502	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1507.2158	
Space heating per m2										(98c) / (4) =		17.4305	(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 Heat pump-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												1.2300	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	327.5428	231.6940	181.9549	95.3720	40.5527	0.0000	0.0000	0.0000	0.0000	84.5010	206.3482	339.2502	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.23													
307a	402.8777	284.9836	223.8046	117.3075	49.8798	0.0000	0.0000	0.0000	0.0000	103.9363	253.8083	417.2777	
Space heating requirement	402.8777	284.9836	223.8046	117.3075	49.8798	0.0000	0.0000	0.0000	0.0000	103.9363	253.8083	417.2777	(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	273.0020	241.5086	256.5632	225.3349	218.3187	196.5811	193.8074	201.5130	203.7555	227.3964	242.0633	269.9696	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.23													
310a	335.7925	297.0555	315.5727	277.1619	268.5320	241.7948	238.3831	247.8610	250.6192	279.6976	297.7379	332.0626	
Water heating fuel	335.7925	297.0555	315.5727	277.1619	268.5320	241.7948	238.3831	247.8610	250.6192	279.6976	297.7379	332.0626	(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	17.4544	15.7653	17.4544	16.8914	17.4544	16.8914	17.4544	17.4544	16.8914	17.4544	16.8914	17.4544	(331)
Lighting	24.3591	19.5418	17.5952	12.8910	9.9574	8.1353	9.0835	11.8070	15.3362	20.1219	22.7276	25.0361	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-12.8059	-19.6827	-30.8849	-38.0197	-43.9688	-42.1705	-41.6368	-37.7702	-31.5482	-23.8427	-14.6379	-10.8871	(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												1853.8755	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3382.2708	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												18.5388	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700) mechanical ventilation fans (SFP = 0.7700)												205.5117	(330a)
Total electricity for the above, kWh/year												205.5117	(331)
Electricity for lighting (calculated in Appendix L)												196.5921	(332)

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

PV generation	-347.8554	(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	5290.3946	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			300.0000	(367)
Space and Water heating from Heat pump	1745.3821	0.1561	96.4481	(367)
Electrical energy for heat distribution (space & water)	18.5388	0.0000	7.6591	(372)
Overall CO2 factor for heat network			0.0502	(386)
Total CO2 associated with community systems			262.9610	(373)
Space and water heating			262.9610	(376)
Pumps, fans and electric keep-hot	205.5117	0.1387	28.5070	(378)
Energy for lighting	196.5921	0.1443	28.3743	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-347.8554	0.1328	-46.1915	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-46.1915	(380)
Total CO2, kg/year			273.6508	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1600	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			300.0000	(467a)
Space and Water heating from Heat pump	1745.3821	1.5778	975.0111	(467)
Electrical energy for heat distribution (space & water)	18.5388	0.0000	80.6946	(472)
Overall CO2 factor for heat network			0.5291	(486)
Total CO2 associated with community systems			2770.5130	(473)
Space and water heating			2770.5130	(476)
Pumps, fans and electric keep-hot	205.5117	1.5128	310.8981	(478)
Energy for lighting	196.5921	1.5338	301.5395	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-347.8554	1.4907	-518.5353	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-518.5353	(480)
Total Primary energy kWh/year			2864.4154	(483)
Dwelling Primary energy Rate (DPER)			33.1300	(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		86.4700 (1b)	x	2.5300 (2b)	=	218.7691	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.4700						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	218.7691	(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) =	0.1371	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3871	(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) =	0.3000	(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													

	0.3825	0.3750	0.3675	0.3300	0.3225	0.2850	0.2850	0.2775	0.3000	0.3225	0.3375	0.3525	(22b)
Effective ac	0.5732	0.5703	0.5675	0.5545	0.5520	0.5406	0.5406	0.5385	0.5450	0.5520	0.5570	0.5621	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.7000	1.0000	1.7000			(26)
TER Opening Type (Uw = 1.20)			16.9700	1.1450	19.4313			(27)
Exposed floor			86.4700	0.1300	11.2411			(28b)
External Wall 1	65.3800	18.6700	46.7100	0.1800	8.4078			(29a)
stair wall	28.4100		28.4100	0.1800	5.1138			(29a)
Total net area of external elements Aum(A, m2)			180.2600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.8940			(33)
Party Wall 1			23.0600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.9563 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	37.0700	0.0700	2.5949
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	9.1100	0.0000	0.0000
E16 Corner (normal)	10.1200	0.0900	0.9108
E18 Party wall between dwellings	5.0600	0.0600	0.3036
E17 Corner (inverted - internal area greater than external area)	5.0600	-0.0900	-0.4554
P7 Party Wall - Exposed floor (normal)	9.1100	0.1600	1.4576
E20 Exposed floor (normal)	25.8600	0.3200	8.2752
E3 Sill	7.0000	0.0500	0.3500
E9 Balcony between dwellings, wall insulation continuous	11.2100	0.0200	0.2242
E1 Steel lintel with perforated steel base plate	10.4400	0.0500	0.5220
E4 Jamb	30.2000	0.0500	1.5100

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.6929 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 61.5869 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	41.3790	41.1739	40.9729	40.0285	39.8519	39.0294	39.0294	38.8771	39.3462	39.8519	40.2093	40.5830	(38)
Heat transfer coeff	102.9659	102.7608	102.5598	101.6154	101.4388	100.6163	100.6163	100.4640	100.9331	101.4388	101.7962	102.1699	(39)

Average = Sum(39)m / 12 = 101.6146

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1908	1.1884	1.1861	1.1752	1.1731	1.1636	1.1636	1.1618	1.1673	1.1731	1.1772	1.1816	(40)
HLP (average)												1.1751	
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 2.5743 (42)

Hot water usage for mixer showers

67.3815	66.3689	64.8934	62.0701	59.9866	57.6631	56.3425	57.8069	59.4121	61.9069	64.7907	67.1234	(42a)

Hot water usage for baths

29.0995	28.6673	28.0587	26.9366	26.0964	25.1647	24.6615	25.2658	25.9238	26.9207	28.0660	29.0011	(42b)

Hot water usage for other uses

40.9930	39.5023	38.0116	36.5210	35.0303	33.5397	33.5397	35.0303	36.5210	38.0116	39.5023	40.9930	(42c)

Average daily hot water use (litres/day) 126.3697 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.4740	134.5386	130.9637	125.5277	121.1134	116.3675	114.5436	118.1030	121.8569	126.8392	132.3590	137.1175	(44)
Energy conte	217.7252	191.5811	201.2864	171.8412	163.0419	143.0875	138.5306	146.2362	150.2618	172.1196	188.5697	214.6928	(45)
Energy content (annual)											Total = Sum(45)m =	2098.9739	
Distribution loss (46)m = 0.15 x (45)m	32.6588	28.7372	30.1930	25.7762	24.4563	21.4631	20.7796	21.9354	22.5393	25.8179	28.2854	32.2039	(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

264.3201	233.6668	247.8813	216.9330	209.6368	188.1793	185.1255	192.8311	195.3536	218.7145	233.6615	261.2877	(62)
WWHRS -30.8040	-27.2433	-28.5277	-23.6220	-22.0149	-18.8383	-17.6579	-18.7774	-19.4908	-22.9775	-26.0307	-30.2336	(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

233.5161	206.4235	219.3537	193.3110	187.6219	169.3410	167.4676	174.0537	175.8628	195.7370	207.6308	231.0541	(64)
									Total per year (kWh/year) = Sum(64)m =		2361.3731	(64)

12Total per year (kWh/year) 2361 (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

109.6696	97.3693	104.2036	93.2107	91.4873	83.6501	83.3373	85.8995	86.0355	94.5057	98.7729	108.6613	(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	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	128.7128	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.3072	130.9830	118.3072	122.2508	118.3072	122.2508	118.3072	118.3072	122.2508	118.3072	122.2508	118.3072	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	232.4315	234.8435	228.7655	215.8263	199.4929	184.1417	173.8862	171.4743	177.5523	190.4915	206.8249	222.1760	(68)

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

	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	35.8713	(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)													
	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	-102.9702	(71)
Water heating gains (Table 5)													
	147.4053	144.8948	140.0587	129.4593	122.9669	116.1806	112.0126	115.4563	119.4938	127.0238	137.1846	146.0501	(72)
Total internal gains													
	562.7579	575.3351	551.7453	532.1502	505.3808	484.1870	465.8199	466.8517	480.9107	500.4364	530.8741	551.1472	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.8000	10.6334	0.6300	0.7000	0.7700	9.0992	(74)
South	14.1700	46.7521	0.6300	0.7000	0.7700	202.4615	(78)

Solar gains	211.5607	348.9688	451.9219	524.8360	561.3888	547.1760	531.6515	504.9476	476.7457	378.3392	251.2109	182.5309	(83)
Total gains	774.3186	924.3039	1003.6672	1056.9862	1066.7696	1031.3630	997.4713	971.7993	957.6564	878.7756	782.0851	733.6781	(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	23.5506	23.5977	23.6439	23.8636	23.9052	24.1006	24.1006	24.1371	24.0250	23.9052	23.8213	23.7341	
alpha	2.5700	2.5732	2.5763	2.5909	2.5937	2.6067	2.6067	2.6091	2.6017	2.5937	2.5881	2.5823	
util living area													
	0.9249	0.8873	0.8436	0.7736	0.6761	0.5403	0.4125	0.4370	0.6003	0.7840	0.8905	0.9330	(86)
MIT	18.6799	19.0691	19.5168	20.0426	20.4832	20.7976	20.9269	20.9126	20.7167	20.1487	19.3309	18.6064	(87)
Th 2	19.9274	19.9293	19.9312	19.9399	19.9416	19.9492	19.9492	19.9507	19.9463	19.9416	19.9382	19.9348	(88)
util rest of house													
	0.9145	0.8725	0.8229	0.7426	0.6293	0.4712	0.3244	0.3496	0.5349	0.7484	0.8736	0.9237	(89)
MIT 2	17.2542	17.7378	18.2918	18.9351	19.4500	19.7928	19.9089	19.8998	19.7134	19.0760	18.0793	17.1669	(90)
Living area fraction									fLA = Living area / (4) =			0.3277	(91)
MIT	17.7215	18.1741	18.6933	19.2981	19.7886	20.1221	20.2426	20.2317	20.0422	19.4276	18.4895	17.6387	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7215	18.1741	18.6933	19.2981	19.7886	20.1221	20.2426	20.2317	20.0422	19.4276	18.4895	17.6387	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8864	0.8423	0.7943	0.7214	0.6219	0.4832	0.3499	0.3740	0.5412	0.7285	0.8447	0.8968	(94)
Useful gains	686.3719	778.5589	797.1899	762.4979	663.4718	498.3571	348.9798	363.4402	518.3264	640.1760	660.6334	657.9317	(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													
	1381.9527	1364.0613	1250.5414	1056.6047	820.4968	555.6149	366.5035	384.9516	599.7648	895.4596	1159.4121	1373.0289	(97)
Space heating kWh													
	517.5121	393.4576	337.2935	211.7569	116.8266	0.0000	0.0000	0.0000	0.0000	189.9310	359.1206	532.0323	(98a)
Space heating requirement - total per year (kWh/year)												2657.9306	
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													
	517.5121	393.4576	337.2935	211.7569	116.8266	0.0000	0.0000	0.0000	0.0000	189.9310	359.1206	532.0323	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2657.9306	
Space heating per m2											(98c) / (4) =	30.7382	(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													
	517.5121	393.4576	337.2935	211.7569	116.8266	0.0000	0.0000	0.0000	0.0000	189.9310	359.1206	532.0323	(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)													
	560.6848	426.2812	365.4318	229.4224	126.5727	0.0000	0.0000	0.0000	0.0000	205.7758	389.0798	576.4164	(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													
	233.5161	206.4235	219.3537	193.3110	187.6219	169.3410	167.4676	174.0537	175.8628	195.7370	207.6308	231.0541	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7915	85.4825	85.0214	84.2646	83.0291	79.8000	79.8000	79.8000	79.8000	83.9923	85.2765	85.8677	(217)
Fuel for water heating, kWh/month													
	272.1901	241.4804	257.9982	229.4094	225.9711	212.2068	209.8591	218.1124	220.3794	233.0416	243.4793	269.0815	(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	24.5819	19.7205	17.7561	13.0089	10.0485	8.2097	9.1665	11.9150	15.4764	20.3059	22.9355	25.2651	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.5033	-14.7128	-23.1950	-28.6828	-33.3005	-31.9636	-31.5722	-28.6011	-23.8381	-17.8987	-10.9024	-8.0701	(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	-2.0066	-4.3975	-9.0849	-14.1751	-19.2839	-19.5830	-19.3578	-16.1415	-11.5091	-6.4598	-2.7313	-1.5743	(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	2879.6648	(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	2833.2096	(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)	198.3901	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-388.5451	(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	5608.7193	(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	2879.6648	0.2100	604.7296	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2833.2096	0.2100	594.9740	(264)
Space and water heating			1199.7036	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	198.3901	0.1443	28.6338	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-262.2404	0.1327	-34.7968	
PV Unit electricity exported	-126.3047	0.1248	-15.7621	
Total			-50.5590	(269)
Total CO2, kg/year			1189.7077	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.7600	(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	2879.6648	1.1300	3254.0212	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2833.2096	1.1300	3201.5268	(278)
Space and water heating			6455.5480	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	198.3901	1.5338	304.2973	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-262.2404	1.4903	-390.8149	
PV Unit electricity exported	-126.3047	0.4580	-57.8509	
Total			-448.6658	(283)
Total Primary energy kWh/year			6441.2803	(286)
Target Primary Energy Rate (TPER)			74.4900	(287)