

Full SAP Calculation Printout



Property Reference	Flat 04_09 mid N			Issued on Date	25/01/2024
Assessment Reference	Flat 04_09 mid N BE LEAN	Prop Type Ref	SE_01_009 exposed floor W		
Property					
SAP Rating	85 B	DER	13.08	TER	13.99
Environmental	91 B	% DER < TER			6.50
CO ₂ Emissions (t/year)	0.66	DFEE	25.49	TFEE	26.18
Compliance Check	See BREL	% DFEE < TFEE			2.62
% DPER < TPER	2.50	DPER	74.43	TPER	76.34
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	53.2000 (1b)	2.5300 (2b)	134.5960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	134.5960 (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)			8.6000	1.1450	9.8473		(27)
Int door			1.7000	1.1000	1.8700		(26)
External Wall 1	49.0600	10.3000	38.7600	0.1500	5.8140	14.0000	542.6400 (29a)
stair wall	17.5300		17.5300	0.1800	3.1554	14.0000	245.4200 (29a)
Total net area of external elements Aum(A, m ²)			66.5900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.6867		(33)
Party Wall 1			18.1700	0.0000	0.0000	20.0000	363.4000 (32)
Party Floor			53.2000			40.0000	2128.0000 (32d)
Party Ceiling 1			53.2000			90.0000	4788.0000 (32b)
Internal Wall 1			97.8100			9.0000	880.2900 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	8947.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							168.1908 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E7 Party floor between dwellings (in blocks of flats)	45.0200	0.0400	1.8008										
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.3600	0.0000	0.0000										
E16 Corner (normal)	7.5900	0.0900	0.6831										
E18 Party wall between dwellings	5.0600	0.0600	0.3036										
E17 Corner (inverted - internal area greater than external area)	2.5300	0.0000	0.0000										
E3 Sill	1.7500	0.0500	0.0875										
E9 Balcony between dwellings, wall insulation continuous	7.6200	0.1000	0.7620										
E1 Steel lintel with perforated steel base plate	5.0900	0.1000	0.5090										
E4 Jamb	21.2000	0.0500	1.0600										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.2060 (36)									
Point Thermal Bridges				0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		25.8927 (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	12.4464	12.3173	12.1882	11.5428	11.4137	10.7683	10.7683	10.6392	11.0264	11.4137	11.6719	11.9300	(38)
Average = Sum(39)m / 12 =	38.3391	38.2100	38.0809	37.4355	37.3064	36.6610	36.6610	36.5319	36.9192	37.3064	37.5646	37.8228	(39)
												37.4032	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7207	0.7182	0.7158	0.7037	0.7012	0.6891	0.6891	0.6867	0.6940	0.7012	0.7061	0.7110	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												0.7031	
												31	

4. Water heating energy requirements (kWh/year)													

Assumed occupancy													1.7845 (42)
Hot water usage for mixer showers													
	54.1390	53.3253	52.1398	49.8714	48.1974	46.3305	45.2694	46.4460	47.7358	49.7402	52.0573	53.9315	(42a)
Hot water usage for baths													
	23.4047	23.0572	22.5677	21.6652	20.9894	20.2400	19.8352	20.3213	20.8505	21.6524	22.5735	23.3256	(42b)
Hot water usage for other uses													
	32.9046	31.7081	30.5115	29.3150	28.1185	26.9219	26.9219	28.1185	29.3150	30.5115	31.7081	32.9046	(42c)
Average daily hot water use (litres/day)													101.5275 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	110.4483	108.0906	105.2190	100.8515	97.3052	93.4925	92.0266	94.8858	97.9013	101.9041	106.3389	110.1617	(44)
Energy conte	174.9231	153.9195	161.7177	138.0607	130.9915	114.9599	111.2982	117.4884	120.7221	138.2829	151.4992	172.4867	(45)
Energy content (annual)										Total = Sum(45)m =		1686.3499	
Distribution loss (46)m = 0.15 x (45)m													
	26.2385	23.0879	24.2576	20.7091	19.6487	17.2440	16.6947	17.6233	18.1083	20.7424	22.7249	25.8730	(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													
	230.1999	203.8470	216.9945	191.5544	186.2683	168.4536	166.5750	172.7652	174.2158	193.5597	204.9929	227.7635	(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													
	230.1999	203.8470	216.9945	191.5544	186.2683	168.4536	166.5750	172.7652	174.2158	193.5597	204.9929	227.7635	(64)
												2337.1897	(64)
12Total per year (kWh/year)												2337	(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)
												0.0000	(64a)
Heat gains from water heating, kWh/month													
	102.3834	91.1202	97.9926	88.7001	87.7761	81.0191	81.2281	83.2863	82.9350	90.2005	93.1684	101.5733	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	79.1654	87.6474	79.1654	81.8043	79.1654	81.8043	79.1654	79.1654	81.8043	79.1654	81.8043	79.1654	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	155.5356	157.1496	153.0825	144.4239	133.4941	123.2217	116.3590	114.7450	118.8122	127.4707	138.4005	148.6730	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	(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)													
	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	(71)
Water heating gains (Table 5)													
	137.6121	135.5955	131.7104	123.1946	117.9786	112.5265	109.1775	111.9440	115.1876	121.2372	129.4006	136.5232	(72)
Total internal gains													
	422.0800	430.1594	413.7251	399.1897	380.4050	367.3193	354.4688	355.6213	365.5709	377.6402	399.3722	414.1285	(73)

6. Solar gains													

[Jan]													
	Area												
	m2												
	Solar flux												
	Table 6a												
	W/m2												
	Specific data												
	or Table 6b												
	Specific data												
	or Table 6c												
	Access												
	factor												
	Table 6d												
	Gains												
	W												
South	8.6000												94.7352 (78)

Solar gains	94.7352	155.1519	197.6359	223.3715	232.7669	224.0065	218.8680	212.5511	206.4541	167.3458	112.2935	81.8599	(83)

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Total gains 516.8152 585.3113 611.3611 622.5612 613.1720 591.3258 573.3368 568.1724 572.0250 544.9860 511.6657 495.9884 (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	64.8290	65.0480	65.2685	66.3938	66.6235	67.7965	67.7965	68.0360	67.3224	66.6235	66.1657	65.7140
alpha	5.3219	5.3365	5.3512	5.4263	5.4416	5.5198	5.5198	5.5357	5.4882	5.4416	5.4110	5.3809
util living area	0.9169	0.8624	0.7967	0.6870	0.5545	0.3953	0.2812	0.2955	0.4424	0.6756	0.8524	0.9271 (86)
MIT	20.4943	20.6642	20.8019	20.9229	20.9787	20.9974	20.9997	20.9996	20.9949	20.9395	20.7377	20.4651 (87)
Th 2	20.3226	20.3248	20.3269	20.3376	20.3397	20.3505	20.3505	20.3526	20.3462	20.3397	20.3354	20.3312 (88)
util rest of house	0.9048	0.8451	0.7736	0.6568	0.5180	0.3557	0.2397	0.2540	0.4015	0.6403	0.8317	0.9163 (89)
MIT 2	19.7507	19.9551	20.1176	20.2621	20.3213	20.3487	20.3503	20.3524	20.3425	20.2833	20.0549	19.7226 (90)
Living area fraction	fLA = Living area / (4) = 0.4412 (91)											
MIT	20.0788	20.2679	20.4195	20.5536	20.6113	20.6348	20.6368	20.6379	20.6303	20.5728	20.3561	20.0502 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.0788	20.2679	20.4195	20.5536	20.6113	20.6348	20.6368	20.6379	20.6303	20.5728	20.3561	20.0502 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9000	0.8435	0.7769	0.6669	0.5331	0.3731	0.2580	0.2723	0.4193	0.6530	0.8323	0.9113 (94)
Useful gains	465.1504	493.7364	474.9507	415.1551	326.9008	220.6332	147.9303	154.7344	239.8713	355.8755	425.8784	451.9719 (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	604.9436	587.2093	530.0672	436.2593	332.4502	221.2432	147.9925	154.8187	241.0925	372.0487	497.9613	599.4973 (97)
Space heating kWh	104.0061	62.8137	41.0066	15.1950	4.1288	0.0000	0.0000	0.0000	0.0000	12.0329	51.8997	109.7589 (98a)
Space heating requirement - total per year (kWh/year)	400.8417											
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	104.0061	62.8137	41.0066	15.1950	4.1288	0.0000	0.0000	0.0000	0.0000	12.0329	51.8997	109.7589 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	400.8417											
Space heating per m2	(98c) / (4) = 7.5346 (99)											

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Boilers-Space and Water
Factor for control and charging method (Table 4c(3)) for space heating
Factor for charging method (Table 4c(3)) for water heating
Distribution loss factor (Table 12c) for community heating system
Efficiency of secondary/supplementary heating system, %

0.0000 (301)
1.0000 (302)
1.0000 (303a)
1.0000 (305)
1.0000 (305a)
1.0500 (306)
0.0000 (208)

Space heating:

Space heating requirement	104.0061	62.8137	41.0066	15.1950	4.1288	0.0000	0.0000	0.0000	0.0000	12.0329	51.8997	109.7589 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05												
307a	109.2065	65.9544	43.0570	15.9547	4.3352	0.0000	0.0000	0.0000	0.0000	12.6345	54.4946	115.2468
Space heating requirement	109.2065	65.9544	43.0570	15.9547	4.3352	0.0000	0.0000	0.0000	0.0000	12.6345	54.4946	115.2468 (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	230.1999	203.8470	216.9945	191.5544	186.2683	168.4536	166.5750	172.7652	174.2158	193.5597	204.9929	227.7635 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05												
310a	241.7099	214.0393	227.8442	201.1321	195.5817	176.8762	174.9037	181.4035	182.9266	203.2377	215.2425	239.1517
Water heating fuel	241.7099	214.0393	227.8442	201.1321	195.5817	176.8762	174.9037	181.4035	182.9266	203.2377	215.2425	239.1517 (310)
Cooling System Energy Efficiency Ratio	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	10.1529	9.1704	10.1529	9.8254	10.1529	9.8254	10.1529	10.1529	9.8254	10.1529	9.8254	10.1529 (331)
Lighting	16.4490	13.1960	11.8815	8.7049	6.7239	5.4935	6.1338	7.9729	10.3561	13.5877	15.3473	16.9062 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	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)	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)	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)	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)	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)	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	420.8838 (307)											
Space heating fuel - secondary	0.0000 (309)											
Water heating fuel - community heating	2454.0491 (310)											
Efficiency of water heater	0.0000 (311)											
Electricity used for heat distribution	4.2088 (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)

119.5428 (330a)
119.5428 (331)
132.7530 (332)

Total electricity for the above, kWh/year

Electricity for lighting (calculated in Appendix L)

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)

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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	3127.2287 (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	3124.9271	0.2100	96.0713 (367)
Electrical energy for heat distribution (space & water)	4.2088	0.0000	4.1201 (372)
Overall CO2 factor for heat network			0.2297 (386)
Total CO2 associated with community systems			660.3548 (373)
Space and water heating			660.3548 (376)
Pumps, fans and electric keep-hot	119.5428	0.1387	16.5821 (378)
Energy for lighting	132.7530	0.1443	19.1604 (379)
Total CO2, kg/year			696.0972 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.0800 (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	3124.9271	1.1300	516.9551 (467)
Electrical energy for heat distribution (space & water)	4.2088	0.0000	43.9864 (472)
Overall CO2 factor for heat network			1.2436 (486)
Total CO2 associated with community systems			3575.1541 (473)
Space and water heating			3575.1541 (476)
Pumps, fans and electric keep-hot	119.5428	1.5128	180.8443 (478)
Energy for lighting	132.7530	1.5338	203.6209 (479)
Total Primary energy kWh/year			3959.6194 (483)
Dwelling Primary energy Rate (DPER)			74.4300 (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	53.2000 (1b)	x 2.5300 (2b)	= 134.5960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 134.5960 (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)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1486 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3986	(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) =		0.3089 (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	0.3939	0.3861	0.3784	0.3398	0.3321	0.2935	0.2935	0.2857	0.3089	0.3321	0.3475	0.3630 (22b)
Effective ac	0.5776	0.5746	0.5716	0.5577	0.5551	0.5431	0.5431	0.5408	0.5477	0.5551	0.5604	0.5659 (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)			8.6000	1.1450	9.8473		(27)

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External Wall 1	49.0600	10.3000	38.7600	0.1800	6.9768	(29a)
stair wall	17.5300		17.5300	0.1800	3.1554	(29a)
Total net area of external elements Aum(A, m2)			66.5900			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.6795	(33)
Party Wall 1			18.1700	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 142.1908 (35)

List of Thermal Bridges						
K1 Element			Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)			45.0200	0.0700	3.1514	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)			14.3600	0.0000	0.0000	
E16 Corner (normal)			7.5900	0.0900	0.6831	
E18 Party wall between dwellings			5.0600	0.0600	0.3036	
E17 Corner (inverted - internal area greater than external area)			2.5300	-0.0900	-0.2277	
E3 Sill			1.7500	0.0500	0.0875	
E9 Balcony between dwellings, wall insulation continuous			7.6200	0.0200	0.1524	
E1 Steel lintel with perforated steel base plate			5.0900	0.0500	0.2545	
E4 Jamb			21.2000	0.0500	1.0600	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4648 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 27.1443 (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	25.6534	25.5196	25.3885	24.7726	24.6574	24.1209	24.1209	24.0216	24.3276	24.6574	24.8905	25.1342
Heat transfer coeff	52.7977	52.6640	52.5328	51.9169	51.8017	51.2653	51.2653	51.1659	51.4719	51.8017	52.0348	52.2785
Average = Sum(39)m / 12 =												51.9164

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9924	0.9899	0.9875	0.9759	0.9737	0.9636	0.9636	0.9618	0.9675	0.9737	0.9781	0.9827
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7845 (42)
Hot water usage for mixer showers	54.1390	53.3253	52.1398	49.8714	48.1974	46.3305	45.2694	46.4460	47.7358	49.7402	52.0573	53.9315	(42a)
Hot water usage for baths	23.4047	23.0572	22.5677	21.6652	20.9894	20.2400	19.8352	20.3213	20.8505	21.6524	22.5735	23.3256	(42b)
Hot water usage for other uses	32.9046	31.7081	30.5115	29.3150	28.1185	26.9219	26.9219	28.1185	29.3150	30.5115	31.7081	32.9046	(42c)
Average daily hot water use (litres/day)													101.5275 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.4483	108.0906	105.2190	100.8515	97.3052	93.4925	92.0266	94.8858	97.9013	101.9041	106.3389	110.1617	(44)
Energy content (annual)	174.9231	153.9195	161.7177	138.0607	130.9915	114.9599	111.2982	117.4884	120.7221	138.2829	151.4992	172.4867	(45)
Distribution loss (46)m = 0.15 x (45)m	26.2385	23.0879	24.2576	20.7091	19.6487	17.2440	16.6947	17.6233	18.1083	20.7424	22.7249	25.8730	(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	221.5180	196.0053	208.3126	183.1526	177.5864	160.0517	157.8931	164.0833	165.8140	184.8778	196.5910	219.0816	(62)
WWHRS	-24.7501	-21.8892	-22.9211	-18.9796	-17.6883	-15.1360	-14.1876	-15.0870	-15.6603	-18.4617	-20.9149	-24.2917	(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	196.7679	174.1161	185.3915	164.1730	159.8981	144.9158	143.7055	148.9963	150.1537	166.4161	175.6762	194.7898	(64)
12Total per year (kWh/year)													2005.0000 (64)
Electric shower(s)													2005 (64)
	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)
													0.0000 (64a)
Heat gains from water heating, kWh/month	95.4379	84.8468	91.0470	81.9787	80.8306	74.2976	74.2826	76.3408	76.2136	83.2550	86.4470	94.6277	(65)

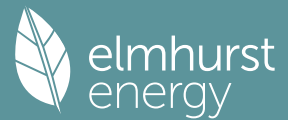
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	81.6803	90.4317	81.6803	84.4029	81.6803	84.4029	81.6803	81.6803	84.4029	81.6803	84.4029	81.6803 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	155.5356	157.1496	153.0825	144.4239	133.4941	123.2217	116.3590	114.7450	118.8122	127.4707	138.4005	148.6730 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223 (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)												
	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782 (71)
Water heating gains (Table 5)												
	128.2767	126.2601	122.3751	113.8592	108.6433	103.1912	99.8422	102.6086	105.8522	111.9019	120.0652	127.1878 (72)
Total internal gains												
	418.2594	426.6083	409.9046	395.4530	376.5845	360.5826	347.6483	348.8008	358.8342	373.8197	395.6355	410.3079 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2		Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W	
South	8.6000		46.7521		0.6300		0.7000		0.7700		122.8771 (78)	
Solar gains	122.8771	201.2411	256.3454	289.7260	301.9124	290.5496	283.8847	275.6913	267.7831	217.0574	145.6513	106.1772 (83)
Total gains	541.1365	627.8494	666.2500	685.1790	678.4969	651.1322	631.5329	624.4921	626.6172	590.8771	541.2868	516.4851 (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	39.7984	39.8995	39.9991	40.4736	40.5636	40.9881	40.9881	41.0676	40.8235	40.5636	40.3819	40.1936
alpha	3.6532	3.6600	3.6666	3.6982	3.7042	3.7325	3.7325	3.7378	3.7216	3.7042	3.6921	3.6796
util living area	0.9276	0.8853	0.8349	0.7517	0.6377	0.4837	0.3522	0.3707	0.5349	0.7496	0.8839	0.9363 (86)
MIT	19.7862	20.0658	20.3424	20.6367	20.8422	20.9577	20.9899	20.9876	20.9357	20.6921	20.2142	19.7348 (87)
Th 2	20.0896	20.0917	20.0938	20.1035	20.1053	20.1137	20.1137	20.1153	20.1105	20.1053	20.1016	20.0978 (88)
util rest of house	0.9165	0.8690	0.8121	0.7185	0.5910	0.4230	0.2833	0.3019	0.4750	0.7106	0.8648	0.9263 (89)
MIT 2	18.7044	19.0474	19.3829	19.7353	19.9633	20.0838	20.1088	20.1089	20.0620	19.8062	19.2431	18.6471 (90)
Living area fraction	19.1816	19.4967	19.8062	20.1330	20.3510	20.4693	20.4975	20.4965	20.4474	20.1970	19.6715	19.1270 (92)
MIT	19.1816	19.4967	19.8062	20.1330	20.3510	20.4693	20.4975	20.4965	20.4474	20.1970	19.6715	19.1270 (93)
Temperature adjustment												0.0000
adjusted MIT	19.1816	19.4967	19.8062	20.1330	20.3510	20.4693	20.4975	20.4965	20.4474	20.1970	19.6715	19.1270 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9032	0.8569	0.8042	0.7197	0.6043	0.4478	0.3134	0.3318	0.4982	0.7148	0.8544	0.9134 (94)
Useful gains	488.7712	538.0334	535.7681	493.1131	409.9822	291.5793	197.9373	207.2360	312.1900	422.3760	462.4619	471.7489 (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	785.7171	768.7183	699.0125	583.1813	448.1386	300.8936	199.8073	209.6022	326.7145	497.1431	654.1556	780.3592 (97)
Space heating kWh	220.9278	155.0202	121.4538	64.8491	28.3884	0.0000	0.0000	0.0000	0.0000	55.6268	138.0195	229.6060 (98a)
Space heating requirement - total per year (kWh/year)												1013.8915
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	220.9278	155.0202	121.4538	64.8491	28.3884	0.0000	0.0000	0.0000	0.0000	55.6268	138.0195	229.6060 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1013.8915
Space heating per m2										(98c) / (4) =		19.0581 (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	220.9278	155.0202	121.4538	64.8491	28.3884	0.0000	0.0000	0.0000	0.0000	55.6268	138.0195	229.6060 (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)	239.3584	167.9526	131.5859	70.2591	30.7566	0.0000	0.0000	0.0000	0.0000	60.2674	149.5335	248.7606 (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	196.7679	174.1161	185.3915	164.1730	159.8981	144.9158	143.7055	148.9963	150.1537	166.4161	175.6762	194.7898 (64)
Efficiency of water heater (217)m	84.3201	83.8003	83.1351	82.1578	81.0383	79.8000	79.8000	79.8000	79.8000	81.8790	83.5246	79.8000 (216)
Fuel for water heating, kWh/month	233.3582	207.7751	223.0003	199.8265	197.3117	181.5987	180.0821	186.7121	188.1625	203.2464	210.3287	84.4295 (217)
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	16.9715	13.6152	12.2590	8.9815	6.9375	5.6680	6.3287	8.2262	10.6850	14.0194	15.8348	17.4432 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-5.9123	-9.1903	-14.5487	-18.0718	-21.0615	-20.2543	-20.0157	-18.0986	-15.0300	-11.2210	-6.7978	-5.0173 (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	-1.1690	-2.5671	-5.3113	-8.2962	-11.2906	-11.4593	-11.3186	-9.4289	-6.7171	-3.7653	-1.5902	-0.9163 (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												1098.4740 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000

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Water heating fuel used	2442.1154 (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)	136.9701 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-239.0494 (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	3524.5101 (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	1098.4740	0.2100	230.6795 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2442.1154	0.2100	512.8442 (264)
Space and water heating			743.5238 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	136.9701	0.1443	19.7690 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-165.2194	0.1326	-21.9078
PV Unit electricity exported	-73.8300	0.1248	-9.2128
Total			-31.1206 (269)
Total CO2, kg/year			744.1014 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.9900 (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	1098.4740	1.1300	1241.2756 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2442.1154	1.1300	2759.5904 (278)
Space and water heating			4000.8660 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	136.9701	1.5338	210.0893 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-165.2194	1.4899	-246.1679
PV Unit electricity exported	-73.8300	0.4580	-33.8134
Total			-279.9813 (283)
Total Primary energy kWh/year			4061.0749 (286)
Target Primary Energy Rate (TPER)			76.3400 (287)