

Full SAP Calculation Printout



Plot Reference	UNIT 08				Issued on Date	08/07/2026	
Assessment Reference	001			Plot Type Ref	UNIT 08		
Plot Address	UNIT 08, Stoney Wood Quarter, 34 The Fairway, LONDON, NW7 3HS				SAP Version	10.2	
SAP Rating	83 B	DER	3.38	TER	12.72		
Environmental	97 A	% DER < TER				73.43	
CO ₂ Emissions (t/year)	0.27	DFEE	35.28	TFEE	35.77		
Compliance Check	See BREL	% DFEE < TFEE				1.38	
% DPER < TPER	46.64	DPER	36.07	TPER	67.59		
Assessor Details	Mr. Ondrej Gajdos				Assessor ID	W452-0001	
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	35.5000 (1b)	x 2.5000 (2b)	= 88.7500 (1b) - (3b)
First floor	32.0000 (1c)	x 2.8000 (2c)	= 89.6000 (1c) - (3c)
Second floor	23.8000 (1d)	x 2.6500 (2d)	= 63.0700 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 241.4200 (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	4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1050 (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	0.1339	0.1313	0.1286	0.1155	0.1129	0.0997	0.0997	0.0971	0.1050	0.1129	0.1181	0.1234 (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) =												81.0000 (23c)
Effective ac	0.2289	0.2262	0.2236	0.2105	0.2079	0.1947	0.1947	0.1921	0.2000	0.2079	0.2131	0.2184 (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							
dl			2.9000	1.0000	2.9000		(26)
1			46.2200	0.7940	36.6967		(27)
exposed wall	93.7400	49.1200	44.6200	0.1500	6.6930	60.0000	2677.1999 (29a)
terraces	9.0000		9.0000	0.1000	0.9000	9.0000	81.0000 (30)
flat roof	16.0000		16.0000	0.1000	1.6000	9.0000	144.0000 (30)
pitched rafters	8.7000		8.7000	0.1000	0.8700	9.0000	78.3000 (30)
oval roof	1.2000		1.2000	0.1000	0.1200	9.0000	10.8000 (30)
Total net area of external elements Aum(A, m ²)			128.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.7797		(33)
Main dwelling							
pw			93.1050	0.0000	0.0000	110.0000	10241.5504 (32)
pf			35.5000			40.0000	1420.0000 (32d)
iw			101.8400			9.0000	916.5600 (32c)

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if	54.2000	18.0000	975.6000 (32d)
ic	54.2000	9.0000	487.8000 (32e)
Heat capacity Cm = Sum(A x k)			
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K			
(28)...(30) + (32) + (32a)...(32e) = 17032.8102 (34)			
List of Thermal Bridges			
186.5587 (35)			
K1 Element			
E2 Other lintels (including other steel lintels)			
E3 Sill			
E4 Jamb			
E6 Intermediate floor within a dwelling			
E7 Party floor between dwellings (in blocks of flats)			
E24 Eaves (insulation at ceiling level - inverted)			
E11 Eaves (insulation at rafter level)			
E13 Gable (insulation at rafter level)			
E14 Flat roof			
E16 Corner (normal)			
E17 Corner (inverted - internal area greater than external area)			
E18 Party wall between dwellings			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			
Point Thermal bridges			
Total fabric heat loss			
(33) + (36) + (36a) = 64.0497 (37)			
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)			
(38)m			
Heat transfer coeff			
Average = Sum(39)m / 12 = 80.7677			
HLP			
HLP (average)			
Days in month			

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6431 (42)
Hot water usage for mixer showers												
Hot water usage for baths												
Hot water usage for other uses												
Average daily hot water use (litres/day)												
Daily hot water use												
Energy conte												
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss (or HIU 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												
If cylinder contains dedicated solar storage												
Primary loss												
Combi loss												
Total heat required for water heating calculated for each month												
WWHRS												
PV diverter												
Solar input												
FGHRS												
Output from w/h												
12Total per year (kWh/year)												
Electric shower(s)												
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												

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

Metabolic gains (Table 5), Watts												
(66)m												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans												
Losses e.g. evaporation (negative values) (Table 5)												
Water heating gains (Table 5)												
Total internal gains												

6. Solar gains

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[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	
Northeast				26.7000	11.2829	0.5300		0.7000		0.7700	77.4534 (75)		
East				2.0000	19.6403	0.5300		0.7000		0.7700	10.0991 (76)		
Southeast				15.9200	36.7938	0.5300		0.7000		0.7700	150.6001 (77)		
Southwest				0.7500	36.7938	0.5300		0.7000		0.7700	7.0949 (79)		
Northwest				0.8500	11.2829	0.5300		0.7000		0.7700	2.4657 (81)		
Solar gains	247.7133	451.0467	693.1569	984.1797	1215.2426	1255.7028	1190.1664	1010.5209	792.9341	519.1218	302.0336	208.5251 (83)	
Total gains	832.0003	1048.3339	1266.1631	1537.0231	1740.4558	1762.1262	1677.6375	1498.9893	1295.8824	1039.1109	853.3842	780.7803 (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	57.5001	57.6467	57.7939	58.5417	58.6935	59.4649	59.4649	59.6216	59.1539	58.6935	58.3906	58.0907	
alpha	4.8333	4.8431	4.8529	4.9028	4.9129	4.9643	4.9643	4.9748	4.9436	4.9129	4.8927	4.8727	
util living area	0.9631	0.9092	0.8013	0.6092	0.4268	0.2885	0.2086	0.2434	0.4223	0.7313	0.9226	0.9710 (86)	
MIT	20.1081	20.4262	20.7312	20.9349	20.9893	20.9988	20.9998	20.9996	20.9927	20.8773	20.4704	20.0479 (87)	
Th 2	20.1664	20.1684	20.1703	20.1801	20.1820	20.1918	20.1918	20.1938	20.1879	20.1820	20.1781	20.1742 (88)	
util rest of house	0.9557	0.8936	0.7743	0.5736	0.3904	0.2523	0.1703	0.2008	0.3739	0.6896	0.9064	0.9650 (89)	
MIT 2	19.1467	19.5361	19.8928	20.1199	20.1735	20.1911	20.1917	20.1936	20.1831	20.0700	19.6044	19.0778 (90)	
Living area fraction	19.4205	19.7896	20.1315	20.3520	20.4058	20.4211	20.4219	20.4231	fLA = Living area / (4) =	20.2999	19.8510	0.2848 (91)	
MIT	19.4205	19.7896	20.1315	20.3520	20.4058	20.4211	20.4219	20.4231	20.4136	20.2999	19.8510	19.3540 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.4205	19.7896	20.1315	20.3520	20.4058	20.4211	20.4219	20.4231	20.4136	20.2999	19.8510	19.3540 (93)	
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9476	0.8857	0.7729	0.5812	0.4004	0.2626	0.1812	0.2129	0.3874	0.6959	0.8990	0.9577 (94)	
Useful gains	788.4175	928.4958	978.6625	893.3062	696.9318	462.7086	304.0357	319.1462	502.0528	723.1079	767.1638	747.7312 (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	1244.1708	1222.0577	1115.9550	925.5483	701.7859	463.1580	304.0875	319.2608	504.9843	781.9160	1033.2020	1234.2569 (97)	
Space heating kWh	339.0804	197.2736	102.1456	23.2143	3.6115	0.0000	0.0000	0.0000	0.0000	43.7532	191.5475	361.9751 (98a)	
Space heating requirement - total per year (kWh/year)												1262.6012	
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	339.0804	197.2736	102.1456	23.2143	3.6115	0.0000	0.0000	0.0000	0.0000	43.7532	191.5475	361.9751 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1262.6012	
Space heating per m2										(98c) / (4) =		13.8291 (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												1.5000 (306)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
Space heating:													
Space heating requirement													
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	508.6206	295.9103	153.2184	34.8215	5.4172	0.0000	0.0000	0.0000	0.0000	65.6298	287.3213	542.9627	
Space heating requirement	508.6206	295.9103	153.2184	34.8215	5.4172	0.0000	0.0000	0.0000	0.0000	65.6298	287.3213	542.9627 (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													
	276.7329	244.7913	260.0122	228.2794	221.1123	199.0329	196.1811	204.0188	206.3303	230.3458	245.2946	273.6485 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	415.0993	367.1870	390.0184	342.4190	331.6685	298.5493	294.2717	306.0282	309.4954	345.5188	367.9419	410.4728	
Water heating fuel	415.0993	367.1870	390.0184	342.4190	331.6685	298.5493	294.2717	306.0282	309.4954	345.5188	367.9419	410.4728 (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	17.3355	15.6578	17.3355	16.7762	17.3355	16.7762	17.3355	17.3355	16.7762	17.3355	16.7762	17.3355 (331)	
Lighting	25.3042	20.3000	18.2779	13.3911	10.3437	8.4509	9.4359	12.2651	15.9312	20.9025	23.6094	26.0075 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-3.8722	-6.9034	-12.7994	-18.1122	-22.7370	-22.4577	-21.9794	-18.8626	-14.1187	-9.0242	-4.6572	-3.1585 (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	-0.4608	-1.2251	-3.1995	-6.0798	-9.2609	-9.7983	-9.5186	-7.3024	-4.4285	-1.9751	-0.6650	-0.3413 (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												1893.9017 (307)	
Space heating fuel - secondary												0.0000 (309)	
Water heating fuel - community heating												4178.6704 (310)	

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Efficiency of water heater	0.0000 (311)
Electricity used for heat distribution	18.9390 (313)
Space cooling fuel	0.0000 (321)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6930)	
mechanical ventilation fans (SFP = 0.6930)	204.1110 (330a)
Total electricity for the above, kWh/year	204.1110 (331)
Electricity for lighting (calculated in Appendix L)	204.2192 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-212.9380 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	6267.9643 (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			330.0000 (367)
Space and Water heating from Heat pump	1840.1734	0.1585	90.9703 (367)
Electrical energy for heat distribution (space & water)	18.9390	0.0000	8.8901 (372)
Overall CO2 factor for heat network			0.0458 (386)
Total CO2 associated with community systems			278.2878 (373)
Space and water heating			278.2878 (376)
Pumps, fans and electric keep-hot	204.1110	0.1387	28.3127 (378)
Energy for lighting	204.2192	0.1443	29.4751 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-158.6826	0.1305	-20.7005
PV Unit electricity exported	-54.2554	0.1206	-6.5407
Total			-27.2411 (380)
Total CO2, kg/year			308.8346 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3800 (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			330.0000 (467a)
Space and Water heating from Heat pump	1840.1734	1.5867	910.6182 (467)
Electrical energy for heat distribution (space & water)	18.9390	0.0000	93.6092 (472)
Overall CO2 factor for heat network			0.4825 (486)
Total CO2 associated with community systems			2930.2518 (473)
Space and water heating			2930.2518 (476)
Pumps, fans and electric keep-hot	204.1110	1.5128	308.7790 (478)
Energy for lighting	204.2192	1.5338	313.2383 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-158.6826	1.4819	-235.1495
PV Unit electricity exported	-54.2554	0.4422	-23.9935
Total			-259.1429 (480)
Total Primary energy kWh/year			3293.1261 (483)
Dwelling Primary energy Rate (DPER)			36.0700 (484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	35.5000 (1b)	x 2.5000 (2b)	= 88.7500 (1b) - (3b)
First floor	32.0000 (1c)	x 2.8000 (2c)	= 89.6000 (1c) - (3c)
Second floor	23.8000 (1d)	x 2.6500 (2d)	= 63.0700 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	241.4200 (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	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) = 0.1243 (8)
Pressure test	Yes

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Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Blower Door
5.0000 (17)
0.3743 (18)
4 (19)

Shelter factor

Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.7000 (20)$$
$$(21) = (18) \times (20) = 0.2620 (21)$$

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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													
	0.3340	0.3275	0.3209	0.2882	0.2816	0.2489	0.2489	0.2423	0.2620	0.2816	0.2947	0.3078	(22b)
Effective ac	0.5558	0.5536	0.5515	0.5415	0.5397	0.5310	0.5310	0.5294	0.5343	0.5397	0.5434	0.5474	(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 Opaque door			2.9000	1.0000	2.9000			(26)
TER Opening Type			19.9100	1.1450	22.7977			(27)
exposed wall	93.7400	22.8100	70.9300	0.1800	12.7674			(29a)
terraces	9.0000		9.0000	0.1100	0.9900			(30)
flat roof	16.0000		16.0000	0.1100	1.7600			(30)
pitched rafters	8.7000		8.7000	0.1100	0.9570			(30)
oval roof	1.2000		1.2000	0.1100	0.1320			(30)
Total net area of external elements Aum(A, m2)			128.6400					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	42.3041		(33)
Main dwelling								
pw			93.1050	0.0000	0.0000			(32)

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

186.5587 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	22.2400	0.0500	1.1120	
E2 Other lintels (including other steel lintels)	21.2400	0.0500	1.0620	
E3 Sill	76.5000	0.0500	3.8250	
E4 Jamb	8.0000	0.0000	0.0000	
E6 Intermediate floor within a dwelling	13.2000	0.0700	0.9240	
E7 Party floor between dwellings (in blocks of flats)	10.3000	0.2400	2.4720	
E24 Eaves (insulation at ceiling level - inverted)	6.3000	0.0400	0.2520	
E11 Eaves (insulation at rafter level)	2.0000	0.0800	0.1600	
E13 Gable (insulation at rafter level)	14.9000	0.0800	1.1920	
E14 Flat roof	23.0000	0.0900	2.0700	
E16 Corner (normal)	10.3000	-0.0900	-0.9270	
E17 Corner (inverted - internal area greater than external area)	15.6000	0.0600	0.9360	
E18 Party wall between dwellings				

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

Point Thermal bridges

Total fabric heat loss

$$(36a) = 0.0000$$
$$(33) + (36) + (36a) = 55.3821 (37)$$

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	
	44.2789	44.1063	43.9371	43.1425	42.9939	42.3018	42.3018	42.1736	42.5684	42.9939	43.2946	43.6090	(38)
Heat transfer coeff	99.6610	99.4884	99.3192	98.5246	98.3760	97.6839	97.6839	97.5558	97.9505	98.3760	98.6767	98.9911	(39)
Average = Sum(39)m / 12 =												98.5239	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.0916	1.0897	1.0878	1.0791	1.0775	1.0699	1.0699	1.0685	1.0728	1.0775	1.0808	1.0842	(40)
HLP (average)												1.0791	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6431 (42)
Hot water usage for mixer showers	68.5358	67.5059	66.0050	63.1334	61.0142	58.6509	57.3077	58.7971	60.4299	62.9674	65.9007	68.2733	(42a)
Hot water usage for baths	29.5959	29.1563	28.5374	27.3961	26.5416	25.5940	25.0821	25.6968	26.3660	27.3799	28.5447	29.4958	(42b)
Hot water usage for other uses	41.6980	40.1817	38.6654	37.1491	35.6328	34.1165	34.1165	35.6328	37.1491	38.6654	40.1817	41.6980	(42c)
Average daily hot water use (litres/day)												128.5351	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	139.8297	136.8439	133.2078	127.6786	123.1886	118.3615	116.5063	120.1268	123.9450	129.0127	134.6271	139.4671	(44)
Energy conte	221.4561	194.8639	204.7354	174.7857	165.8355	145.5392	140.9043	148.7420	152.8366	175.0690	191.8009	218.3717	(45)
Energy content (annual)										Total = Sum(45)m =		2134.9405	
Distribution loss (46)m = 0.15 x (45)m	33.2184	29.2296	30.7103	26.2179	24.8753	21.8309	21.1356	22.3113	22.9255	26.2604	28.7701	32.7558	(46)
Water storage loss (or HIU loss):													
Total storage 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	(56)
If cylinder contains dedicated solar storage													
Primary 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	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	272.4150	240.8913	255.6943	224.1007	216.7945	194.8543	191.8632	199.7009	202.1517	226.0279	241.1160	269.3306	(62)
WWHRS	-31.3317	-27.7100	-29.0164	-24.0267	-22.3920	-19.1610	-17.9604	-19.0991	-19.8247	-23.3711	-26.4767	-30.7515	(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	(64a)
Output from w/h	241.0833	213.1813	226.6780	200.0741	194.4024	175.6933	173.9028	180.6018	182.3270	202.6568	214.6393	238.5791	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2443.8192	(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	86.3739	76.2991	80.8143	70.4450	67.8800	60.7206	59.5904	62.1964	63.1469	70.9502	76.1026	85.3483	(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	132.1550	132.1550	132.1550	132.1550	132.1550	132.1550	132.1550	132.1550	132.1550	132.1550	132.1550	132.1550 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.8636	134.9204	121.8636	125.9257	121.8636	125.9257	121.8636	121.8636	125.9257	121.8636	125.9257	121.8636 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.4492	243.9546	237.6409	224.1997	207.2326	191.2859	180.6325	178.1270	184.4407	197.8820	214.8491	230.7958 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2155	36.2155	36.2155	36.2155	36.2155	36.2155	36.2155	36.2155	36.2155	36.2155	36.2155	36.2155 (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)	-105.7240	-105.7240	-105.7240	-105.7240	-105.7240	-105.7240	-105.7240	-105.7240	-105.7240	-105.7240	-105.7240	-105.7240 (71)
Water heating gains (Table 5)	116.0939	113.5403	108.6213	97.8403	91.2366	84.3341	80.0946	83.5974	87.7041	95.3631	105.6980	114.7155 (72)
Total internal gains	545.0531	558.0619	533.7723	513.6122	485.9793	464.1922	445.2372	446.2344	460.7170	480.7552	512.1193	533.0213 (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
Northeast					11.5000	11.2829	0.6300	0.7000			0.7700	39.6545 (75)
East					0.8600	19.6403	0.6300	0.7000			0.7700	5.1620 (76)
Southeast					6.8600	36.7938	0.6300	0.7000			0.7700	77.1385 (77)
Southwest					0.3200	36.7938	0.6300	0.7000			0.7700	3.5983 (79)
Northwest					0.3700	11.2829	0.6300	0.7000			0.7700	1.2758 (81)
Solar gains	126.8290	230.9373	354.9038	503.9203	622.2384	642.9591	609.4008	517.4109	405.9939	265.7933	154.6413	106.7646 (83)
Total gains	671.8822	788.9992	888.6761	1017.5325	1108.2176	1107.1513	1054.6380	963.6454	866.7109	746.5485	666.7606	639.7859 (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	47.4743	47.5567	47.6377	48.0219	48.0944	48.4352	48.4352	48.4988	48.3033	48.0944	47.9478	47.7955
alpha	4.1650	4.1704	4.1758	4.2015	4.2063	4.2290	4.2290	4.2333	4.2202	4.2063	4.1965	4.1864
util living area	0.9862	0.9728	0.9444	0.8658	0.7237	0.5416	0.4021	0.4557	0.6971	0.9109	0.9745	0.9886 (86)
MIT	19.5089	19.7577	20.1048	20.5355	20.8315	20.9618	20.9914	20.9856	20.8929	20.4877	19.9228	19.4634 (87)
Th 2	20.0077	20.0093	20.0108	20.0179	20.0192	20.0255	20.0255	20.0266	20.0231	20.0192	20.0165	20.0137 (88)
util rest of house	0.9829	0.9665	0.9315	0.8363	0.6705	0.4674	0.3156	0.3638	0.6230	0.8840	0.9674	0.9859 (89)
MIT 2	18.2790	18.5939	19.0279	19.5497	19.8749	20.0014	20.0220	20.0204	19.9460	19.5083	18.8111	18.2254 (90)
Living area fraction	18.6292	18.9253	19.3346	19.8304	20.1473	20.2749	20.2981	20.2953	20.2156	19.7872	19.1277	18.5779 (92)
MIT	18.6292	18.9253	19.3346	19.8304	20.1473	20.2749	20.2981	20.2953	20.2156	19.7872	19.1277	18.5779 (93)
Temperature adjustment												0.0000
adjusted MIT	18.6292	18.9253	19.3346	19.8304	20.1473	20.2749	20.2981	20.2953	20.2156	19.7872	19.1277	18.5779 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9766	0.9575	0.9206	0.8299	0.6779	0.4869	0.3401	0.3897	0.6386	0.8765	0.9590	0.9803 (94)
Useful gains	656.1688	755.4348	818.1017	844.4875	751.2590	539.0906	358.6759	375.4922	553.4881	654.3281	639.4084	627.1980 (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	1428.0657	1395.3589	1274.7202	1076.9161	831.0090	554.3476	361.2434	380.0066	599.0272	903.7971	1186.8510	1423.2875 (97)
Space heating kWh	574.2913	430.0289	339.7241	167.3486	59.3339	0.0000	0.0000	0.0000	0.0000	185.6049	394.1587	592.2906 (98a)
Space heating requirement - total per year (kWh/year)												2742.7812
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	574.2913	430.0289	339.7241	167.3486	59.3339	0.0000	0.0000	0.0000	0.0000	185.6049	394.1587	592.2906 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2742.7812
Space heating per m ²										(98c) / (4) =		30.0414 (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 %)												92.4000 (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	574.2913	430.0289	339.7241	167.3486	59.3339	0.0000	0.0000	0.0000	0.0000	185.6049	394.1587	592.2906 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	621.5274	465.3993	367.6668	181.1132	64.2142	0.0000	0.0000	0.0000	0.0000	200.8711	426.5787	641.0072 (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)

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Water heating													
Water heating requirement	241.0833	213.1813	226.6780	200.0741	194.4024	175.6933	173.9028	180.6018	182.3270	202.6568	214.6393	238.5791	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.1713	85.8526	85.2462	84.0012	82.1585	80.3000	80.3000	80.3000	80.3000	84.1935	85.6654	86.2477	(217)
Fuel for water heating, kWh/month	279.7721	248.3109	265.9097	238.1801	236.6187	218.7961	216.5664	224.9089	227.0573	240.7036	250.5555	276.6210	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	25.3208	20.3133	18.2899	13.4000	10.3505	8.4565	9.4421	12.2732	15.9416	20.9163	23.6249	26.0246	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.0159	-29.9004	-45.5053	-54.2626	-61.2404	-58.1485	-57.4238	-52.8415	-45.2655	-35.5133	-22.5890	-17.1134	(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	-6.7203	-14.4905	-29.4774	-45.2914	-60.9070	-61.5884	-60.8807	-51.0904	-36.8421	-21.0685	-9.0803	-5.2894	(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												2968.3779	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2924.0003	(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)												204.3537	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-902.5462	(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												5280.1856	(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	2968.3779	0.2100	623.3594	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2924.0003	0.2100	614.0401	(264)
Space and water heating			1237.3994	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	204.3537	0.1443	29.4946	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-499.8196	0.1334	-66.6750	
PV Unit electricity exported	-402.7267	0.1252	-50.4330	
Total			-117.1080	(269)
Total CO2, kg/year			1161.7152	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7200	(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	2968.3779	1.1300	3354.2670	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2924.0003	1.1300	3304.1203	(278)
Space and water heating			6658.3873	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	204.3537	1.5338	313.4446	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-499.8196	1.4929	-746.2052	
PV Unit electricity exported	-402.7267	0.4596	-185.1106	
Total			-931.3158	(283)
Total Primary energy kWh/year			6170.6169	(286)
Target Primary Energy Rate (TPER)			67.5900	(287)