

Full SAP Calculation Printout



Property Reference	L02_flat 5 (new build)				Issued on Date	02/05/2025
Assessment Reference	Be Lean	Prop Type Ref	L02_2B3P			
Property	22, Palace Road, London, N11 2PS					
SAP Rating	86 B	DER	11.94	TER	10.94	
Environmental	90 B	% DER < TER				-9.14
CO ₂ Emissions (t/year)	0.98	DFEE	35.61	TFEE	36.64	
Compliance Check	See BREL	% DFEE < TFEE				2.83
% DPER < TPER	-18.33	DPER	67.72	TPER	57.23	
Assessor Details	Dr. Alan Harries				Assessor ID	BC24-0001
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)
Main dwelling			
Ground floor	93.0000 (1b)	2.5000 (2b)	232.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	232.5000 (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	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762 (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) =												80.1000 (23c)
Effective ac	0.2907	0.2870	0.2833	0.2645	0.2607	0.2420	0.2420	0.2382	0.2495	0.2607	0.2682	0.2757 (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
Main dwelling							
Window			28.3100	0.9615	27.2212		(27)
Rooflight			2.9600	0.9615	2.8462		(27a)
External Wall 1	83.6000	28.3100	55.2900	0.1600	8.8464	110.0000	6081.9000 (29a)
External Roof 1	93.0000	2.9600	90.0400	0.1000	9.0040	9.0000	810.3600 (30)
Total net area of external elements Aum(A, m ²)			176.6000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	47.9177	(33)
Main dwelling							
Party Floor 1			93.0000			40.0000	3720.0000 (32d)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	10612.2600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							114.1103 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				17.1000	0.0700	1.1970	
E14 Flat roof				38.4700	0.0800	3.0776	

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E16 Corner (normal)	10.0000	0.0900	0.9000
E18 Party wall between dwellings	10.0700	0.0600	0.6042
R1 Head of roof window	3.2000	0.0800	0.2560
R2 Sill of roof window	3.2000	0.0600	0.1920
R3 Jamb of roof window	3.6000	0.0800	0.2880
P4 Party wall - Roof (insulation at ceiling level)	11.5000	0.1200	1.3800
E2 Other lintels (including other steel lintels)	12.1000	0.2000	2.4200
E3 Sill	12.1000	0.0400	0.4840
E4 Jamb	21.6800	0.0500	1.0840

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal Bridges (36a) = 11.8828 (36)
 Total fabric heat loss (33) + (36) + (36a) = 59.8005 (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	22.3078	22.0201	21.7324	20.2938	20.0060	18.5674	18.5674	18.2797	19.1429	20.0060	20.5815	21.1569 (38)
Heat transfer coeff	82.1083	81.8206	81.5329	80.0943	79.8066	78.3680	78.3680	78.0802	78.9434	79.8066	80.3820	80.9574 (39)
Average = Sum(39)m / 12 =												80.0223

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8829	0.8798	0.8767	0.8612	0.8581	0.8427	0.8427	0.8396	0.8489	0.8581	0.8643	0.8705 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6646 (42)
Hot water usage for mixer showers	88.5099	87.1797	85.2415	81.5330	78.7962	75.7441	74.0094	75.9329	78.0416	81.3185	85.1067	88.1708 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	41.9181	40.3938	38.8695	37.3453	35.8210	34.2967	34.2967	35.8210	37.3453	38.8695	40.3938	41.9181 (42c)
Average daily hot water use (litres/day)												119.7105 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	130.4280	127.5736	124.1110	118.8782	114.6171	110.0408	108.3060	111.7539	115.3868	120.1881	125.5005	130.0889 (44)
Energy content (annual)	206.5661	181.6631	190.7540	162.7383	154.2967	135.3080	130.9867	138.3747	142.2835	163.0941	178.7985	203.6878 (45)
Distribution loss (46)m = 0.15 x (45)m	30.9849	27.2495	28.6131	24.4108	23.1445	20.2962	19.6480	20.7562	21.3425	24.4641	26.8198	30.5532 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200 (48)
Temperature factor from Table 2b												0.7800 (49)
Enter (49) or (54) in (55)												1.4976 (55)
Total storage loss	46.4256	41.9328	46.4256	44.9280	46.4256	44.9280	46.4256	46.4256	44.9280	46.4256	44.9280	46.4256 (56)
If cylinder contains dedicated solar storage	46.4256	41.9328	46.4256	44.9280	46.4256	44.9280	46.4256	46.4256	44.9280	46.4256	44.9280	46.4256 (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	276.2541	244.6071	260.4420	230.1783	223.9847	202.7480	200.6747	208.0627	209.7235	232.7821	246.2385	273.3758 (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	276.2541	244.6071	260.4420	230.1783	223.9847	202.7480	200.6747	208.0627	209.7235	232.7821	246.2385	273.3758 (64)
Total per year (kWh/year)												2809.0715 (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	124.4336	110.7582	119.1761	108.0625	107.0540	98.9419	99.3035	101.7600	101.2613	109.9792	113.4025	123.4766 (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	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.3171	136.5297	123.3171	127.4277	123.3171	127.4277	123.3171	123.3171	127.4277	123.3171	127.4277	123.3171 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.4900	247.0270	240.6338	227.0233	209.8424	193.6949	182.9074	180.3703	186.7636	200.3741	217.5549	233.7024 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230 (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)	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839 (71)
Water heating gains (Table 5)	167.2495	164.8187	160.1829	150.0868	143.8899	137.4193	133.4724	136.7742	140.6406	147.8215	157.5035	165.9632 (72)
Total internal gains	598.0255	611.3443	587.1028	567.5067	540.0184	521.5109	502.6659	503.4306	517.8009	534.4816	565.4550	585.9516 (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	
Southeast				16.6500	36.7938	0.4000		0.7000	0.7700		118.8723 (77)	
Northwest				11.6600	11.2829	0.4000		0.7000	0.7700		25.5277 (81)	
Northwest				2.9600	26.0000	0.4000		0.7000	1.0000		19.3939 (82)	
Solar gains	163.7939	294.7256	442.2748	608.9128	734.3833	751.2324	715.1102	618.6895	499.8409	336.5203	199.1174	138.2414 (83)

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Total gains 761.8194 906.0699 1029.3775 1176.4195 1274.4017 1272.7432 1217.7761 1122.1201 1017.6418 871.0019 764.5724 724.1931 (84)

7. Mean internal temperature (heating season)

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

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	35.9020	36.0282	36.1554	36.8048	36.9374	37.6155	37.6155	37.7541	37.3413	36.9374	36.6730	36.4123	
alpha	3.3935	3.4019	3.4104	3.4537	3.4625	3.5077	3.5077	3.5169	3.4894	3.4625	3.4449	3.4275	
util living area	0.9346	0.8918	0.8235	0.6953	0.5413	0.3848	0.2807	0.3161	0.5054	0.7568	0.8951	0.9426	(86)
MIT	19.5433	19.8734	20.2593	20.6633	20.8833	20.9736	20.9933	20.9900	20.9319	20.6193	20.0371	19.4965	(87)
Th 2	20.1821	20.1847	20.1874	20.2006	20.2032	20.2165	20.2165	20.2192	20.2112	20.2032	20.1979	20.1926	(88)
util rest of house	0.9259	0.8786	0.8034	0.6652	0.5026	0.3403	0.2317	0.2639	0.4550	0.7239	0.8801	0.9349	(89)
MIT 2	18.4846	18.8944	19.3663	19.8505	20.0943	20.1964	20.2127	20.2132	20.1554	19.8146	19.1137	18.4336	(90)
Living area fraction									fLA = Living area / (4) =				
MIT	18.8227	19.2071	19.6515	20.1101	20.3463	20.4446	20.4620	20.4613	20.4034	20.0716	19.4086	18.7731	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8227	19.2071	19.6515	20.1101	20.3463	20.4446	20.4620	20.4613	20.4034	20.0716	19.4086	18.7731	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9082	0.8602	0.7888	0.6617	0.5097	0.3534	0.2471	0.2802	0.4675	0.7181	0.8629	0.9181	(94)
Useful gains	691.9104	779.3897	811.9539	778.3910	649.5936	449.8128	300.9343	314.4237	475.7841	625.4419	659.7546	664.8541	(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	1192.4350	1170.6121	1072.2783	897.8648	690.0292	458.0282	302.6596	317.1040	497.6115	755.8984	989.3909	1179.7967	(97)
Space heating kWh	372.3903	262.9014	193.6813	86.0211	30.0841	0.0000	0.0000	0.0000	0.0000	97.0596	237.3382	383.1173	(98a)
Space heating requirement - total per year (kWh/year)												1662.5934	
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	372.3903	262.9014	193.6813	86.0211	30.0841	0.0000	0.0000	0.0000	0.0000	97.0596	237.3382	383.1173	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1662.5934	
Space heating per m2										(98c) / (4) =		17.8773	(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, %

Space heating:													0.0000 (301)
Space heating requirement	372.3903	262.9014	193.6813	86.0211	30.0841	0.0000	0.0000	0.0000	0.0000	97.0596	237.3382	383.1173	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.00													
307a	372.3903	262.9014	193.6813	86.0211	30.0841	0.0000	0.0000	0.0000	0.0000	97.0596	237.3382	383.1173	
Space heating requirement	372.3903	262.9014	193.6813	86.0211	30.0841	0.0000	0.0000	0.0000	0.0000	97.0596	237.3382	383.1173	(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	276.2541	244.6071	260.4420	230.1783	223.9847	202.7480	200.6747	208.0627	209.7235	232.7821	246.2385	273.3758	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.00													
310a	276.2541	244.6071	260.4420	230.1783	223.9847	202.7480	200.6747	208.0627	209.7235	232.7821	246.2385	273.3758	
Water heating fuel	276.2541	244.6071	260.4420	230.1783	223.9847	202.7480	200.6747	208.0627	209.7235	232.7821	246.2385	273.3758	(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	15.6349	14.1219	15.6349	15.1306	15.6349	15.1306	15.6349	15.6349	15.1306	15.6349	15.1306	15.6349	(331)
Lighting	24.6336	19.7620	17.7935	13.0363	10.0696	8.2269	9.1858	11.9401	15.5090	20.3486	22.9837	25.3183	(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												1662.5934	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2809.0715	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												16.6259	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6490)
mechanical ventilation fans (SFP = 0.6490)

Total electricity for the above, kWh/year	184.0889	(330a)
Electricity for lighting (calculated in Appendix L)	198.8074	(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)

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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	4854.5611 (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			89.5000 (367)
Space and Water heating from Boilers	4996.2736	0.2100	390.1057 (367)
Electrical energy for heat distribution (space & water)	16.6259	0.0000	6.5555 (372)
Overall CO2 factor for heat network			0.2361 (386)
Total CO2 associated with community systems			1055.7729 (373)
Space and water heating			1055.7729 (376)
Pumps, fans and electric keep-hot	184.0889	0.1387	25.5354 (378)
Energy for lighting	198.8074	0.1443	28.6940 (379)
Total CO2, kg/year			1110.0024 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.9400 (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			89.5000 (467a)
Space and Water heating from Boilers	4996.2736	1.1300	2099.1402 (467)
Electrical energy for heat distribution (space & water)	16.6259	0.0000	68.9674 (472)
Overall CO2 factor for heat network			1.2780 (486)
Total CO2 associated with community systems			5714.7566 (473)
Space and water heating			5714.7566 (476)
Pumps, fans and electric keep-hot	184.0889	1.5128	278.4896 (478)
Energy for lighting	198.8074	1.5338	304.9374 (479)
Total Primary energy kWh/year			6298.1836 (483)
Dwelling Primary energy Rate (DPER)			67.7200 (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)
Main dwelling	93.0000 (1b)	x 2.5000 (2b)	= 232.5000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 232.5000 (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) =	Air changes per hour
Pressure test		30.0000 / (5) = 0.1290 (8)
Pressure Test Method		Yes
Measured/design AP50		Blower Door
Infiltration rate		5.0000 (17)
Number of sides sheltered		0.3790 (18)
		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3790 (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	0.4833	0.4738	0.4643	0.4169	0.4075	0.3601	0.3601	0.3506	0.3790	0.4075	0.4264	0.4454 (22b)
Effective ac	0.6168	0.6122	0.6078	0.5869	0.5830	0.5648	0.5648	0.5615	0.5718	0.5830	0.5909	0.5992 (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
Main dwelling							
TER Opening Type			21.0500	1.1450	24.1031		(27)
TER Roof Light			2.2000	1.5918	4.4485		(27a)

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External Wall 1	83.6000	21.0500	62.5500	0.1800	11.2590	(29a)
External Roof 1	93.0000	2.2000	90.8000	0.1100	9.9880	(30)
Total net area of external elements Aum(A, m2)			176.6000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.7986	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 114.1103 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.1000	0.0700	1.1970
E14 Flat roof	38.4700	0.0800	3.0776
E16 Corner (normal)	10.0000	0.0900	0.9000
E18 Party wall between dwellings	10.0700	0.0600	0.6042
R1 Head of roof window	3.2000	0.0800	0.2560
R2 Sill of roof window	3.2000	0.0600	0.1920
R3 Jamb of roof window	3.6000	0.0800	0.2880
P4 Party wall - Roof (insulation at ceiling level)	11.5000	0.1200	1.3800
E2 Other lintels (including other steel lintels)	12.1000	0.0500	0.6050
E3 Sill	12.1000	0.0500	0.6050
E4 Jamb	21.6800	0.0500	1.0840

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1888 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 59.9874 (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	47.3219	46.9740	46.6330	45.0313	44.7316	43.3365	43.3365	43.0782	43.8739	44.7316	45.3378	45.9716 (38)
Average = Sum(39)m / 12 =	107.3093	106.9614	106.6204	105.0186	104.7190	103.3239	103.3239	103.0655	103.8612	104.7190	105.3252	105.9590 (39)
												105.0172

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1539	1.1501	1.1465	1.1292	1.1260	1.1110	1.1110	1.1082	1.1168	1.1260	1.1325	1.1393 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6646 (42)
Hot water usage for mixer showers	88.5099	87.1797	85.2415	81.5330	78.7962	75.7441	74.0094	75.9329	78.0416	81.3185	85.1067	88.1708 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	41.9181	40.3938	38.8695	37.3453	35.8210	34.2967	34.2967	35.8210	37.3453	38.8695	40.3938	41.9181 (42c)
Average daily hot water use (litres/day)												119.7105 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	130.4280	127.5736	124.1110	118.8782	114.6171	110.0408	108.3060	111.7539	115.3868	120.1881	125.5005	130.0889 (44)
Distribution loss (46)m = 0.15 x (45)m	206.5661	181.6631	190.7540	162.7383	154.2967	135.3080	130.9867	138.3747	142.2835	163.0941	178.7985	203.6878 (45)
Water storage loss:										Total = Sum(45)m =		1988.5515
Store volume	30.9849	27.2495	28.6131	24.4108	23.1445	20.2962	19.6480	20.7562	21.3425	24.4641	26.8198	30.5532 (46)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (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	257.4922	227.6608	241.6801	212.0216	205.2228	184.5913	181.9128	189.3007	191.5668	214.0202	228.0818	254.6138 (62)
WWHRS	-40.4630	-35.7858	-37.4729	-31.0290	-28.9179	-24.7453	-23.1947	-24.6653	-25.6024	-30.1824	-34.1930	-39.7137 (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	217.0291	191.8750	204.2072	180.9926	176.3048	159.8460	158.7181	164.6355	165.9644	183.8377	193.8888	214.9001 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2212.1995 (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)
Heat gains from water heating, kWh/month	109.4241	97.2012	104.1666	93.5371	92.0445	84.4165	84.2939	86.7504	86.7359	94.9696	98.8771	108.4670 (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
133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299	133.2299 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
123.3171	136.5297	123.3171	127.4277	123.3171	127.4277	123.3171	123.3171	127.4277	123.3171	127.4277	123.3171	123.3171 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
244.4900	247.0270	240.6338	227.0233	209.8424	193.6949	182.9074	180.3703	186.7636	200.3741	217.5549	233.7024	233.7024 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230	36.3230 (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)												
-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839	-106.5839 (71)
Water heating gains (Table 5)												
147.0754	144.6446	140.0088	129.9127	123.7157	117.2452	113.2983	116.6000	120.4665	127.6474	137.3294	145.7890	145.7890 (72)
Total internal gains	580.8514	594.1702	569.9287	550.3326	522.8443	501.3368	482.4918	483.2564	497.6267	517.3075	548.2809	568.7775 (73)

6. Solar gains

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[Jan]			Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
Southeast			12.3800	36.7938	0.6300		0.7000		0.7700	139.2091 (77)
Northwest			8.6700	11.2829	0.6300		0.7000		0.7700	29.8960 (81)
Northwest			2.2000	26.0000	0.6300		0.7000		1.0000	22.7027 (82)

Solar gains	191.8077	345.1304	517.9093	713.0392	859.9626	879.6919	837.3932	724.4865	585.3180	394.0717	233.1722	161.8853 (83)
Total gains	772.6592	939.3007	1087.8380	1263.3718	1382.8068	1381.0286	1319.8850	1207.7429	1082.9448	911.3792	781.4531	730.6628 (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	27.4706	27.5599	27.6481	28.0698	28.1501	28.5302	28.5302	28.6017	28.3826	28.1501	27.9881	27.8207
alpha	2.8314	2.8373	2.8432	2.8713	2.8767	2.9020	2.9020	2.9068	2.8922	2.8767	2.8659	2.8547
util living area	0.9453	0.9098	0.8528	0.7438	0.6020	0.4476	0.3340	0.3764	0.5769	0.8040	0.9154	0.9521 (86)
MIT	18.8568	19.2467	19.7489	20.3266	20.7121	20.9118	20.9719	20.9600	20.8123	20.2742	19.4783	18.8006 (87)
Th 2	19.9571	19.9601	19.9631	19.9770	19.9796	19.9919	19.9919	19.9941	19.9871	19.9796	19.9744	19.9688 (88)
util rest of house	0.9369	0.8967	0.8321	0.7103	0.5540	0.3856	0.2613	0.2998	0.5119	0.7691	0.9009	0.9447 (89)
MIT 2	17.4801	17.9669	18.5862	19.2829	19.7157	19.9274	19.9774	19.9722	19.8374	19.2446	18.2740	17.4169 (90)
Living area fraction	17.9198	18.3756	18.9575	19.6162	20.0339	20.2417	20.2950	20.2876	FLA = Living area / (4) =			0.3194 (91)
MIT	17.9198	18.3756	18.9575	19.6162	20.0339	20.2417	20.2950	20.2876	20.1487	19.5734	18.6586	17.8588 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9198	18.3756	18.9575	19.6162	20.0339	20.2417	20.2950	20.2876	20.1487	19.5734	18.6586	17.8588 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9151	0.8719	0.8085	0.6974	0.5567	0.4014	0.2836	0.3227	0.5228	0.7533	0.8774	0.9242 (94)
Useful gains	707.0359	818.9490	879.5199	881.0780	769.7800	554.3718	374.3038	389.6977	566.1626	686.5277	685.6434	675.2755 (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	1461.5267	1441.3718	1328.2232	1125.4019	872.7201	582.9262	381.7785	400.6813	628.2285	939.6864	1217.4098	1447.2702 (97)
Space heating kWh	561.3412	418.2681	333.8353	175.9132	76.5874	0.0000	0.0000	0.0000	0.0000	188.3501	382.8718	574.3641 (98a)
Space heating requirement - total per year (kWh/year)												2711.5311
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	561.3412	418.2681	333.8353	175.9132	76.5874	0.0000	0.0000	0.0000	0.0000	188.3501	382.8718	574.3641 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2711.5311
Space heating per m2										(98c) / (4) =		29.1562 (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	561.3412	418.2681	333.8353	175.9132	76.5874	0.0000	0.0000	0.0000	0.0000	188.3501	382.8718	574.3641 (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)	608.1703	453.1615	361.6850	190.5885	82.9766	0.0000	0.0000	0.0000	0.0000	204.0629	414.8123	622.2796 (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	217.0291	191.8750	204.2072	180.9926	176.3048	159.8460	158.7181	164.6355	165.9644	183.8377	193.8888	214.9001 (64)
Efficiency of water heater (217)m	86.0927	85.7584	85.1549	83.9960	82.3269	79.8000	79.8000	79.8000	79.8000	84.1142	85.5562	79.8000 (216)
Fuel for water heating, kWh/month	252.0878	223.7390	239.8067	215.4777	214.1521	200.3083	198.8948	206.3101	207.9754	218.5573	226.6215	249.4362 (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	25.6229	20.5556	18.5080	13.5598	10.4740	8.5573	9.5547	12.4196	16.1318	21.1658	23.9067	26.3350 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-31.1292	-45.0374	-66.4116	-76.6558	-84.3487	-79.3176	-78.3151	-73.0849	-64.1622	-52.3574	-34.6191	-26.7780 (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	-14.2609	-30.3250	-60.8865	-92.3572	-123.0210	-123.9597	-122.5305	-103.3603	-75.2319	-43.7016	-19.1459	-11.2553 (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												2937.7368 (211)

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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	2653.3668	(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)	206.7912	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1532.2527	(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	4351.6422	(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	2937.7368	0.2100	616.9247 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2653.3668	0.2100	557.2070 (264)
Space and water heating			1174.1318 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	206.7912	0.1443	29.8464 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-712.2168	0.1341	-95.4741
PV Unit electricity exported	-820.0359	0.1256	-102.9967
Total			-198.4708 (269)
Total CO2, kg/year			1017.4366 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9400 (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	2937.7368	1.1300	3319.6426 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2653.3668	1.1300	2998.3045 (278)
Space and water heating			6317.9471 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	206.7912	1.5338	317.1832 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-712.2168	1.4954	-1065.0515
PV Unit electricity exported	-820.0359	0.4610	-378.0570
Total			-1443.1085 (283)
Total Primary energy kWh/year			5322.1227 (286)
Target Primary Energy Rate (TPER)			57.2300 (287)