

Full SAP Calculation Printout



Plot Reference	UNIT 15				Issued on Date	08/07/2026	
Assessment Reference	001			Plot Type Ref	UNIT 15		
Plot Address	UNIT 15, Stoney Wood Quarter, 34 The Fairway, LONDON, NW7 3HS				SAP Version	10.2	
SAP Rating	79 C	DER	4.68	TER	17.45		
Environmental	96 A	% DER < TER				73.18	
CO ₂ Emissions (t/year)	0.3	DFEE	49.64	TFEE	50.66		
Compliance Check	See BREL	% DFEE < TFEE				2.02	
% DPER < TPER	47.24	DPER	49.49	TPER	93.80		
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	72.7000 (1b)	2.9000 (2b)	210.8300 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	210.8300 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	3 (19)

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

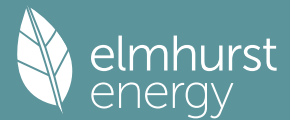
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316 (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			2.1000	1.0000	2.1000		(26)
l			45.3300	0.7940	35.9901		(27)
exposed wall	74.5300	45.3300	29.2000	0.1500	4.3800	60.0000	1751.9999 (29a)
corridor wall	15.9500	2.1000	13.8500	0.2500	3.4625	9.0000	124.6500 (29a)
stair wall	7.2500		7.2500	0.1700	1.2325	9.0000	65.2500 (29a)
flat roof	72.7000		72.7000	0.1000	7.2700	9.0000	654.3000 (30)
Total net area of external elements Aum(A, m ²)			170.4300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.4351		(33)
Main dwelling							
pw			14.5000	0.0000	0.0000	110.0000	1595.0000 (32)
pf			72.7000			40.0000	2907.9999 (32d)
iw			176.9000			9.0000	1592.0999 (32c)

Heat capacity Cm = Sum (A x k)	(28)...(30) + (32) + (32a)...(32e) =	8691.2997 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		119.5502 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	17.3600	0.0500	0.8680
E3 Sill	16.3600	0.0500	0.8180
E4 Jamb	64.0000	0.0500	3.2000
E7 Party floor between dwellings (in blocks of flats)	27.7000	0.0700	1.9390
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5000	0.0200	0.1100
E24 Eaves (insulation at ceiling level - inverted)	4.9000	0.0800	0.3920
E15 Flat roof with parapet	25.8000	0.5600	14.4480
E16 Corner (normal)	14.5000	0.0900	1.3050
E17 Corner (inverted - internal area greater than external area)	11.6000	-0.0900	-1.0440
E18 Party wall between dwellings	11.6000	0.0600	0.6960
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			22.7320 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	77.1671 (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	16.9217	16.7195	16.5173	15.5063	15.3041	14.2931	14.2931	14.0909	14.6975	15.3041	15.7085	16.1129	(38)
Heat transfer coeff	94.0888	93.8866	93.6844	92.6734	92.4712	91.4602	91.4602	91.2580	91.8646	92.4712	92.8756	93.2800	(39)
Average = Sum(39)m / 12 =												92.6229	
HLP	1.2942	1.2914	1.2886	1.2747	1.2720	1.2580	1.2580	1.2553	1.2636	1.2720	1.2775	1.2831	(40)
HLP (average)												1.2740	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3098 (42)
Hot water usage for mixer showers												
62.9483	62.0023	60.6238	57.9863	56.0399	53.8693	52.6355	54.0035	55.5032	57.8338	60.5279	62.7071	(42a)
Hot water usage for baths												
27.1930	26.7892	26.2205	25.1719	24.3867	23.5160	23.0458	23.6105	24.2254	25.1570	26.2272	27.1011	(42b)
Hot water usage for other uses												
38.2852	36.8930	35.5008	34.1086	32.7164	31.3242	31.3242	32.7164	34.1086	35.5008	36.8930	38.2852	(42c)
Average daily hot water use (litres/day)												118.0531 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	128.4265	125.6844	122.3450	117.2667	113.1430	108.7095	107.0055	110.3304	113.8372	118.4916	123.6481	128.0933 (44)
Energy conte	203.3961	178.9729	188.0398	160.5323	152.3122	133.6710	129.4138	136.6121	140.3726	160.7919	176.1594	200.5632 (45)
Energy content (annual)										Total = Sum(45)m =		1960.8375
Distribution loss (46)m = 0.15 x (45)m												
30.5094	26.8459	28.2060	24.0798	22.8468	20.0507	19.4121	20.4918	21.0559	24.1188	26.4239	30.0845	(46)
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												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
258.6729	228.9004	243.3166	214.0260	207.5890	187.1647	184.6906	191.8889	193.8663	216.0687	229.6531	255.8400	(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												
258.6729	228.9004	243.3166	214.0260	207.5890	187.1647	184.6906	191.8889	193.8663	216.0687	229.6531	255.8400	(64)
Total per year (kWh/year) = Sum(64)m =												2611.6773 (64)
12Total per year (kWh/year)												2612 (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												
111.8506	99.4505	106.7447	96.1719	94.8652	87.2406	87.2515	89.6450	89.4688	97.6848	101.3679	110.9087	(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	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.6499	113.6481	102.6499	106.0715	102.6499	106.0715	102.6499	102.6499	106.0715	102.6499	106.0715	102.6499	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.5149	205.6267	200.3049	188.9755	174.6741	161.2328	152.2532	150.1413	155.4631	166.7926	181.0940	194.5353	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492	(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)	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	(71)
Water heating gains (Table 5)	150.3369	147.9917	143.4740	133.5721	127.5070	121.1675	117.2736	120.4906	124.2623	131.2967	140.7888	149.0709	(72)
Total internal gains	514.1494	524.9143	504.0766	486.2669	462.4788	446.1195	429.8244	430.9295	443.4447	458.3869	485.6021	503.9037	(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	11.5600	11.2829	0.5300	0.7000	0.7700	33.5341 (75)

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East			3.5400		19.6403		0.5300		0.7000		0.7700		17.8755 (76)
Southeast			16.8700		36.7938		0.5300		0.7000		0.7700		159.5869 (77)
Southwest			13.3600		36.7938		0.5300		0.7000		0.7700		126.3830 (79)

Solar gains	337.3795	590.3405	847.0586	1111.7722	1299.3990	1313.0943	1256.4059	1113.3700	938.4989	663.2746	407.0093	286.8162 (83)
Total gains	851.5289	1115.2548	1351.1351	1598.0391	1761.8777	1759.2138	1686.2303	1544.2995	1381.9436	1121.6615	892.6113	790.7200 (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	25.6593	25.7145	25.7700	26.0512	26.1081	26.3967	26.3967	26.4552	26.2805	26.1081	25.9944	25.8818	
alpha	2.7106	2.7143	2.7180	2.7367	2.7405	2.7598	2.7598	2.7637	2.7520	2.7405	2.7330	2.7255	
util living area													
	0.9030	0.8303	0.7330	0.5935	0.4505	0.3219	0.2352	0.2664	0.4280	0.6741	0.8495	0.9167 (86)	
MIT	19.0723	19.5920	20.1144	20.5823	20.8399	20.9537	20.9857	20.9795	20.8971	20.5028	19.7138	18.9698 (87)	
Th 2	19.8454	19.8476	19.8497	19.8607	19.8629	19.8738	19.8738	19.8760	19.8694	19.8629	19.8585	19.8541 (88)	
util rest of house													
	0.8886	0.8083	0.7022	0.5535	0.4034	0.2685	0.1763	0.2033	0.3661	0.6280	0.8257	0.9041 (89)	
MIT 2	17.6691	18.2991	18.9176	19.4538	19.7259	19.8429	19.8673	19.8661	19.7947	19.3906	18.4709	17.5488 (90)	
Living area fraction													
										fLA = Living area / (4) =		0.4003 (91)	
MIT	18.2308	18.8166	19.3966	19.9055	20.1718	20.2876	20.3150	20.3118	20.2359	19.8358	18.9684	18.1176 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.2308	18.8166	19.3966	19.9055	20.1718	20.2876	20.3150	20.3118	20.2359	19.8358	18.9684	18.1176 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8637	0.7857	0.6890	0.5552	0.4165	0.2884	0.1996	0.2280	0.3867	0.6268	0.8039	0.8798 (94)	
Useful gains	735.4245	876.2608	930.9116	887.1635	733.8127	507.3610	336.5025	352.1705	534.3732	703.0276	717.6130	695.7094 (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													
	1310.7292	1306.5855	1208.2116	1019.9160	783.4014	520.1851	339.7718	356.9823	563.6757	854.0430	1102.2841	1298.2355 (97)	
Space heating kWh													
	428.0267	289.1782	206.3112	95.5818	36.8939	0.0000	0.0000	0.0000	0.0000	112.3555	276.9632	448.2794 (98a)	
Space heating requirement - total per year (kWh/year)												1893.5899	
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													
	428.0267	289.1782	206.3112	95.5818	36.8939	0.0000	0.0000	0.0000	0.0000	112.3555	276.9632	448.2794 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1893.5899	
Space heating per m2										(98c) / (4) =		26.0466 (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													
	428.0267	289.1782	206.3112	95.5818	36.8939	0.0000	0.0000	0.0000	0.0000	112.3555	276.9632	448.2794 (98)	
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	642.0401	433.7673	309.4668	143.3726	55.3409	0.0000	0.0000	0.0000	0.0000	168.5332	415.4447	672.4191	
Space heating requirement													
	642.0401	433.7673	309.4668	143.3726	55.3409	0.0000	0.0000	0.0000	0.0000	168.5332	415.4447	672.4191 (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													
	258.6729	228.9004	243.3166	214.0260	207.5890	187.1647	184.6906	191.8889	193.8663	216.0687	229.6531	255.8400 (64)	
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	388.0094	343.3506	364.9748	321.0390	311.3835	280.7471	277.0360	287.8334	290.7995	324.1031	344.4796	383.7600	
Water heating fuel													
	388.0094	343.3506	364.9748	321.0390	311.3835	280.7471	277.0360	287.8334	290.7995	324.1031	344.4796	383.7600 (310)	
Cooling System Energy Efficiency Ratio													
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	15.1389	13.6738	15.1389	14.6505	15.1389	14.6505	15.1389	15.1389	14.6505	15.1389	14.6505	15.1389 (331)	
Lighting	21.3286	17.1106	15.4062	11.2872	8.7186	7.1232	7.9534	10.3381	13.4282	17.6185	19.9001	21.9214 (332)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-3.0561	-5.4595	-10.1467	-14.3978	-18.1146	-17.9096	-17.5282	-15.0223	-11.2182	-7.1477	-3.6790	-2.4919 (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	-0.3484	-0.9272	-2.4239	-4.6102	-7.0266	-7.4344	-7.2202	-5.5359	-3.3546	-1.4946	-0.5028	-0.2580 (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													2840.3848 (307)
Space heating fuel - secondary													0.0000 (309)
Water heating fuel - community heating													3917.5159 (310)
Efficiency of water heater													0.0000 (311)
Electricity used for heat distribution													28.4038 (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)													178.2483 (330a)
Total electricity for the above, kWh/year													178.2483 (331)

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Electricity for lighting (calculated in Appendix L)	172.1342 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-167.3084 (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	6940.9748 (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	2047.8487	0.1565	134.6873 (367)
Electrical energy for heat distribution (space & water)	28.4038	0.0000	9.9630 (372)
Overall CO2 factor for heat network			0.0461 (386)
Total CO2 associated with community systems			311.8736 (373)
Space and water heating			311.8736 (376)
Pumps, fans and electric keep-hot	178.2483	0.1387	24.7252 (378)
Energy for lighting	172.1342	0.1443	24.8443 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-126.1715	0.1304	-16.4538
PV Unit electricity exported	-41.1369	0.1205	-4.9586
Total			-21.4124 (380)
Total CO2, kg/year			340.0307 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6800 (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	2047.8487	1.5793	1359.3129 (467)
Electrical energy for heat distribution (space & water)	28.4038	0.0000	104.4373 (472)
Overall CO2 factor for heat network			0.4838 (486)
Total CO2 associated with community systems			3269.2053 (473)
Space and water heating			3269.2053 (476)
Pumps, fans and electric keep-hot	178.2483	1.5128	269.6541 (478)
Energy for lighting	172.1342	1.5338	264.0251 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-126.1715	1.4817	-186.9510
PV Unit electricity exported	-41.1369	0.4422	-18.1901
Total			-205.1410 (480)
Total Primary energy kWh/year			3597.7435 (483)
Dwelling Primary energy Rate (DPER)			49.4900 (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	72.7000 (1b)	2.9000 (2b)	210.8300 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	210.8300 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1423 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3923 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3040 (21)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

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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												
Effective ac	0.3876	0.3800	0.3724	0.3344	0.3268	0.2888	0.2888	0.2812	0.3040	0.3268	0.3420	0.3572 (22b)
	0.5751	0.5722	0.5694	0.5559	0.5534	0.5417	0.5417	0.5395	0.5462	0.5534	0.5585	0.5638 (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			2.1000	1.0000	2.1000		(26)
TER Opening Type			16.0700	1.1450	18.4008		(27)
exposed wall	74.5300	16.0700	58.4600	0.1800	10.5228		(29a)
corridor wall	15.9500	2.1000	13.8500	0.1800	2.4930		(29a)
stair wall	7.2500		7.2500	0.1800	1.3050		(29a)
flat roof	72.7000		72.7000	0.1100	7.9970		(30)
Total net area of external elements Aum(A, m2)			170.4300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.8186		(33)
Main dwelling							
pw			14.5000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							119.5502 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				17.3600	0.0500	0.8680	
E3 Sill				16.3600	0.0500	0.8180	
E4 Jamb				64.0000	0.0500	3.2000	
E7 Party floor between dwellings (in blocks of flats)				27.7000	0.0700	1.9390	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				5.5000	0.0200	0.1100	
E24 Eaves (insulation at ceiling level - inverted)				4.9000	0.2400	1.1760	
E15 Flat roof with parapet				25.8000	0.5600	14.4480	
E16 Corner (normal)				14.5000	0.0900	1.3050	
E17 Corner (inverted - internal area greater than external area)				11.6000	-0.0900	-1.0440	
E18 Party wall between dwellings				11.6000	0.0600	0.6960	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						23.5160	(36)
Point Thermal bridges						0.0000	
Total fabric heat loss					(33) + (36) + (36a) =	66.3346	(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	40.0141	39.8111	39.6122	38.6777	38.5028	37.6889	37.6889	37.5382	38.0024	38.5028	38.8565	39.2263 (38)
Average = Sum(39)m / 12 =	106.3487	106.1457	105.9467	105.0122	104.8374	104.0235	104.0235	103.8728	104.3370	104.8374	105.1911	105.5609 (39)
												105.0114
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.4628	1.4601	1.4573	1.4445	1.4421	1.4309	1.4309	1.4288	1.4352	1.4421	1.4469	1.4520 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

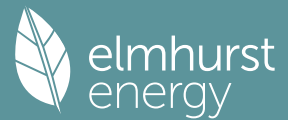
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3098 (42)
Hot water usage for mixer showers	62.9483	62.0023	60.6238	57.9863	56.0399	53.8693	52.6355	54.0035	55.5032	57.8338	60.5279	62.7071 (42a)
Hot water usage for baths	27.1930	26.7892	26.2205	25.1719	24.3867	23.5160	23.0458	23.6105	24.2254	25.1570	26.2272	27.1011 (42b)
Hot water usage for other uses	38.2852	36.8930	35.5008	34.1086	32.7164	31.3242	31.3242	32.7164	34.1086	35.5008	36.8930	38.2852 (42c)
Average daily hot water use (litres/day)												118.0531 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	128.4265	125.6844	122.3450	117.2667	113.1430	108.7095	107.0055	110.3304	113.8372	118.4916	123.6481	128.0933 (44)
Distribution loss (46)m = 0.15 x (45)m	203.3961	178.9729	188.0398	160.5323	152.3122	133.6710	129.4138	136.6121	140.3726	160.7919	176.1594	200.5632 (45)
Water storage loss (or HIU loss):	Total = Sum(45)m =											1960.8375
Total storage loss	30.5094	26.8459	28.2060	24.0798	22.8468	20.0507	19.4121	20.4918	21.0559	24.1188	26.4239	30.0845 (46)
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 (56)
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 (59)
Total heat required for water heating calculated for each month	254.3550	225.0003	238.9987	209.8474	203.2711	182.9861	180.3727	187.5710	189.6877	211.7508	225.4745	251.5221 (61)
WWHRS	-28.7773	-25.4509	-26.6507	-22.0678	-20.5664	-17.5988	-16.4961	-17.5420	-18.2084	-21.4657	-24.3181	-28.2444 (62)
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 (63a)
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 (63b)
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 (63c)
Output from w/h	225.5777	199.5495	212.3480	187.7795	182.7047	165.3873	163.8766	170.0291	171.4793	190.2851	201.1564	223.2777 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2293.4507 (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	80.3689	71.0154	75.2629	65.7058	63.3835	56.7744	55.7698	58.1633	59.0027	66.2030	70.9018	79.4270 (64a)
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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	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925	115.4925 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	102.6708	113.6712	102.6708	106.0931	102.6708	106.0931	102.6708	102.6708	106.0931	102.6708	106.0931	102.6708 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	203.5149	205.6267	200.3049	188.9755	174.6741	161.2328	152.2532	150.1413	155.4631	166.7926	181.0940	194.5353 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

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Pumps, fans	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492	34.5492 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940	-92.3940 (71)
Water heating gains (Table 5)	108.0228	105.6776	101.1599	91.2580	85.1929	78.8533	74.9594	78.1764	81.9481	88.9826	98.4747	106.7567 (72)
Total internal gains	474.8562	485.6233	464.7833	446.9744	423.1855	403.8270	387.5311	388.6363	401.1521	419.0937	446.3095	464.6105 (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					4.1000	11.2829	0.6300	0.7000	0.7700			14.1377 (75)
East					1.2600	19.6403	0.6300	0.7000	0.7700			7.5629 (76)
Southeast					5.9800	36.7938	0.6300	0.7000	0.7700			67.2431 (77)
Southwest					4.7300	36.7938	0.6300	0.7000	0.7700			53.1873 (79)
Solar gains	142.1311	248.7100	356.8911	468.4580	547.5424	553.3230	529.4313	469.1416	395.4302	279.4445	171.4669	120.8283 (83)
Total gains	616.9872	734.3333	821.6745	915.4324	970.7279	957.1500	916.9624	857.7779	796.5823	698.5381	617.7764	585.4388 (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	22.7013	22.7447	22.7874	22.9902	23.0285	23.2087	23.2087	23.2424	23.1390	23.0285	22.9511	22.8707
alpha	2.5134	2.5163	2.5192	2.5327	2.5352	2.5472	2.5472	2.5495	2.5426	2.5352	2.5301	2.5247
util living area	0.9531	0.9282	0.8919	0.8224	0.7187	0.5796	0.4526	0.4936	0.6805	0.8534	0.9314	0.9584 (86)
MIT	18.2820	18.6477	19.1590	19.8091	20.3618	20.7437	20.9015	20.8742	20.5900	19.8627	18.9620	18.2177 (87)
Th 2	19.7155	19.7176	19.7197	19.7294	19.7312	19.7398	19.7398	19.7413	19.7365	19.7312	19.7275	19.7237 (88)
util rest of house	0.9447	0.9158	0.8726	0.7897	0.6645	0.4945	0.3392	0.3796	0.6027	0.8190	0.9173	0.9509 (89)
MIT 2	16.6137	17.0723	17.7098	18.5067	19.1496	19.5581	19.6936	19.6778	19.4168	18.5937	17.4815	16.5374 (90)
Living area fraction	17.2815	17.7029	18.2899	19.0280	19.6348	20.0327	20.1771	20.1567	19.8864	19.1017	18.0742	17.2100 (92)
MIT	17.2815	17.7029	18.2899	19.0280	19.6348	20.0327	20.1771	20.1567	19.8864	19.1017	18.0742	17.2100 (92)
Temperature adjustment	17.2815	17.7029	18.2899	19.0280	19.6348	20.0327	20.1771	20.1567	19.8864	19.1017	18.0742	17.2100 (93)
adjusted MIT	17.2815	17.7029	18.2899	19.0280	19.6348	20.0327	20.1771	20.1567	19.8864	19.1017	18.0742	17.2100 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9224	0.8897	0.8455	0.7684	0.6599	0.5157	0.3805	0.4195	0.6129	0.7981	0.8926	0.9299 (94)
Useful gains	569.0853	653.3069	694.7070	703.4140	640.5708	493.6188	348.9314	359.8061	488.2419	557.4965	551.4324	544.3862 (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	1380.5637	1358.9742	1249.0981	1063.5663	831.8654	565.1248	372.1030	390.2176	603.7359	891.2911	1154.3829	1373.3419 (97)
Space heating kWh	603.7399	474.2085	412.4670	259.3096	142.3232	0.0000	0.0000	0.0000	0.0000	248.3432	434.1244	616.7430 (98a)
Space heating requirement - total per year (kWh/year)												3191.2588
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	603.7399	474.2085	412.4670	259.3096	142.3232	0.0000	0.0000	0.0000	0.0000	248.3432	434.1244	616.7430 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3191.2588
Space heating per m ²												(98c) / (4) = 43.8963 (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	603.7399	474.2085	412.4670	259.3096	142.3232	0.0000	0.0000	0.0000	0.0000	248.3432	434.1244	616.7430 (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)	653.3981	513.2126	446.3929	280.6381	154.0295	0.0000	0.0000	0.0000	0.0000	268.7697	469.8316	667.4708 (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	225.5777	199.5495	212.3480	187.7795	182.7047	165.3873	163.8766	170.0291	171.4793	190.2851	201.1564	223.2777 (64)
Water heating requirement	86.3835	86.1668	85.7778	85.0733	83.8519	80.3000	80.3000	80.3000	80.3000	84.9530	85.9841	80.3000 (216)
Efficiency of water heater (217)m	261.1350	231.5850	247.5557	220.7269	217.8896	205.9617	204.0805	211.7423	213.5483	223.9887	233.9459	86.4394 (217)
Fuel for water heating, kWh/month	261.1350	231.5850	247.5557	220.7269	217.8896	205.9617	204.0805	211.7423	213.5483	223.9887	233.9459	258.3057 (219)
Space cooling fuel requirement	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)
(221)m	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)
Pumps and Fa	21.3330	17.1141	15.4093	11.2895	8.7204	7.1246	7.9550	10.3402	13.4309	17.6221	19.9041	21.9259 (232)
Lighting	Electricity generated by PVs (Appendix M) (negative quantity)											
(233a)m	-12.0177	-18.3106	-28.4181	-34.5825	-39.6583	-37.8948	-37.4340	-34.1467	-28.8024	-22.0469	-13.6882	-10.2368 (233a)

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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	-3.1891	-6.9375	-14.2297	-22.0407	-29.8153	-30.2078	-29.8538	-24.9665	-17.8978	-10.1351	-4.3243	-2.5052	(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												3453.7433	(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												2730.4654	(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)												172.1692	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-513.3399	(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												5929.0380	(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	3453.7433	0.2100	725.2861	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2730.4654	0.2100	573.3977	(264)
Space and water heating			1298.6838	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	172.1692	0.1443	24.8493	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-317.2370	0.1330	-42.1915	
PV Unit electricity exported	-196.1029	0.1250	-24.5140	
Total			-66.7055	(269)
Total CO2, kg/year			1268.7569	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.4500	(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	3453.7433	1.1300	3902.7300	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2730.4654	1.1300	3085.4259	(278)
Space and water heating			6988.1559	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	172.1692	1.5338	264.0789	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-317.2370	1.4914	-473.1407	
PV Unit electricity exported	-196.1029	0.4588	-89.9747	
Total			-563.1154	(283)
Total Primary energy kWh/year			6819.2202	(286)
Target Primary Energy Rate (TPER)			93.8000	(287)