Full SAP Calculation Printout

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

SAP Rating	84 B	**DER**	14.02	**TER**	14.79
Environmental	89 B	**% DER < TER**			5.21
CO_2 Emissions (t/year)	0.9	**DFEE**	36.15	**TFEE**	36.40
Compliance Check	See BREL	**% DFEE < TFEE**			0.69
% DPER < TPER	1.11	**DPER**	79.42	**TPER**	80.31

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) =		82.8000 (23c)

Effective ac	0.2342	0.2313	0.2284	0.2139	0.2110	0.1964	0.1964	0.1935	0.2023	0.2110	0.2168	0.2226	(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)
External Roof 1	69.1900		69.1900	0.1200	8.3028	9.0000	622.7100	(30)
Total net area of external elements Aum(A, m2)			155.6000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.2085			(33)
Party Wall 1			17.3400	0.0000	0.0000	20.0000	346.8000	(32)
Party Floor			69.1900			40.0000	2767.6000	(32d)
Internal Wall 1			84.0500			9.0000	756.4500	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5520.0400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		79.7809 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	29.4900	0.0400	1.1796	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.8500	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	
E14 Flat roof	34.1500	0.0600	2.0490	
P4 Party wall - Roof (insulation at ceiling level)	6.8500	0.0600	0.4110	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.4441 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.6526 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	13.5301	13.3622	13.1943	12.3549	12.1870	11.3476	11.3476	11.1797	11.6833	12.1870	12.5227	12.8585	(38)
Heat transfer coeff	58.1826	58.0148	57.8469	57.0074	56.8396	56.0001	56.0001	55.8323	56.3359	56.8396	57.1753	57.5111	(39)
Average = Sum(39)m / 12 =												56.9655	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8409	0.8385	0.8361	0.8239	0.8215	0.8094	0.8094	0.8069	0.8142	0.8215	0.8264	0.8312	(40)
HLP (average)												0.8233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2263	(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)

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)

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)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.3540	26.4303	26.5070	26.8973	26.9767	27.3811	27.3811	27.4634	27.2179	26.9767	26.8183	26.6617	
alpha	2.7569	2.7620	2.7671	2.7932	2.7984	2.8254	2.8254	2.8309	2.8145	2.7984	2.7879	2.7774	
util living area	0.8833	0.8441	0.7945	0.7079	0.5956	0.4514	0.3352	0.3592	0.5221	0.7204	0.8393	0.8921	(86)
MIT	19.2735	19.5716	19.9342	20.3721	20.6964	20.9007	20.9682	20.9606	20.8425	20.4364	19.8126	19.2278	(87)
Th 2	20.2180	20.2201	20.2222	20.2326	20.2347	20.2452	20.2452	20.2473	20.2410	20.2347	20.2306	20.2264	(88)
util rest of house	0.8723	0.8302	0.7762	0.6824	0.5605	0.4055	0.2812	0.3047	0.4761	0.6910	0.8228	0.8818	(89)
MIT 2	18.1941	18.5640	19.0124	19.5495	19.9292	20.1598	20.2237	20.2196	20.0990	19.6369	18.8772	18.1429	(90)
Living area fraction										fLA = Living area / (4) =		0.5108	(91)
MIT	18.7454	19.0786	19.4833	19.9697	20.3211	20.5382	20.6039	20.5981	20.4788	20.0452	19.3550	18.6970	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7454	19.0786	19.4833	19.9697	20.3211	20.5382	20.6039	20.5981	20.4788	20.0452	19.3550	18.6970	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8479	0.8070	0.7571	0.6731	0.5646	0.4237	0.3071	0.3304	0.4909	0.6832	0.8016	0.8577	(94)
Useful gains	499.0153	536.0097	534.1063	500.8754	426.4418	312.3272	218.2530	226.9044	327.2105	421.9541	464.2384	485.0220	(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	840.4734	822.5690	751.0405	631.0530	490.0178	332.5402	224.2217	234.3875	359.3539	536.8626	700.6825	833.7408	(97)
Space heating kWh	254.0449	192.5679	161.3990	93.7279	47.3005	0.0000	0.0000	0.0000	0.0000	85.4919	170.2398	259.4468	(98a)
Space heating requirement - total per year (kWh/year)												1264.2187	
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	254.0449	192.5679	161.3990	93.7279	47.3005	0.0000	0.0000	0.0000	0.0000	85.4919	170.2398	259.4468	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1264.2187	
Space heating per m2										(98c) / (4) =		18.2717	(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	254.0449	192.5679	161.3990	93.7279	47.3005	0.0000	0.0000	0.0000	0.0000	85.4919	170.2398	259.4468	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05													
307a	266.7471	202.1963	169.4690	98.4142	49.6655	0.0000	0.0000	0.0000	0.0000	89.7665	178.7518	272.4191	
Space heating requirement	266.7471	202.1963	169.4690	98.4142	49.6655	0.0000	0.0000	0.0000	0.0000	89.7665	178.7518	272.4191	(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												1327.4296	(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												13.2743	(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	4345.7747	(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	4373.7592	0.2100	303.0002	(367)
Electrical energy for heat distribution (space & water)	13.2743	0.0000	5.8579	(372)
Overall CO2 factor for heat network			0.2297	(386)
Total CO2 associated with community systems			924.3473	(373)
Space and water heating			924.3473	(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			969.9363	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.0200	(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	4373.7592	1.1300	1630.4298	(467)
Electrical energy for heat distribution (space & water)	13.2743	0.0000	61.9082	(472)
Overall CO2 factor for heat network			1.2436	(486)
Total CO2 associated with community systems			5004.2561	(473)
Space and water heating			5004.2561	(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			5494.7519	(483)
Dwelling Primary energy Rate (DPER)			79.4200	(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)
External Roof 1	69.1900		69.1900	0.1100	7.6109			(30)
Total net area of external elements Aum(A, m2)			155.6000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5505			(33)
Party Wall 1			17.3400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 79.7809 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	29.4900	0.0700	2.0643
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.8500	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
E14 Flat roof	34.1500	0.0800	2.7320
P4 Party wall - Roof (insulation at ceiling level)	6.8500	0.1200	0.8220

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7227 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 45.2732 (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	77.8983	77.7530	77.6106	76.9417	76.8165	76.2339	76.2339	76.1260	76.4583	76.8165	77.0697	77.3344	(39)
Average = Sum(39)m / 12 =												76.9411	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1259	1.1238	1.1217	1.1120	1.1102	1.1018	1.1018	1.1002	1.1050	1.1102	1.1139	1.1177	(40)
HLP (average)												1.1120	
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	0.0000	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)

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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	19.6839	19.7207	19.7569	19.9287	19.9611	20.1137	20.1137	20.1422	20.0547	19.9611	19.8956	19.8275	
alpha	2.3123	2.3147	2.3171	2.3286	2.3307	2.3409	2.3409	2.3428	2.3370	2.3307	2.3264	2.3218	
util living area	0.8992	0.8635	0.8182	0.7419	0.6401	0.5077	0.3892	0.4170	0.5807	0.7608	0.8635	0.9073	(86)
MIT	18.4563	18.8256	19.3089	19.9052	20.4038	20.7572	20.9060	20.8863	20.6467	20.0023	19.1401	18.3874	(87)
Th 2	19.9798	19.9815	19.9831	19.9910	19.9925	19.9994	19.9994	20.0006	19.9967	19.9925	19.9895	19.9864	(88)
util rest of house	0.8878	0.8486	0.7981	0.7127	0.5973	0.4461	0.3110	0.3388	0.5217	0.7275	0.8462	0.8967	(89)
MIT 2	17.0310	17.4902	18.0898	18.8206	19.4082	19.8007	19.9419	19.9276	19.6905	18.9541	17.8970	16.9489	(90)
Living area fraction										fLA = Living area / (4) =		0.5108	(91)
MIT	17.7590	18.1723	18.7125	19.3746	19.9167	20.2892	20.4343	20.4173	20.1789	19.4895	18.5319	17.6836	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7590	18.1723	18.7125	19.3746	19.9167	20.2892	20.4343	20.4173	20.1789	19.4895	18.5319	17.6836	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8560	0.8163	0.7687	0.6928	0.5939	0.4647	0.3459	0.3725	0.5330	0.7088	0.8156	0.8657	(94)
Useful gains	523.6113	577.1780	589.0618	569.2239	500.5212	381.6184	273.7278	283.0746	389.3020	471.6219	495.7299	506.1715	(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	1048.4331	1031.9594	947.8196	805.9316	631.1814	433.7117	292.3069	305.8193	464.7820	682.8594	881.0562	1042.7496	(97)
Space heating kWh	390.4674	305.6130	266.9158	170.4296	97.2112	0.0000	0.0000	0.0000	0.0000	157.1607	277.4350	399.2141	(98a)
Space heating requirement - total per year (kWh/year)												2064.4468	
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	390.4674	305.6130	266.9158	170.4296	97.2112	0.0000	0.0000	0.0000	0.0000	157.1607	277.4350	399.2141	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2064.4468	
Space heating per m2											(98c) / (4) =	29.8374	(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	390.4674	305.6130	266.9158	170.4296	97.2112	0.0000	0.0000	0.0000	0.0000	157.1607	277.4350	399.2141	(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)	423.0416	331.1084	289.1829	184.6475	105.3209	0.0000	0.0000	0.0000	0.0000	170.2716	300.5796	432.5180	(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	85.3578	85.0948	84.6593	83.9315	82.7921	79.8000	79.8000	79.8000	79.8000	83.7225	84.8666	85.4267	(217)
Fuel for water heating, kWh/month	254.6063	225.8542	241.4280	215.0252	211.8654	198.7220	196.7405	204.2787	206.1859	218.3635	228.0671	251.7684	(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	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2236.6704	(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	2652.9052	(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	4836.1507	(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	2236.6704	0.2100	469.7008	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2652.9052	0.2100	557.1101	(264)
Space and water heating			1026.8109	(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			1023.0240	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7900	(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	2236.6704	1.1300	2527.4375	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2652.9052	1.1300	2997.7828	(278)
Space and water heating			5525.2204	(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			5556.5687	(286)
Target Primary Energy Rate (TPER)			80.3100	(287)