

Full SAP Calculation Printout



Property Reference	Flat 02_03 mid N				Issued on Date	25/01/2024	
Assessment Reference	Flat 02_03 mid N BE GREEN			Prop Type Ref	SE_01_009 exposed floor W		
Property							
SAP Rating	84 B		DER	2.75		TER	11.90
Environmental	98 A		% DER < TER				76.89
CO ₂ Emissions (t/year)	0.22		DFEE	28.86		TFEE	29.16
Compliance Check	See BREL		% DFEE < TFEE				1.02
% DPER < TPER	55.30		DPER	28.83		TPER	64.50
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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	88.9700 (1b)	2.5300 (2b)	225.0941 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.9700		225.0941 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	225.0941 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

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)

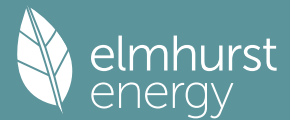
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	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)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			15.9700	1.1450	18.2863		(27)
Int door			1.7000	1.1000	1.8700		(26)
External Wall 1	59.1500	15.9700	43.1800	0.1500	6.4770	14.0000	604.5200 (29a)
Corridor wall	45.1500	1.7000	43.4500	0.1800	7.8210	14.0000	608.3000 (29a)
Total net area of external elements Aum(A, m ²)			104.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.4543		(33)
Party Wall 1			23.0700	0.0000	0.0000	20.0000	461.4000 (32)
Party Floor 1			88.9700			40.0000	3558.8000 (32d)
Party Ceiling 1			88.9700			90.0000	8007.3000 (32b)
Internal Wall 1			167.6400			9.0000	1508.7600 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14749.0800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							165.7759 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

Full SAP Calculation Printout



E7 Party floor between dwellings (in blocks of flats)	75.6100	0.0400	3.0244
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	18.2400	0.0000	0.0000
E16 Corner (normal)	25.3000	0.0900	2.2770
E18 Party wall between dwellings	5.0600	0.0600	0.3036
E17 Corner (inverted - internal area greater than external area)	12.6500	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	11.3200	0.1000	1.1320
E4 Jamb	25.8000	0.0500	1.2900
E3 Sill	9.5900	0.0500	0.4795
E9 Balcony between dwellings, wall insulation continuous	6.8500	0.1000	0.6850

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal Bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 43.6458 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	20.8149	20.5991	20.3832	19.3038	19.0879	18.0085	18.0085	17.7926	18.4403	19.0879	19.5197	19.9514 (38)
Average = Sum(39)m / 12 =	64.4607	64.2448	64.0289	62.9495	62.7337	61.6543	61.6543	61.4384	62.0860	62.7337	63.1654	63.5972 (39)
												62.8956
HLP (average)	0.7245	0.7221	0.7197	0.7075	0.7051	0.6930	0.6930	0.6906	0.6978	0.7051	0.7100	0.7148 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	0.7069 (40)
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6114 (42)											
Hot water usage for mixer showers	68.0036	66.9817	65.4925	62.6432	60.5404	58.1955	56.8626	58.3406	59.9607	62.4784	65.3889	67.7431 (42a)
Hot water usage for baths	29.3670	28.9309	28.3167	27.1843	26.3363	25.3961	24.8882	25.4981	26.1621	27.1682	28.3240	29.2677 (42b)
Hot water usage for other uses	41.3729	39.8684	38.3640	36.8595	35.3550	33.8506	33.8506	35.3550	36.8595	38.3640	39.8684	41.3729 (42c)
Average daily hot water use (litres/day)	32.9604	29.0025	30.4718	26.0142	24.6821	21.6613	20.9715	22.1380	22.7474	26.0564	28.5467	32.5013 (43)
Daily hot water use	138.7436	135.7810	132.1731	126.6869	122.2318	117.4421	115.6014	119.1937	122.9823	128.0106	133.5813	138.3837 (44)
Energy content (annual)	219.7359	193.3503	203.1452	173.4281	164.5475	144.4088	139.8099	147.5867	151.6495	173.7092	190.3111	216.6755 (45)
Distribution loss (46)m = 0.15 x (45)m	32.9604	29.0025	30.4718	26.0142	24.6821	21.6613	20.9715	22.1380	22.7474	26.0564	28.5467	32.5013 (46)
Water storage loss:	110.0000 (47)											
Store volume	110.0000 (47)											
b) If manufacturer declared loss factor is not known :	0.0152 (51)											
Hot water storage loss factor from Table 2 (kWh/litre/day)	1.0294 (52)											
Volume factor from Table 2a	0.6000 (53)											
Temperature factor from Table 2b	1.0327 (55)											
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	275.0127	243.2778	258.4220	226.9218	219.8243	197.9025	195.0867	202.8635	205.1431	228.9860	243.8048	271.9523 (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	275.0127	243.2778	258.4220	226.9218	219.8243	197.9025	195.0867	202.8635	205.1431	228.9860	243.8048	271.9523 (64)
Total per year (kWh/year)	2769.1973 (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	117.2836	104.2309	111.7672	100.4598	98.9335	90.8109	90.7082	93.2940	93.2184	101.9797	106.0734	116.2660 (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	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.7062	132.5319	119.7062	123.6964	119.7062	123.6964	119.7062	119.7062	123.6964	119.7062	123.6964	119.7062 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	237.1700	239.6311	233.4292	220.2262	203.5598	187.8957	177.4312	174.9701	181.1719	194.3749	211.0413	226.7054 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568 (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)	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543 (71)
Water heating gains (Table 5)	157.6393	155.1056	150.2248	139.5275	132.9751	126.1262	121.9197	125.3952	129.4700	137.0695	147.3241	156.2716 (72)
Total internal gains	576.6859	589.4389	565.5306	545.6205	518.4115	499.8887	481.2274	482.2418	496.5087	513.3211	544.2323	564.8536 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	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)
East	1.9100	19.6403	0.4000	0.8500	0.7700	8.8388 (76)
South	8.4600	46.7521	0.4000	0.8500	0.7700	93.1930 (78)

Full SAP Calculation Printout



Solar gains	116.0623	196.7296	268.4554	334.4482	378.4586	377.9991	363.4407	329.8723	290.9908	217.0556	138.7948	99.4924 (83)
Total gains	692.7481	786.1685	833.9860	880.0687	896.8701	877.8878	844.6681	812.1141	787.4995	730.3766	683.0271	664.3460 (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	63.5576	63.7712	63.9862	65.0833	65.3073	66.4507	66.4507	66.6841	65.9885	65.3073	64.8609	64.4206
alpha	5.2372	5.2514	5.2657	5.3389	5.3538	5.4300	5.4300	5.4456	5.3992	5.3538	5.3241	5.2947
util living area	0.9621	0.9307	0.8818	0.7757	0.6262	0.4462	0.3207	0.3473	0.5345	0.7915	0.9267	0.9678 (86)
MIT	20.2472	20.4439	20.6452	20.8543	20.9597	20.9947	20.9993	20.9989	20.9862	20.8627	20.5482	20.2167 (87)
Th 2	20.3192	20.3214	20.3235	20.3342	20.3363	20.3470	20.3470	20.3492	20.3427	20.3363	20.3320	20.3278 (88)
util rest of house	0.9556	0.9198	0.8643	0.7472	0.5873	0.4019	0.2733	0.2985	0.4867	0.7588	0.9135	0.9622 (89)
MIT 2	19.4460	19.6904	19.9359	20.1869	20.3007	20.3434	20.3467	20.3486	20.3325	20.2023	19.8307	19.4148 (90)
Living area fraction	19.6804	19.9109	20.1434	20.3822	20.4935	20.5340	20.5376	20.5389	20.5237	20.3956	20.0407	19.6494 (92)
MIT	19.6804	19.9109	20.1434	20.3822	20.4935	20.5340	20.5376	20.5389	20.5237	20.3956	20.0407	19.6494 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6804	19.9109	20.1434	20.3822	20.4935	20.5340	20.5376	20.5389	20.5237	20.3956	20.0407	19.6494 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9484	0.9124	0.8592	0.7493	0.5967	0.4146	0.2872	0.3127	0.5000	0.7619	0.9069	0.9554 (94)
Useful gains	656.9998	717.2727	716.5852	659.4625	535.1556	364.0060	242.5726	253.9725	393.7612	556.4832	619.4508	634.7302 (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	991.4333	964.3700	873.5729	722.7972	551.6478	365.8535	242.7711	254.2860	398.8245	614.5114	817.4024	982.5372 (97)
Space heating kWh	248.8186	166.0493	116.7989	45.6010	12.2702	0.0000	0.0000	0.0000	0.0000	43.1730	142.5252	258.7684 (98a)
Space heating requirement - total per year (kWh/year)												1034.0047
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	248.8186	166.0493	116.7989	45.6010	12.2702	0.0000	0.0000	0.0000	0.0000	43.1730	142.5252	258.7684 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1034.0047
Space heating per m2										(98c) / (4) =		11.6219 (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	248.8186	166.0493	116.7989	45.6010	12.2702	0.0000	0.0000	0.0000	0.0000	43.1730	142.5252	258.7684 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.23												
307a	306.0468	204.2407	143.6626	56.0892	15.0924	0.0000	0.0000	0.0000	0.0000	53.1028	175.3060	318.2852
Space heating requirement	306.0468	204.2407	143.6626	56.0892	15.0924	0.0000	0.0000	0.0000	0.0000	53.1028	175.3060	318.2852 (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	275.0127	243.2778	258.4220	226.9218	219.8243	197.9025	195.0867	202.8635	205.1431	228.9860	243.8048	271.9523 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.23												
310a	338.2656	299.2317	317.8591	279.1138	270.3839	243.4201	239.9566	249.5221	252.3261	281.6527	299.8799	334.5013
Water heating fuel	338.2656	299.2317	317.8591	279.1138	270.3839	243.4201	239.9566	249.5221	252.3261	281.6527	299.8799	334.5013 (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	17.9591	16.2211	17.9591	17.3797	17.9591	17.3797	17.9591	17.9591	17.3797	17.9591	17.3797	17.9591 (331)
Lighting	24.8726	19.9537	17.9661	13.1627	10.1673	8.3068	9.2749	12.0559	15.6594	20.5460	23.2067	25.5639 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-13.1631	-20.2244	-31.7232	-39.0365	-45.1309	-43.2798	-42.7320	-38.7703	-32.3932	-24.4926	-15.0437	-11.1916 (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												1271.8257 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												3406.1127 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												12.7183 (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)												211.4534 (330a)
Total electricity for the above, kWh/year												211.4534 (331)
Electricity for lighting (calculated in Appendix L)												200.7360 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-357.1811 (333)

Full SAP Calculation Printout



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	4732.9468 (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	1559.3128	0.1574	66.7104 (367)
Electrical energy for heat distribution (space & water)	12.7183	0.0000	6.8007 (372)
Overall CO2 factor for heat network			0.0499 (386)
Total CO2 associated with community systems			233.4900 (373)
Space and water heating			233.4900 (376)
Pumps, fans and electric keep-hot	211.4534	0.1387	29.3312 (378)
Energy for lighting	200.7360	0.1443	28.9724 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-357.1811	0.1328	-47.4325
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-47.4325 (380)
Total CO2, kg/year			244.3611 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.7500 (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	1559.3128	1.5825	670.8957 (467)
Electrical energy for heat distribution (space & water)	12.7183	0.0000	71.9343 (472)
Overall CO2 factor for heat network			0.5280 (486)
Total CO2 associated with community systems			2469.7455 (473)
Space and water heating			2469.7455 (476)
Pumps, fans and electric keep-hot	211.4534	1.5128	319.8867 (478)
Energy for lighting	200.7360	1.5338	307.8956 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-357.1811	1.4907	-532.4466
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-532.4466 (480)
Total Primary energy kWh/year			2565.0812 (483)
Dwelling Primary energy Rate (DPER)			28.8300 (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	88.9700 (1b)	x 2.5300 (2b)	= 225.0941 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.9700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 225.0941 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1333 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3833 (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) = 0.2970 (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	0.3787	0.3713	0.3639	0.3267	0.3193	0.2822	0.2822	0.2748	0.2970	0.3193	0.3342	0.3490 (22b)

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Effective ac 0.5717 0.5689 0.5662 0.5534 0.5510 0.5398 0.5398 0.5377 0.5441 0.5510 0.5558 0.5609 (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)			15.9700	1.1450	18.2863			(27)
External Wall 1	59.1500	15.9700	43.1800	0.1800	7.7724			(29a)
Corridor wall	45.1500	1.7000	43.4500	0.1800	7.8210			(29a)
Total net area of external elements Aum (A, m2)			104.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5797			(33)
Party Wall 1			23.0700	0.0000	0.0000			(32)

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

139.7759 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	75.6100	0.0700	5.2927	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	18.2400	0.0000	0.0000	
E16 Corner (normal)	25.3000	0.0900	2.2770	
E18 Party wall between dwellings	5.0600	0.0600	0.3036	
E17 Corner (inverted - internal area greater than external area)	12.6500	-0.0900	-1.1385	
E1 Steel lintel with perforated steel base plate	11.3200	0.0500	0.5660	
E4 Jamb	25.8000	0.0500	1.2900	
E3 Sill	9.5900	0.0500	0.4795	
E9 Balcony between dwellings, wall insulation continuous	6.8500	0.0200	0.1370	

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

9.2073 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 44.7870 (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	42.4677	42.2609	42.0581	41.1057	40.9275	40.0980	40.0980	39.9444	40.4175	40.9275	41.2880	41.6649	(38)
Heat transfer coeff	87.2547	87.0478	86.8451	85.8927	85.7145	84.8850	84.8850	84.7314	85.2045	85.7145	86.0750	86.4518	(39)
Average = Sum(39)m / 12 =												85.8918	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9807	0.9784	0.9761	0.9654	0.9634	0.9541	0.9541	0.9524	0.9577	0.9634	0.9675	0.9717	(40)
HLP (average)												0.9654	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6114 (42)
Hot water usage for mixer showers	68.0036	66.9817	65.4925	62.6432	60.5404	58.1955	56.8626	58.3406	59.9607	62.4784	65.3889	67.7431	(42a)
Hot water usage for baths	29.3670	28.9309	28.3167	27.1843	26.3363	25.3961	24.8882	25.4981	26.1621	27.1682	28.3240	29.2677	(42b)
Hot water usage for other uses	41.3729	39.8684	38.3640	36.8595	35.3550	33.8506	33.8506	35.3550	36.8595	38.3640	39.8684	41.3729	(42c)
Average daily hot water use (litres/day)													127.5367 (43)
Daily hot water use	138.7436	135.7810	132.1731	126.6869	122.2318	117.4421	115.6014	119.1937	122.9823	128.0106	133.5813	138.3837	(44)
Energy conte	219.7359	193.3503	203.1452	173.4281	164.5475	144.4088	139.8099	147.5867	151.6495	173.7092	190.3111	216.6755	(45)
Energy content (annual)										Total = Sum(45)m =		2118.3576	
Distribution loss (46)m = 0.15 x (45)m	32.9604	29.0025	30.4718	26.0142	24.6821	21.6613	20.9715	22.1380	22.7474	26.0564	28.5467	32.5013	(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	266.3308	235.4361	249.7401	218.5199	211.1424	189.5006	186.4048	194.1816	196.7413	220.3041	235.4029	263.2704	(62)
WWHRS	-31.0884	-27.4949	-28.7910	-23.8401	-22.2181	-19.0122	-17.8209	-18.9508	-19.6708	-23.1897	-26.2711	-30.5127	(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	235.2424	207.9412	220.9491	194.6798	188.9243	170.4884	168.5839	175.2308	177.0705	197.1144	209.1319	232.7577	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2378.1143	(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	110.3381	97.9576	104.8217	93.7383	91.9880	84.0894	83.7627	86.3485	86.4969	95.0342	99.3519	109.3205	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679	130.5679	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	122.2343	135.3309	122.2343	126.3088	122.2343	126.3088	122.2343	122.2343	126.3088	122.2343	126.3088	122.2343	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	237.1700	239.6311	233.4292	220.2262	203.5598	187.8957	177.4312	174.9701	181.1719	194.3749	211.0413	226.7054	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568	36.0568	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	-104.4543	(71)

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Water heating gains (Table 5)	148.3039	145.7702	140.8894	130.1921	123.6397	116.7908	112.5843	116.0598	120.1346	127.7342	137.9888	146.9362 (72)
Total internal gains	572.8786	585.9025	561.7233	541.8975	514.6042	493.1657	474.4201	475.4346	489.7857	509.5138	540.5093	561.0463 (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				5.6000	10.6334	0.6300	0.7000	0.7700	18.1983 (74)			
East				1.9100	19.6403	0.6300	0.7000	0.7700	11.4644 (76)			
South				8.4600	46.7521	0.6300	0.7000	0.7700	120.8768 (78)			
Solar gains	150.5396	255.1699	348.2025	433.7991	490.8831	490.2870	471.4039	427.8637	377.4322	281.5339	180.0250	129.0475 (83)
Total gains	723.4182	841.0724	909.9258	975.6966	1005.4873	983.4528	945.8241	903.2983	867.2180	791.0477	720.5343	690.0938 (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)												
tau	39.5899	39.6840	39.7767	40.2177	40.3013	40.6951	40.6951	40.7689	40.5425	40.3013	40.1325	39.9576
alpha	3.6393	3.6456	3.6518	3.6812	3.6868	3.7130	3.7130	3.7179	3.7028	3.6868	3.6755	3.6638
util living area	0.9590	0.9314	0.8913	0.8105	0.6876	0.5233	0.3872	0.4205	0.6162	0.8309	0.9320	0.9645 (86)
MIT	19.5180	19.7993	20.1287	20.5154	20.7935	20.9441	20.9858	20.9806	20.8955	20.5431	19.9769	19.4685 (87)
Th 2	20.0994	20.1014	20.1033	20.1123	20.1139	20.1218	20.1218	20.1232	20.1188	20.1139	20.1105	20.1070 (88)
util rest of house	0.9521	0.9205	0.8740	0.7812	0.6418	0.4602	0.3131	0.3447	0.5536	0.7984	0.9192	0.9585 (89)
MIT 2	18.3810	18.7326	19.1402	19.6097	19.9240	20.0812	20.1146	20.1128	20.0367	19.6535	18.9662	18.3242 (90)
Living area fraction									fLA = Living area / (4) =			0.2926 (91)
MIT	18.7137	19.0447	19.4294	19.8747	20.1784	20.3337	20.3695	20.3667	20.2879	19.9138	19.2619	18.6590 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7137	19.0447	19.4294	19.8747	20.1784	20.3337	20.3695	20.3667	20.2879	19.9138	19.2619	18.6590 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	678.9317	761.0161	781.6121	753.8477	648.8540	467.9766	316.1650	330.7071	491.0112	625.1021	651.6114	652.6903 (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	1257.6616	1231.2667	1122.8571	942.6453	726.7190	486.7020	319.9730	336.1043	527.2396	798.3268	1046.8378	1250.0092 (97)
Space heating kWh	430.5751	316.0084	253.8863	135.9343	57.9316	0.0000	0.0000	0.0000	0.0000	128.8792	284.5631	444.4053 (98a)
Space heating requirement - total per year (kWh/year)												2052.1831
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	430.5751	316.0084	253.8863	135.9343	57.9316	0.0000	0.0000	0.0000	0.0000	128.8792	284.5631	444.4053 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2052.1831
Space heating per m2										(98c) / (4) =		23.0660 (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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
430.5751	316.0084	253.8863	135.9343	57.9316	0.0000	0.0000	0.0000	0.0000	0.0000	128.8792	284.5631	444.4053 (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)	466.4952	342.3709	275.0664	147.2744	62.7644	0.0000	0.0000	0.0000	0.0000	139.6307	308.3023	481.4791 (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	235.2424	207.9412	220.9491	194.6798	188.9243	170.4884	168.5839	175.2308	177.0705	197.1144	209.1319	232.7577 (64)
Efficiency of water heater (217)m	85.3971	84.9956	84.3722	83.2700	81.7443	79.8000	79.8000	79.8000	79.8000	83.1309	84.7510	79.8000 (216)
Fuel for water heating, kWh/month	275.4687	244.6494	261.8743	233.7935	231.1162	213.6447	211.2580	219.5875	221.8929	237.1132	246.7603	272.2756 (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	25.3979	20.3751	18.3455	13.4407	10.3820	8.4822	9.4708	12.3105	15.9901	20.9799	23.6968	26.1038 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-9.7697	-15.1203	-23.8294	-29.4563	-34.1875	-32.8104	-32.4083	-29.3640	-24.4817	-18.3901	-11.2063	-8.2968 (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)												

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(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	-2.0730	-4.5424	-9.3838	-14.6408	-19.9171	-20.2265	-19.9941	-16.6721	-11.8875	-6.6725	-2.8215	-1.6264	(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												2223.3836	(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												2869.4342	(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)												204.9754	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-399.7787	(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												4984.0146	(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	2223.3836	0.2100	466.9106	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2869.4342	0.2100	602.5812	(264)
Space and water heating			1069.4917	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.9754	0.1443	29.5843	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-269.3210	0.1327	-35.7383	
PV Unit electricity exported	-130.4576	0.1248	-16.2805	
Total			-52.0188	(269)
Total CO2, kg/year			1058.9865	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9000	(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	2223.3836	1.1300	2512.4235	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2869.4342	1.1300	3242.4606	(278)
Space and water heating			5754.8841	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.9754	1.5338	314.3982	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-269.3210	1.4903	-401.3745	
PV Unit electricity exported	-130.4576	0.4580	-59.7534	
Total			-461.1279	(283)
Total Primary energy kWh/year			5738.2552	(286)
Target Primary Energy Rate (TPER)			64.5000	(287)