

Full SAP Calculation Printout



Plot Reference	UNIT 09			Issued on Date	08/07/2026
Assessment Reference	001	Plot Type Ref	UNIT 09		
Plot Address	UNIT 09, Stoney Wood Quarter, 34 The Fairway, LONDON, NW7 3HS			SAP Version	10.2
SAP Rating	85 B	DER	13.35	TER	13.85
Environmental	90 B	% DER < TER			3.61
CO ₂ Emissions (t/year)	0.7	DFEE	27.60	TFEE	27.34
Compliance Check	See BREL	% DFEE < TFEE			-0.94
% DPER < TPER	-1.94	DPER	75.90	TPER	74.45
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	55.0000 (1b)	2.5000 (2b)	137.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	137.5000 (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	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)
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 infiltr 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			3.4300	1.0000	3.4300		(26)
l			24.3100	0.7940	19.3011		(27)
exposed wall	37.2500	27.7400	9.5100	0.1500	1.4265	60.0000	570.6000 (29a)
Total net area of external elements A _{um} (A _m , m ²)			37.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.1576		(33)
Main dwelling							
pw			46.5000	0.0000	0.0000	110.0000	5115.0000 (32)
pf			55.0000			40.0000	2200.0000 (32d)
pc			55.0000			30.0000	1650.0000 (32b)
iw			121.0000			9.0000	1089.0000 (32c)

Heat capacity C _m = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10624.6000 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K		193.1745 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			

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E2 Other lintels (including other steel lintels)	11.0900	0.0500	0.5545	
E3 Sill	9.7200	0.0500	0.4860	
E4 Jamb	40.0000	0.0500	2.0000	
E7 Party floor between dwellings (in blocks of flats)	3.5000	0.0700	0.2450	
E24 Eaves (insulation at ceiling level - inverted)	9.0000	0.0800	0.7200	
E16 Corner (normal)	10.0000	0.0900	0.9000	
E17 Corner (inverted - internal area greater than external area)	7.5000	-0.0900	-0.6750	
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				4.3805 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		28.5381 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 10.3852	Feb 10.2661	Mar 10.1470	Apr 9.5514	May 9.4323	Jun 8.8368	Jul 8.8368	Aug 8.7177	Sep 9.0750	Oct 9.4323	Nov 9.6705	Dec 9.9088 (38)
Heat transfer coeff	38.9233	38.8042	38.6851	38.0896	37.9705	37.3749	37.3749	37.2558	37.6131	37.9705	38.2087	38.4469 (39)
Average = Sum(39)m / 12 =												38.0598
HLP	Jan 0.7077	Feb 0.7055	Mar 0.7034	Apr 0.6925	May 0.6904	Jun 0.6795	Jul 0.6795	Aug 0.6774	Sep 0.6839	Oct 0.6904	Nov 0.6947	Dec 0.6990 (40)
HLP (average)												0.6920
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.8374 (42)
Hot water usage for mixer showers	55.0260	54.1991	52.9941	50.6885	48.9871	47.0896	46.0111	47.2070	48.5179	50.5552	52.9103	54.8152 (42a)
Hot water usage for baths	23.7862	23.4330	22.9355	22.0183	21.3314	20.5699	20.1585	20.6525	21.1904	22.0053	22.9414	23.7058 (42b)
Hot water usage for other uses	33.4464	32.2302	31.0139	29.7977	28.5815	27.3652	27.3652	28.5815	29.7977	31.0139	32.2302	33.4464 (42c)
Average daily hot water use (litres/day)												103.1915 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	112.2586	109.8622	106.9435	102.5045	98.9000	95.0247	93.5349	96.4410	99.5060	103.5744	108.0818	111.9674 (44)
Energy content (annual)	177.7902	156.4423	164.3682	140.3235	133.1384	116.8440	113.1223	119.4141	122.7008	140.5495	153.9824	175.3139 (45)
Distribution loss (46)m = 0.15 x (45)m	26.6685	23.4663	24.6552	21.0485	19.9708	17.5266	16.9684	17.9121	18.4051	21.0824	23.0974	26.2971 (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	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)
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 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.3983	46.8615	47.6644	49.1453	49.0714	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	228.7491	202.4697	215.3271	189.6386	183.5367	163.7055	160.7867	168.5594	171.7723	191.5084	203.2974	226.2728 (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	228.7491	202.4697	215.3271	189.6386	183.5367	163.7055	160.7867	168.5594	171.7723	191.5084	203.2974	226.2728 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2305.6236 (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	71.8550	63.5239	67.3921	58.9863	56.8681	50.5660	49.5293	51.9915	53.0659	59.4724	63.5279	71.0316 (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	91.8680	91.8680	91.8680	91.8680	91.8680	91.8680	91.8680	91.8680	91.8680	91.8680	91.8680	91.8680 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.7953	89.4519	80.7953	83.4884	80.7953	83.4884	80.7953	80.7953	83.4884	80.7953	83.4884	80.7953 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.1856	161.8479	157.6591	148.7417	137.4852	126.9056	119.8378	118.1755	122.3643	131.2817	142.5382	153.1178 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1868	32.1868	32.1868	32.1868	32.1868	32.1868	32.1868	32.1868	32.1868	32.1868	32.1868	32.1868 (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)	-73.4944	-73.4944	-73.4944	-73.4944	-73.4944	-73.4944	-73.4944	-73.4944	-73.4944	-73.4944	-73.4944	-73.4944 (71)
Water heating gains (Table 5)	96.5793	94.5296	90.5808	81.9255	76.4356	70.2306	66.5716	69.8810	73.7026	79.9361	88.2332	95.4726 (72)
Total internal gains	391.1205	399.3898	382.5956	367.7160	348.2764	331.1850	317.7650	319.4122	330.1157	345.5734	367.8203	382.9460 (73)

6. Solar gains												
[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d				Gains W
North			2.0000	10.6334	0.5300	0.7000		0.7700				5.4678 (74)
Northeast			18.2300	11.2829	0.5300	0.7000		0.7700				52.8830 (75)
East			4.0800	19.6403	0.5300	0.7000		0.7700				20.6022 (76)
Solar gains	78.9530	158.3964	278.0698	443.8284	585.1888	619.0099	581.0061	470.1794	334.8629	191.8111	98.9743	64.6874 (83)
Total gains	470.0735	557.7862	660.6654	811.5444	933.4653	950.1948	898.7711	789.5917	664.9787	537.3845	466.7945	447.6334 (84)

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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	75.8229	76.0556	76.2898	77.4826	77.7256	78.9642	78.9642	79.2166	78.4640	77.7256	77.2410	76.7625
alpha	6.0549	6.0704	6.0860	6.1655	6.1817	6.2643	6.2643	6.2811	6.2309	6.1817	6.1494	6.1175
util living area	0.9567	0.9023	0.7801	0.5603	0.3777	0.2517	0.1830	0.2170	0.3896	0.7023	0.9091	0.9648 (86)
MIT	20.4723	20.6799	20.8798	20.9836	20.9986	20.9999	21.0000	21.0000	20.9988	20.9537	20.7179	20.4349 (87)
Th 2	20.3340	20.3359	20.3379	20.3474	20.3493	20.3589	20.3589	20.3609	20.3551	20.3493	20.3455	20.3417 (88)
util rest of house	0.9487	0.8872	0.7551	0.5318	0.3515	0.2265	0.1563	0.1869	0.3535	0.6659	0.8924	0.9581 (89)
MIT 2	19.7318	19.9839	20.2146	20.3324	20.3482	20.3589	20.3589	20.3608	20.3543	20.3074	20.0418	19.6922 (90)
Living area fraction									fLA = Living area / (4) =			0.2964 (91)
MIT	19.9512	20.1901	20.4117	20.5254	20.5410	20.5489	20.5489	20.5503	20.5453	20.4989	20.2422	19.9123 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.8012	20.0401	20.2617	20.3754	20.3910	20.3989	20.3989	20.4003	20.3953	20.3489	20.0922	19.7623 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9412	0.8798	0.7521	0.5331	0.3532	0.2281	0.1580	0.1887	0.3557	0.6659	0.8851	0.9511 (94)
Useful gains	442.4128	490.7630	496.9104	432.5957	329.6545	216.7161	141.9831	149.0295	236.5412	357.8229	413.1808	425.7522 (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	603.3588	587.5007	532.3734	437.0928	329.9995	216.7320	141.9843	149.0329	236.7862	370.1717	496.4149	598.3222 (97)
Space heating kWh	119.7438	65.0077	26.3845	3.2379	0.2566	0.0000	0.0000	0.0000	0.0000	9.1875	59.9285	128.3920 (98a)
Space heating requirement - total per year (kWh/year)												412.1387
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	119.7438	65.0077	26.3845	3.2379	0.2566	0.0000	0.0000	0.0000	0.0000	9.1875	59.9285	128.3920 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												412.1387
Space heating per m2										(98c) / (4) =		7.4934 (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 %)													88.9000 (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	119.7438	65.0077	26.3845	3.2379	0.2566	0.0000	0.0000	0.0000	0.0000	9.1875	59.9285	128.3920 (98)	
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)	
Space heating fuel (main heating system)	134.6950	73.1246	29.6789	3.6422	0.2887	0.0000	0.0000	0.0000	0.0000	10.3346	67.4112	144.4230 (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	228.7491	202.4697	215.3271	189.6386	183.5367	163.7055	160.7867	168.5594	171.7723	191.5084	203.2974	226.2728 (64)	
Efficiency of water heater (217)m	83.0609	82.2334	81.1570	80.4306	80.3108	80.3000	80.3000	80.3000	80.3000	80.6572	82.1084	80.3000 (216)	
Fuel for water heating, kWh/month	275.3992	246.2134	265.3217	235.7791	228.5329	203.8674	200.2325	209.9120	213.9132	237.4350	247.5965	271.9162 (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	13.3555	12.0631	13.3555	12.9247	13.3555	12.9247	13.3555	13.3555	12.9247	13.3555	12.9247	13.3555 (231)	
Lighting	16.7877	13.4677	12.1262	8.8841	6.8624	5.6066	6.2601	8.1371	10.5693	13.8675	15.6633	17.2542 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)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 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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													463.5981 (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													2836.1190 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6930)													
mechanical ventilation fans (SFP = 0.6930)													116.2508 (230a)
central heating pump													41.0000 (230c)
Total electricity for the above, kWh/year													157.2508 (231)
Electricity for lighting (calculated in Appendix L)													135.4860 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (233)

Full SAP Calculation Printout



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	3592.4539 (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	463.5981	0.2100	97.3556 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2836.1190	0.2100	595.5850 (264)
Space and water heating			692.9406 (265)
Pumps, fans and electric keep-hot	157.2508	0.1387	21.8126 (267)
Energy for lighting	135.4860	0.1443	19.5548 (268)
Total CO2, kg/year			734.3080 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.3500 (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	463.5981	1.1300	523.8658 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2836.1190	1.1300	3204.8145 (278)
Space and water heating			3728.6803 (279)
Pumps, fans and electric keep-hot	157.2508	1.5128	237.8889 (281)
Energy for lighting	135.4860	1.5338	207.8130 (282)
Total Primary energy kWh/year			4174.3822 (286)
Dwelling Primary energy Rate (DPER)			75.9000 (287)

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	55.0000 (1b)	x 2.5000 (2b)	= 137.5000 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.0000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 137.5000 (5)
Dwelling volume			

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) = 0.1455 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3955 (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) = 0.2768 (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	0.3529	0.3460	0.3391	0.3045	0.2976	0.2630	0.2630	0.2561	0.2768	0.2976	0.3114	0.3253 (22b)
Effective ac	0.5623	0.5599	0.5575	0.5464	0.5443	0.5346	0.5346	0.5328	0.5383	0.5443	0.5485	0.5529 (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			3.4300	1.0000	3.4300		(26)
TER Opening Type			10.3300	1.1450	11.8282		(27)
exposed wall	37.2500	13.7600	23.4900	0.1800	4.2282		(29a)
Total net area of external elements Aum(A, m2)			37.2500				(31)

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Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 19.4864 (33)
Main dwelling
pw 46.5000 0.0000 0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 193.1745 (35)

List of Thermal Bridges
K1 Element Length Psi-value Total
E2 Other lintels (including other steel lintels) 11.0900 0.0500 0.5545
E3 Sill 9.7200 0.0500 0.4860
E4 Jamb 40.0000 0.0500 2.0000
E7 Party floor between dwellings (in blocks of flats) 3.5000 0.0700 0.2450
E24 Eaves (insulation at ceiling level - inverted) 9.0000 0.2400 2.1600
E16 Corner (normal) 10.0000 0.0900 0.9000
E17 Corner (inverted - internal area greater than external area) 7.5000 -0.0900 -0.6750
E25 Staggered party wall between dwellings 2.5000 0.0600 0.1500
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.8205 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.3069 (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 25.5137 25.4039 25.2963 24.7911 24.6966 24.2565 24.2565 24.1750 24.4260 24.6966 24.8878 25.0877 (38)
Average = Sum(39)m / 12 = 50.8206 50.7109 50.6033 50.0980 50.0035 49.5634 49.5634 49.4820 49.7329 50.0035 50.1947 50.3947 (39)
50.0976
HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
HLP (average) 0.9240 0.9220 0.9201 0.9109 0.9092 0.9012 0.9012 0.8997 0.9042 0.9092 0.9126 0.9163 (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 1.8374 (42)
Hot water usage for mixer showers 55.0260 54.1991 52.9941 50.6885 48.9871 47.0896 46.0111 47.2070 48.5179 50.5552 52.9103 54.8152 (42a)
Hot water usage for baths 23.7862 23.4330 22.9355 22.0183 21.3314 20.5699 20.1585 20.6525 21.1904 22.0053 22.9414 23.7058 (42b)
Hot water usage for other uses 33.4464 32.2302 31.0139 29.7977 28.5815 27.3652 27.3652 28.5815 29.7977 31.0139 32.2302 33.4464 (42c)
Average daily hot water use (litres/day) 103.1915 (43)
Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Energy conte 112.2586 109.8622 106.9435 102.5045 98.9000 95.0247 93.5349 96.4410 99.5060 103.5744 108.0818 111.9674 (44)
Energy content (annual) 177.7902 156.4423 164.3682 140.3235 133.1384 116.8440 113.1223 119.4141 122.7008 140.5495 153.9824 175.3139 (45)
Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1713.9895
26.6685 23.4663 24.6552 21.0485 19.9708 17.5266 16.9684 17.9121 18.4051 21.0824 23.0974 26.2971 (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
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)
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 (59)
Combi loss 50.9589 46.0274 50.9589 49.3151 50.3983 46.8615 47.6644 49.1453 49.0714 50.9589 49.3151 50.9589 (61)
Total heat required for water heating calculated for each month
228.7491 202.4697 215.3271 189.6386 183.5367 163.7055 160.7867 168.5594 171.7723 191.5084 203.2974 226.2728 (62)
WWHRS -25.1556 -22.2478 -23.2966 -19.2905 -17.9781 -15.3840 -14.4200 -15.3342 -15.9168 -18.7642 -21.2576 -24.6897 (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 203.5935 180.2219 192.0304 170.3480 165.5587 148.3216 146.3667 153.2251 155.8554 172.7442 182.0399 201.5830 (64)
Total per year (kWh/year) = Sum(64)m = 2071.8884 (64)
2072 (64)
12Total per year (kWh/year)
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 71.8550 63.5239 67.3921 58.9863 56.8681 50.5660 49.5293 51.9915 53.0659 59.4724 63.5279 71.0316 (65)

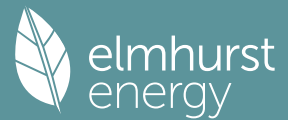
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(66)m 91.8680 91.8680 91.8680 91.8680 91.8680 91.8680 91.8680 91.8680 91.8680 91.8680 91.8680 91.8680 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 81.9955 90.7807 81.9955 84.7287 81.9955 84.7287 81.9955 81.9955 84.7287 81.9955 84.7287 81.9955 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 160.1856 161.8479 157.6591 148.7417 137.4852 126.9056 119.8378 118.1755 122.3643 131.2817 142.5382 153.1178 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 32.1868 32.1868 32.1868 32.1868 32.1868 32.1868 32.1868 32.1868 32.1868 32.1868 32.1868 32.1868 (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) -73.4944 -73.4944 -73.4944 -73.4944 -73.4944 -73.4944 -73.4944 -73.4944 -73.4944 -73.4944 -73.4944 -73.4944 (71)
Water heating gains (Table 5) 96.5793 94.5296 90.5808 81.9255 76.4356 70.2306 66.5716 69.8810 73.7026 79.9361 88.2332 95.4726 (72)
Total internal gains 392.3208 400.7186 383.7958 368.9563 349.4767 332.4252 318.9652 320.6125 331.3560 346.7736 369.0605 384.1462 (73)

6. Solar gains

[Jan] Area Solar flux g FF Access Gains
m2 Table 6a Specific data Access factor W
W/m2 or Table 6b or Table 6c Table 6d
North 0.8500 10.6334 0.6300 0.7000 0.7700 2.7622 (74)
Northeast 7.7500 11.2829 0.6300 0.7000 0.7700 26.7237 (75)
East 1.7300 19.6403 0.6300 0.7000 0.7700 10.3840 (76)

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Solar gains	39.8699	79.9889	140.4288	224.1510	295.5553	312.6422	293.4456	237.4636	169.1137	96.8644	49.9805	32.6659 (83)
Total gains	432.1907	480.7075	524.2246	593.1072	645.0320	645.0675	612.4109	558.0760	500.4697	443.6380	419.0410	416.8122 (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	58.0725	58.1981	58.3219	58.9101	59.0214	59.5455	59.5455	59.6435	59.3425	59.0214	58.7966	58.5633
alpha	4.8715	4.8799	4.8881	4.9273	4.9348	4.9697	4.9697	4.9762	4.9562	4.9348	4.9198	4.9042
util living area	0.9813	0.9676	0.9360	0.8402	0.6742	0.4843	0.3547	0.4051	0.6485	0.8901	0.9658	0.9840 (86)
MIT	19.9379	20.1207	20.3913	20.7294	20.9243	20.9879	20.9979	20.9961	20.9533	20.6859	20.2651	19.9062 (87)
Th 2	20.1471	20.1488	20.1505	20.1583	20.1597	20.1665	20.1665	20.1678	20.1639	20.1597	20.1568	20.1537 (88)
util rest of house	0.9771	0.9604	0.9220	0.8097	0.6252	0.4241	0.2882	0.3331	0.5821	0.8610	0.9570	0.9804 (89)
MIT 2	18.9175	19.1481	19.4841	19.8886	20.0960	20.1590	20.1657	20.1661	20.1309	19.8503	19.3382	18.8824 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.2199	19.4364	19.7530	20.1378	20.3415	20.4047	20.4123	20.4120	20.3746	20.0979	19.6129	19.1858 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.2199	19.4364	19.7530	20.1378	20.3415	20.4047	20.4123	20.4120	20.3746	20.0979	19.6129	19.1858 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9711	0.9530	0.9144	0.8089	0.6361	0.4415	0.3079	0.3544	0.5995	0.8585	0.9500	0.9750 (94)
Useful gains	419.7116	458.1180	479.3745	479.7740	410.3332	284.7928	188.5728	197.7757	300.0300	380.8730	398.0871	406.3748 (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	758.2382	737.1513	670.6453	562.9895	432.1061	287.6986	188.9517	198.5240	312.0554	474.9294	628.0804	755.2046 (97)
Space heating kWh	251.8638	187.5103	142.3055	59.9152	16.1990	0.0000	0.0000	0.0000	0.0000	69.9780	165.5951	259.5294 (98a)
Space heating requirement - total per year (kWh/year)	1152.8964											
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	251.8638	187.5103	142.3055	59.9152	16.1990	0.0000	0.0000	0.0000	0.0000	69.9780	165.5951	259.5294 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1152.8964											
Space heating per m2	(98c) / (4) = 20.9618 (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	251.8638	187.5103	142.3055	59.9152	16.1990	0.0000	0.0000	0.0000	0.0000	69.9780	165.5951	259.5294 (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)	272.5799	202.9333	154.0103	64.8433	17.5314	0.0000	0.0000	0.0000	0.0000	75.7338	179.2155	280.8759 (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	203.5935	180.2219	192.0304	170.3480	165.5587	148.3216	146.3667	153.2251	155.8554	172.7442	182.0399	201.5830 (64)
Efficiency of water heater	84.8384	84.4665	83.7484	82.3735	80.9983	80.3000	80.3000	80.3000	80.3000	82.6038	84.1790	80.3000 (216)
Fuel for water heating, kWh/month	239.9779	213.3648	229.2946	206.7997	204.3976	184.7093	182.2748	190.8158	194.0914	209.1237	216.2532	237.3691 (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	17.0370	13.6677	12.3063	9.0161	6.9643	5.6899	6.3531	8.2580	10.7263	14.0735	15.8959	17.5106 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-10.4843	-15.9063	-24.5860	-29.8000	-34.0780	-32.5400	-32.1560	-29.3846	-24.8548	-19.1126	-11.9222	-8.9387 (233a)
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 (234a)
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 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	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)	-2.9375	-6.3783	-13.0559	-20.1769	-27.2410	-27.5689	-27.2338	-22.7900	-16.3639	-9.2919	-3.9761	-2.3077 (233b)
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 (234b)
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 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	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	1247.7233 (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	2508.4719 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
Total electricity for the above, kWh/year	86.0000 (231)											

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Electricity for lighting (calculated in Appendix L)	137.4987 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-453.0855 (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	3526.6084 (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	1247.7233	0.2100	262.0219 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2508.4719	0.2100	526.7791 (264)
Space and water heating			788.8010 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	137.4987	0.1443	19.8453 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-273.7636	0.1331	-36.4294
PV Unit electricity exported	-179.3219	0.1251	-22.4297
Total			-58.8591 (269)
Total CO2, kg/year			761.7165 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8500 (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	1247.7233	1.1300	1409.9274 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2508.4719	1.1300	2834.5732 (278)
Space and water heating			4244.5006 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	137.4987	1.5338	210.9001 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-273.7636	1.4917	-408.3765
PV Unit electricity exported	-179.3219	0.4591	-82.3256
Total			-490.7021 (283)
Total Primary energy kWh/year			4094.7994 (286)
Target Primary Energy Rate (TPER)			74.4500 (287)