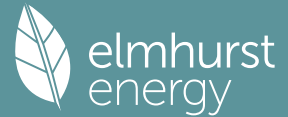


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Plot Reference	Plot 18				Issued on Date	22/12/2025	
Assessment Reference	Plot 18			Plot Type Ref			
Plot Address	Flat 5, 8 Cross Road Manchester, M21 9SB				SAP Version	10.2	
SAP Rating	89 B	DER	3.25	TER	14.13		
Environmental	98 A	% DER < TER				77.00	
CO ₂ Emissions (t/year)	0.14	DFEE	21.17	TFEE	30.23		
Compliance Check	See BREL	% DFEE < TFEE				29.96	
% DPER < TPER	54.52	DPER	34.26	TPER	75.32		
Assessor Details	Daniel Smith				Assessor ID	CJ06-0001	
Client	J Greenwood (Builders) Limited, Steve Brown						

SAP 10 WORKSHEET FOR New Build (As Built) (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	50.3000 (1b)	2.5000 (2b)	125.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.7500 (5)

2. Ventilation rate

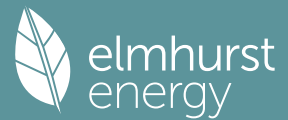
		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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	2.8400	(17)
Infiltration rate	0.1420	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1207 (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	0.1539	0.1509	0.1479	0.1328	0.1298	0.1147	0.1147	0.1116	0.1207	0.1298	0.1358	0.1418 (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) =												72.0000 (23c)
Effective ac	0.2939	0.2909	0.2879	0.2728	0.2698	0.2547	0.2547	0.2516	0.2607	0.2698	0.2758	0.2818 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window N/E			1.9400	1.3258	2.4394		(27)
Window S/W			5.7300	1.3258	7.5966		(27)
EXT Wall	26.0200	7.5700	18.4500	0.1800	3.3210	110.0000	2029.5001 (29a)
Flat Roof	14.2400		14.2400	0.1500	2.1360	9.0000	128.1600 (30)
Total net area of external elements Aum(A, m ²)			40.2600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.4930		(33)
Main dwelling							
Party Wall			56.5200	0.0000	0.0000	45.0000	2543.4000 (32)
Corridor			24.9200	0.0000	0.0000	45.0000	1121.4000 (32)
Party Floor			50.3000			40.0000	2012.0000 (32d)
Party Ceiling			36.0600			30.0000	1081.8000 (32b)
Internal Wall			39.0000			9.0000	351.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9267.2601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							184.2398 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	9.7100	0.0370	0.3593
P4 Party wall - Roof (insulation at ceiling level)	6.9500	0.0400	0.2780
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	53.8300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0250	0.0935
E3 Sill	1.2500	0.0220	0.0275
E4 Jamb	7.5400	0.0170	0.1282
E16 Corner (normal)	5.3600	0.0420	0.2251
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E9 Balcony between dwellings, wall insulation continuous	4.9800	0.1500	0.7470
E24 Eaves (insulation at ceiling level - inverted)	6.7600	0.1500	1.0140
E15 Flat roof with parapet	16.7900	0.1320	2.2163
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.4212 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	20.9142 (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	12.1958	12.0706	11.9454	11.3193	11.1941	10.5680	10.5680	10.4427	10.8184	11.1941	11.4445	11.6949	(38)
Heat transfer coeff	33.1100	32.9847	32.8595	32.2334	32.1082	31.4821	31.4821	31.3569	31.7326	32.1082	32.3586	32.6091	(39)
Average = Sum(39)m / 12 =												32.2021	
HLP	0.6582	0.6558	0.6533	0.6408	0.6383	0.6259	0.6259	0.6234	0.6309	0.6383	0.6433	0.6483	(40)
HLP (average)												0.6402	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6989 (42)
Hot water usage for mixer showers	52.7051	51.9130	50.7588	48.5505	46.9208	45.1034	44.0704	45.2159	46.4715	48.4228	50.6786	52.5031	(42a)
Hot water usage for baths	22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111	(42b)
Hot water usage for other uses	32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288	(42c)
Average daily hot water use (litres/day)												98.8376	(43)
Daily hot water use	107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430	(44)
Energy conte	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167	(45)
Energy content (annual)										Total = Sum(45)m =		1641.6717	
Distribution loss (46)m = 0.15 x (45)m	25.5433	22.4762	23.6150	20.1605	19.1282	16.7871	16.2524	17.1563	17.6285	20.1929	22.1228	25.1875	(46)
Water storage loss (or HIU loss):												201.0000	(47)
Store volume												1.6100	(48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400	(49)
Temperature factor from Table 2b												0.8694	(55)
Enter (49) or (54) in (55)													
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681	(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	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1959.0027	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	56.6210	49.8223	52.3465	44.6890	42.4008	37.2115	36.0262	38.0299	39.0766	44.7609	49.0389	55.8323	(65)

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

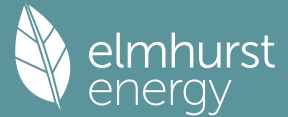
Metabolic gains (Table 5), Watts													
(66)m	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.8635	87.3132	78.8635	81.4923	78.8635	81.4923	78.8635	78.8635	81.4923	78.8635	81.4923	78.8635	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	(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)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	(71)
Water heating gains (Table 5)	76.1034	74.1404	70.3583	62.0681	56.9903	51.6826	48.4223	51.1155	54.2731	60.1624	68.1095	75.0434	(72)
Total internal gains	351.4641	359.4866	343.3844	329.4833	311.3755	298.9210	286.5012	287.6584	297.3152	308.8156	329.7926	343.8733	(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	1.8400	10.6334	0.4000	0.0000	0.7700	6.0262 (74)

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Efficiency of water heater	349.4100	
Water heating fuel used	560.6602 (219)	
Space cooling fuel	0.0000 (221)	
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)		
mechanical ventilation fans (SFP = 0.7500)	115.0612 (230a)	
Total electricity for the above, kWh/year	115.0612 (231)	
Electricity for lighting (calculated in Appendix L)	117.8308 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000 (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	1118.0215 (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	324.4693	0.1588	51.5180 (261)	
Space heating - main system 2	0.0000	0.0000	0.0000 (262)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	560.6602	0.1411	79.1169 (264)	
Space and water heating			130.6349 (265)	
Pumps, fans and electric keep-hot	115.0612	0.1387	15.9604 (267)	
Energy for lighting	117.8308	0.1443	17.0066 (268)	
Total CO2, kg/year			163.6020 (272)	
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2500 (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	324.4693	1.5877	515.1598 (275)	
Space heating - main system 2	0.0000	0.0000	0.0000 (276)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	560.6602	1.5218	853.2118 (278)	
Space and water heating			1368.3716 (279)	
Pumps, fans and electric keep-hot	115.0612	1.5128	174.0647 (281)	
Energy for lighting	117.8308	1.5338	180.7328 (282)	
Total Primary energy kWh/year			1723.1691 (286)	
Dwelling Primary energy Rate (DPER)			34.2600 (287)	

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

1. Overall dwelling characteristics

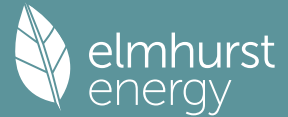
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	50.3000 (1b)	x 2.5000 (2b)	= 125.7500 (1b) - (3b)	
Ground floor				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	125.7500 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1590 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4090	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3477 (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	0.4433	0.4346	0.4259	0.3825	0.3738	0.3303	0.3303	0.3216	0.3477	0.3738	0.3911	0.4085 (22b)

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Effective ac 0.5983 0.5944 0.5907 0.5731 0.5699 0.5546 0.5546 0.5517 0.5604 0.5699 0.5765 0.5835 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			7.5700	1.1450	8.6679		(27)
EXT Wall	26.0200	7.5700	18.4500	0.1800	3.3210		(29a)
Flat Roof	14.2400		14.2400	0.1100	1.5664		(30)
Total net area of external elements Aum(A, m2)			40.2600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	13.5553		(33)
Main dwelling							
Party Wall			56.5200	0.0000	0.0000		(32)
Corridor			24.9200	0.0000	0.0000		(32)

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

184.2398 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	9.7100	0.0700	0.6797
P4 Party wall - Roof (insulation at ceiling level)	6.9500	0.1200	0.8340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	53.8300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0500	0.1870
E3 Sill	1.2500	0.0500	0.0625
E4 Jamb	7.5400	0.0500	0.3770
E16 Corner (normal)	5.3600	0.0900	0.4824
E18 Party wall between dwellings	5.3600	0.0600	0.3216
E25 Staggered party wall between dwellings	5.3600	0.0600	0.3216
E9 Balcony between dwellings, wall insulation continuous	4.9800	0.0200	0.0996
E24 Eaves (insulation at ceiling level - inverted)	6.7600	0.2400	1.6224
E15 Flat roof with parapet	16.7900	0.5600	9.4024

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

14.3902 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 27.9455 (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	24.8262	24.6679	24.5127	23.7838	23.6474	23.0125	23.0125	22.8949	23.2570	23.6474	23.9233	24.2117
Heat transfer coeff	52.7718	52.6135	52.4583	51.7293	51.5929	50.9580	50.9580	50.8404	51.2026	51.5929	51.8688	52.1573
Average = Sum(39)m / 12 =						50.9580	50.9580	50.8404	51.2026	51.5929	51.8688	52.1573

51.7286 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0491	1.0460	1.0429	1.0284	1.0257	1.0131	1.0131	1.0107	1.0179	1.0257	1.0312	1.0369
HLP (average)												1.0284
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

1.6989 (42)

Hot water usage for mixer showers	52.7051	51.9130	50.7588	48.5505	46.9208	45.1034	44.0704	45.2159	46.4715	48.4228	50.6786	52.5031
Hot water usage for baths	22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111
Hot water usage for other uses	32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288
Average daily hot water use (litres/day)						26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288

98.8376 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430
Energy conte	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167
Energy content (annual)										Total = Sum(45)m =		1641.6717

Distribution loss (46)m = 0.15 x (45)m

25.5433	22.4762	23.6150	20.1605	19.1282	16.7871	16.2524	17.1563	17.6285	20.1929	22.1228	25.1875
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Water storage loss (or HIU loss):

Store volume

150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):

1.3938 (48)

Temperature factor from Table 2b

0.5400 (49)

Enter (49) or (54) in (55)

0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325
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(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325
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(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
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(59)

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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(61)

Total heat required for water heating calculated for each month

216.8835	191.9273	204.0281	179.4949	174.1160	157.0061	154.9444	160.9706	162.6155	181.2140	192.5771	214.5116
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(62)

WWHRS	-24.0946	-21.3094	-22.3140	-18.4769	-17.2198	-14.7351	-13.8118	-14.6875	-15.2455	-17.9728	-20.3609	-23.6484
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(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
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(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
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(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
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(63d)

Output from w/h	192.7889	170.6179	181.7141	161.0180	156.8963	142.2710	141.1326	146.2831	147.3700	163.2413	172.2162	190.8632
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(64)

Total per year (kWh/year) = Sum(64)m = 1966.4125 (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	0.0000
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(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	93.8969	83.4909	89.6225	80.7625	79.6767	73.2850	73.3021	75.3058	75.1501	82.0368	85.1123	93.1082
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(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	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468

(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

78.8635	87.3132	78.8635	81.4923	78.8635	81.4923	78.8635	78.8635	78.8635	81.4923	78.8635	81.4923	78.8635
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(67)

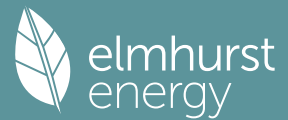
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824
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(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

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Pumps, fans	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	31.4947 0.0000	31.4947 0.0000	31.4947 0.0000	31.4947 0.0000	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	(69) 3.0000 (70)
Losses e.g. evaporation	(negative values) (Table 5)												
Water heating gains	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	(71)
Total internal gains	126.2055	124.2424	120.4603	112.1701	107.0923	101.7847	98.5244	101.2175	104.3751	110.2645	118.2116	125.1455	(72)
	404.5661	412.5887	396.4864	382.5853	364.4776	349.0231	336.6032	337.7605	347.4173	361.9176	382.8947	396.9754	(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				1.8400	10.6334	0.6300	0.7000				0.7700	5.9795 (74)	
South				5.7300	46.7521	0.6300	0.7000				0.7700	81.8705 (78)	
Solar gains	87.8499	145.5098	190.2149	224.2276	243.1727	238.5651	231.1391	217.0032	201.7642	158.2232	104.4208	75.7284 (83)	
Total gains	492.4161	558.0984	586.7014	606.8129	607.6502	587.5882	567.7424	554.7637	549.1815	520.1408	487.3155	472.7038 (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	48.7806	48.9274	49.0721	49.7637	49.8952	50.5169	50.5169	50.6337	50.2756	49.8952	49.6298	49.3553
alpha	4.2520	4.2618	4.2715	4.3176	4.3263	4.3678	4.3678	4.3756	4.3517	4.3263	4.3087	4.2904
util living area	0.9610	0.9352	0.8988	0.8243	0.7061	0.5353	0.3908	0.4159	0.6062	0.8247	0.9315	0.9661 (86)
MIT	19.8760	20.1036	20.3564	20.6520	20.8594	20.9678	20.9934	20.9913	20.9434	20.7019	20.2613	19.8410 (87)
Th 2	20.0426	20.0452	20.0477	20.0597	20.0620	20.0724	20.0724	20.0744	20.0684	20.0620	20.0574	20.0527 (88)
util rest of house	0.9529	0.9224	0.8791	0.7912	0.6542	0.4648	0.3104	0.3348	0.5363	0.7856	0.9159	0.9590 (89)
MIT 2	18.7647	19.0475	19.3577	19.7145	19.9415	20.0519	20.0698	20.0706	20.0290	19.7793	19.2561	18.7286 (90)
Living area fraction	19.3594	19.6127	19.8922	20.2162	20.4328	20.5421	20.5641	20.5634	20.5184	20.2731	19.7941	19.3239 (92)
MIT	19.3594	19.6127	19.8922	20.2162	20.4328	20.5421	20.5641	20.5634	20.5184	20.2731	19.7941	19.3239 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3594	19.6127	19.8922	20.2162	20.4328	20.5421	20.5641	20.5634	20.5184	20.2731	19.7941	19.3239 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9459	0.9157	0.8755	0.7971	0.6755	0.5011	0.3533	0.3780	0.5709	0.7951	0.9109	0.9523 (94)
Useful gains	465.7899	511.0665	513.6292	483.6680	410.4704	294.4499	200.5714	209.7245	313.5429	413.5522	443.8988	450.1479 (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	794.7139	774.0884	702.5306	585.3801	450.5482	302.7977	202.0031	211.6673	328.6375	499.0609	658.4273	788.8228 (97)
Space heating kWh	244.7195	176.7507	140.5426	73.2327	29.8179	0.0000	0.0000	0.0000	0.0000	63.6184	154.4605	251.9741 (98a)
Space heating requirement - total per year (kWh/year)												1135.1165
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	244.7195	176.7507	140.5426	73.2327	29.8179	0.0000	0.0000	0.0000	0.0000	63.6184	154.4605	251.9741 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1135.1165
Space heating per m ²										(98c) / (4) =		22.5669 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	244.7195	176.7507	140.5426	73.2327	29.8179	0.0000	0.0000	0.0000	0.0000	63.6184	154.4605	251.9741 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	265.1349	191.4959	152.2672	79.3421	32.3054	0.0000	0.0000	0.0000	0.0000	68.9257	167.3462	272.9947 (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	192.7889	170.6179	181.7141	161.0180	156.8963	142.2710	141.1326	146.2831	147.3700	163.2413	172.2162	190.8632 (64)
Efficiency of water heater (217)m	84.5958	84.1391	83.4904	82.4112	81.1129	79.8000	79.8000	79.8000	79.8000	82.1344	83.8166	79.8000 (216)
Fuel for water heating, kWh/month	227.8942	202.7808	217.6468	195.3836	193.4296	178.2845	176.8579	183.3121	184.6741	198.7489	205.4679	225.3839 (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	16.3863	13.1457	11.8362	8.6717	6.6983	5.4726	6.1104	7.9425	10.3166	13.5359	15.2888	16.8417 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-13.6309	-20.2773	-30.7412	-36.5291	-41.1420	-39.0690	-38.6181	-35.5985	-30.5608	-24.0636	-15.3659	-11.6660 (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)

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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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.7814	-10.2931	-20.8967	-32.0302	-42.9765	-43.3895	-35.9756	-25.9837	-14.9022	-6.4436	-3.7620	(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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											1229.8120	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											79.8000	
Water heating fuel used											2389.8643	(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)											132.2467	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-621.5509	(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											3216.3722	(238)

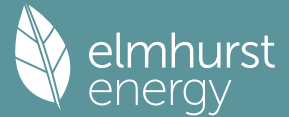
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1229.8120	0.2100	258.2605	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2389.8643	0.2100	501.8715	(264)
Space and water heating			760.1320	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.2467	0.1443	19.0873	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-337.2625	0.1335	-45.0088	
PV Unit electricity exported	-284.2884	0.1253	-35.6267	
Total			-80.6355	(269)
Total CO2, kg/year			710.5130	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1300	(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	1229.8120	1.1300	1389.6876	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2389.8643	1.1300	2700.5467	(278)
Space and water heating			4090.2343	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.2467	1.5338	202.8444	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-337.2625	1.4932	-503.5857	
PV Unit electricity exported	-284.2884	0.4600	-130.7670	
Total			-634.3527	(283)
Total Primary energy kWh/year			3788.8268	(286)
Target Primary Energy Rate (TPER)			75.3200	(287)

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Plot Reference	Plot 18				Issued on Date	22/12/2025	
Assessment Reference	Plot 18			Plot Type Ref			
Plot Address	Flat 5, 8 Cross Road Manchester, M21 9SB				SAP Version	10.2	
SAP Rating	89 B	DER	3.25	TER	14.13		
Environmental	98 A	% DER < TER				77.00	
CO ₂ Emissions (t/year)	0.14	DFEE	21.17	TFEE	30.23		
Compliance Check	See BREL	% DFEE < TFEE				29.96	
% DPER < TPER	54.52	DPER	34.26	TPER	75.32		
Assessor Details	Daniel Smith				Assessor ID	CJ06-0001	
Client	J Greenwood (Builders) Limited, Steve Brown						

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.3000 (1b)	2.5000 (2b)	125.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.7500 (5)

2. Ventilation rate

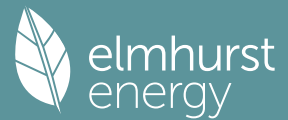
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1590 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.8400 (17)
Infiltration rate	0.3010 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2559 (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 infilt rate	0.3263	0.3199	0.3135	0.2815	0.2751	0.2431	0.2431	0.2367	0.2559	0.2751	0.2879	0.3007 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5532	0.5512	0.5491	0.5396	0.5378	0.5295	0.5295	0.5280	0.5327	0.5378	0.5414	0.5452 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window N/E			1.8400	1.3258	2.4394		(27)
Window S/W			5.7300	1.3258	7.5966		(27)
EXT Wall	26.0200	7.5700	18.4500	0.1800	3.3210	110.0000	2029.5001 (29a)
Flat Roof	14.2400		14.2400	0.1500	2.1360	9.0000	128.1600 (30)
Total net area of external elements Aum(A, m ²)			40.2600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.4930		(33)
Main dwelling							
Party Wall			56.5200	0.0000	0.0000	45.0000	2543.4000 (32)
Corridor			24.9200	0.0000	0.0000	45.0000	1121.4000 (32)
Party Floor			50.3000			40.0000	2012.0000 (32d)
Party Ceiling			36.0600			30.0000	1081.8000 (32b)
Internal Wall			39.0000			9.0000	351.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9267.2601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							184.2398 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				9.7100	0.0370	0.3593	

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P4 Party wall - Roof (insulation at ceiling level)	6.9500	0.0400	0.2780
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	53.8300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0250	0.0935
E3 Sill	1.2500	0.0220	0.0275
E4 Jamb	7.5400	0.0170	0.1282
E16 Corner (normal)	5.3600	0.0420	0.2251
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E9 Balcony between dwellings, wall insulation continuous	4.9800	0.1500	0.7470
E24 Eaves (insulation at ceiling level - inverted)	6.7600	0.1500	1.0140
E15 Flat roof with parapet	16.7900	0.1320	2.2163
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.4212 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	20.9142 (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	22.9573	22.8716	22.7875	22.3927	22.3188	21.9749	21.9749	21.9112	22.1074	22.3188	22.4682	22.6245 (38)
Average = Sum(39)m / 12 =	43.8715	43.7857	43.7017	43.3068	43.2329	42.8890	42.8890	42.8254	43.0215	43.2329	43.3824	43.5386 (39)
												43.3065
HLP	0.8722	0.8705	0.8688	0.8610	0.8595	0.8527	0.8527	0.8514	0.8553	0.8595	0.8625	0.8656 (40)
HLP (average)												0.8610
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6989 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111 (42b)
Hot water usage for other uses	32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288 (42c)
Average daily hot water use (litres/day)												50.2453 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	54.8169	53.3138	51.6725	49.6291	47.8064	45.9121	45.5181	47.1560	48.8360	50.7814	52.8429	54.7399 (44)
Distribution loss (46)m = 0.15 x (45)m	86.8166	75.9182	79.4188	67.9398	64.3567	56.4543	55.0501	58.3890	60.2196	68.9098	75.2844	85.7095 (45)
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 (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 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	73.7941	64.5304	67.5060	57.7488	54.7032	47.9862	46.7926	49.6306	51.1867	58.5733	63.9917	72.8530 (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	73.7941	64.5304	67.5060	57.7488	54.7032	47.9862	46.7926	49.6306	51.1867	58.5733	63.9917	72.8530 (64)
12Total per year (kWh/year)												709.2967 (64)
Electric shower(s)	42.2080	37.6077	41.0661	39.1889	39.9243	38.0839	39.3533	39.9243	39.1889	41.0661	40.2939	42.2080 (64a)
Heat gains from water heating, kWh/month	29.0005	25.5345	27.1430	24.2344	23.6569	21.5175	21.5365	22.3887	22.5939	24.9099	26.0714	28.7653 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 480.1132 (64a)												

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	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.8635	87.3132	78.8635	81.4923	78.8635	81.4923	78.8635	78.8635	81.4923	78.8635	81.4923	78.8635 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947 (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)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)	38.9792	37.9978	36.4826	33.6589	31.7968	29.8854	28.9469	30.0924	31.3804	33.4810	36.2103	38.6630 (72)
Total internal gains	314.3399	323.3441	309.5087	301.0741	286.1821	277.1238	267.0257	266.6353	274.4226	282.1341	297.8934	307.4929 (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				1.8400	10.6334	0.4000	0.0000	0.7700	6.0262 (74)			
South				5.7300	46.7521	0.4000	0.0000	0.7700	82.5099 (78)			
Solar gains	88.5361	146.6463	191.7006	225.9789	245.0720	240.4285	232.9445	218.6981	203.3401	159.4590	105.2364	76.3199 (83)
Total gains	402.8759	469.9903	501.2093	527.0530	531.2540	517.5523	499.9702	485.3335	477.7627	441.5931	403.1298	383.8128 (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	58.6768	58.7917	58.9048	59.4419	59.5435	60.0209	60.0209	60.1101	59.8361	59.5435	59.3383	59.1254	
alpha	4.9118	4.9194	4.9270	4.9628	4.9696	5.0014	5.0014	5.0073	4.9891	4.9696	4.9559	4.9417	
util living area	0.9754	0.9501	0.9123	0.8299	0.7000	0.5197	0.3756	0.4032	0.5981	0.8399	0.9504	0.9799 (86)	
MIT	20.0237	20.2570	20.4925	20.7503	20.9129	20.9840	20.9974	20.9963	20.9679	20.7730	20.3665	19.9770 (87)	
Th 2	20.1912	20.1927	20.1941	20.2008	20.2021	20.2079	20.2079	20.2090	20.2057	20.2021	20.1995	20.1969 (88)	
util rest of house	0.9703	0.9404	0.8957	0.8000	0.6534	0.4593	0.3089	0.3352	0.5369	0.8057	0.9391	0.9757 (89)	
MIT 2	19.3109	19.5382	19.7640	20.0055	20.1432	20.1998	20.2070	20.2077	20.1879	20.0310	19.6530	19.2698 (90)	
Living area fraction	fLA = Living area / (4) =												0.5352 (91)
MIT	19.6924	19.9229	20.1539	20.4041	20.5551	20.6195	20.6300	20.6297	20.6054	20.4281	20.0349	19.6483 (92)	
Temperature adjustment													0.0000
adjusted MIT	19.6924	19.9229	20.1539	20.4041	20.5551	20.6195	20.6300	20.6297	20.6054	20.4281	20.0349	19.6483 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9665	0.9367	0.8948	0.8080	0.6746	0.4910	0.3446	0.3715	0.5682	0.8160	0.9365	0.9722 (94)
Useful gains	389.3830	440.2524	448.4865	425.8763	358.3818	254.1162	172.2857	180.3212	271.4870	360.3595	377.5145	373.1286 (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	675.2863	657.7865	596.6982	498.2077	382.8329	258.1710	172.8443	181.1397	279.8712	424.8990	561.1451	672.5975 (97)
Space heating kWh	212.7121	146.1829	110.2695	52.0786	18.1916	0.0000	0.0000	0.0000	0.0000	48.0174	132.2140	222.8049 (98a)
Space heating requirement - total per year (kWh/year)												942.4711
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	212.7121	146.1829	110.2695	52.0786	18.1916	0.0000	0.0000	0.0000	0.0000	48.0174	132.2140	222.8049 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												942.4711
Space heating per m2	(98c) / (4) =											18.7370 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	403.1571	317.3790	325.4728	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9421	0.9729	0.9668	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	379.8187	308.7639	314.6554	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	573.6952	554.8174	539.2545	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	139.5910	183.0638	167.1018	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.8978	45.7660	41.7754	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												122.4392 (107)
Energy for space heating												18.7370 (99)
Energy for space cooling												2.4342 (108)
Total												21.1712 (109)
Fabric Energy Efficiency (DFEE)												21.2 (109)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022) CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

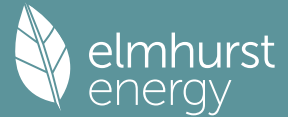
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	50.3000 (1b)	x 2.5000 (2b)	= 125.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	125.7500 (5)

2. Ventilation rate

m3 per hour		
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	20.0000 / (5) =	0.1590 (8)
Pressure test												Yes		
Pressure Test Method												Blower Door		
Measured/design AP50													5.0000 (17)	
Infiltration rate													0.4090 (18)	
Number of sides sheltered													2 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =												0.8500 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =												0.3477 (21)	

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind factor	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)		
Adj infilt rate	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)		
	0.4433	0.4346	0.4259	0.3825	0.3738	0.3303	0.3303	0.3216	0.3477	0.3738	0.3911	0.4085 (22b)		
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)		
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)		
Effective ac	0.5983	0.5944	0.5907	0.5731	0.5699	0.5546	0.5546	0.5517	0.5604	0.5699	0.5765	0.5835 (25)		

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opening Type			7.5700	1.1450	8.6679			(27)
EXT Wall	26.0200	7.5700	18.4500	0.1800	3.3210			(29a)
Flat Roof	14.2400		14.2400	0.1100	1.5664			(30)
Total net area of external elements Aum(A, m2)			40.2600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	13.5553			(33)
Main dwelling								
Party Wall			56.5200	0.0000	0.0000			(32)
Corridor			24.9200	0.0000	0.0000			(32)

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

184.2398 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	9.7100	0.0700	0.6797	
P4 Party wall - Roof (insulation at ceiling level)	6.9500	0.1200	0.8340	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	53.8300	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	3.7400	0.0500	0.1870	
E3 Sill	1.2500	0.0500	0.0625	
E4 Jamb	7.5400	0.0500	0.3770	
E16 Corner (normal)	5.3600	0.0900	0.4824	
E18 Party wall between dwellings	5.3600	0.0600	0.3216	
E25 Staggered party wall between dwellings	5.3600	0.0600	0.3216	
E9 Balcony between dwellings, wall insulation continuous	4.9800	0.0200	0.0996	
E24 Eaves (insulation at ceiling level - inverted)	6.7600	0.2400	1.6224	
E15 Flat roof with parapet	16.7900	0.5600	9.4024	

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

14.3902 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 27.9455 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

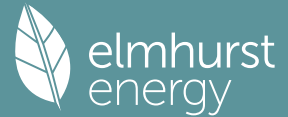
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat transfer coeff	24.8262	24.6679	24.5127	23.7838	23.6474	23.0125	23.0125	22.8949	23.2570	23.6474	23.9233	24.2117 (38)		
Average = Sum(39)m / 12 =	52.7718	52.6135	52.4583	51.7293	51.5929	50.9580	50.9580	50.8404	51.2026	51.5929	51.8688	52.1573 (39)		
												51.7286		

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP (average)	1.0491	1.0460	1.0429	1.0284	1.0257	1.0131	1.0131	1.0107	1.0179	1.0257	1.0312	1.0369 (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												1.6989 (42)		
Hot water usage for mixer showers														
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)		
Hot water usage for other uses	22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111 (42b)		
Average daily hot water use (litres/day)	32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288 (42c)		
												50.2453 (43)		
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	54.8169	53.3138	51.6725	49.6291	47.8064	45.9121	45.5181	47.1560	48.8360	50.7814	52.8429	54.7399 (44)		
Energy content (annual)	86.8166	75.9182	79.4188	67.9398	64.3567	56.4543	55.0501	58.3890	60.2196	68.9098	75.2844	85.7095 (45)		
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m =	834.4667	
Water storage loss (or HIU 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 (46)		
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)		
Total heat required for water heating calculated for each month	73.7941	64.5304	67.5060	57.7488	54.7032	47.9862	46.7926	49.6306	51.1867	58.5733	63.9917	72.8530 (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	73.7941	64.5304	67.5060	57.7488	54.7032	47.9862	46.7926	49.6306	51.1867	58.5733	63.9917	72.8530 (64)		
												709.2967 (64)		
12Total per year (kWh/year)												709		
Electric shower(s)	42.2080	37.6077	41.0661	39.1889	39.9243	38.0839	39.3533	39.9243	39.1889	41.0661	40.2939	42.2080 (64a)		
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	480.1132 (64a)	
Heat gains from water heating, kWh/month														

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29.0005 25.5345 27.1430 24.2344 23.6569 21.5175 21.5365 22.3887 22.5939 24.9099 26.0714 28.7653 (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	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.8635	87.3132	78.8635	81.4923	78.8635	81.4923	78.8635	78.8635	81.4923	78.8635	81.4923	78.8635	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	(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)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	(71)
Water heating gains (Table 5)	38.9792	37.9978	36.4826	33.6589	31.7968	29.8854	28.9469	30.0924	31.3804	33.4810	36.2103	38.6630	(72)
Total internal gains	314.3399	323.3441	309.5087	301.0741	286.1821	277.1238	267.0257	266.6353	274.4226	282.1341	297.8934	307.4929	(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					1.8400	10.6334	0.6300	0.7000			0.7700	5.9795 (74)
South					5.7300	46.7521	0.6300	0.7000			0.7700	81.8705 (78)
Solar gains	87.8499	145.5098	190.2149	224.2276	243.1727	238.5651	231.1391	217.0032	201.7642	158.2232	104.4208	75.7284 (83)
Total gains	402.1898	468.8538	499.7236	525.3017	529.3547	515.6890	498.1649	483.6385	476.1868	440.3573	402.3142	383.2213 (84)

7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
tau	48.7806	48.9274	49.0721	49.7637	49.8952	50.5169	50.5169	50.6337	50.2756	49.8952	49.6298	49.3553	
alpha	4.2520	4.2618	4.2715	4.3176	4.3263	4.3678	4.3678	4.3756	4.3517	4.3263	4.3087	4.2904	
util living area	0.9803	0.9624	0.9360	0.8756	0.7703	0.5981	0.4424	0.4729	0.6764	0.8828	0.9625	0.9836	(86)
MIT	19.6585	19.9088	20.1920	20.5405	20.8005	20.9508	20.9894	20.9857	20.9135	20.5906	20.0768	19.6207	(87)
Th 2	20.0426	20.0452	20.0477	20.0597	20.0620	20.0724	20.0724	20.0744	20.0684	20.0620	20.0574	20.0527	(88)
util rest of house	0.9759	0.9543	0.9218	0.8481	0.7212	0.5232	0.3527	0.3825	0.6050	0.8516	0.9529	0.9799	(89)
MIT 2	18.8353	19.0819	19.3580	19.6950	19.9245	20.0473	20.0690	20.0694	20.0198	19.7485	19.2588	18.8059	(90)
Living area fraction									fLA = Living area / (4) =			0.5352	(91)
MIT	19.2759	19.5245	19.8043	20.1475	20.3933	20.5308	20.5616	20.5598	20.4981	20.1992	19.6966	19.2419	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2759	19.5245	19.8043	20.1475	20.3933	20.5308	20.5616	20.5598	20.4981	20.1992	19.6966	19.2419	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9714	0.9489	0.9177	0.8510	0.7395	0.5611	0.4005	0.4306	0.6392	0.8567	0.9485	0.9758	(94)
Useful gains	390.6846	444.9077	458.5863	447.0066	391.4773	289.3673	199.5326	208.2596	304.3857	377.2326	381.6018	373.9483	(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	790.3038	769.4447	697.9230	581.8270	448.5129	302.2222	201.8735	211.4867	327.5977	495.2504	653.3689	784.5468	(97)
Space heating kWh	297.3167	218.0889	178.0665	97.0707	42.4345	0.0000	0.0000	0.0000	0.0000	87.8052	195.6723	305.4853	(98a)
Space heating requirement - total per year (kWh/year)												1421.9400	
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	297.3167	218.0889	178.0665	97.0707	42.4345	0.0000	0.0000	0.0000	0.0000	87.8052	195.6723	305.4853	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1421.9400	
Space heating per m ²										(98c) / (4) =		28.2692	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	479.0052	377.0892	386.3872	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8778	0.9314	0.9200	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	420.4602	351.2106	355.4901	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	571.5173	552.7073	537.2735	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	108.7611	149.9135	135.2468	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.1903	37.4784	33.8117	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												98.4804	(107)
Energy for space heating												28.2692	(99)
Energy for space cooling												1.9579	(108)
Total												30.2270	(109)
Fabric Energy Efficiency (TFEE)												30.2	(109)

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Plot Reference	Plot 18			Issued on Date	22/12/2025	
Assessment Reference	Plot 18		Plot Type Ref			
Plot Address	Flat 5, 8 Cross Road Manchester, M21 9SB			SAP Version	10.2	
SAP Rating	89 B		DER	3.25	TER	14.13
Environmental	98 A		% DER < TER			77.00
CO ₂ Emissions (t/year)	0.14		DFEE	21.17	TFEE	30.23
Compliance Check	See BREL		% DFEE < TFEE			29.96
% DPER < TPER	54.52		DPER	34.26	TPER	75.32
Assessor Details	Daniel Smith			Assessor ID	CJ06-0001	
Client	J Greenwood (Builders) Limited, Steve Brown					

SAP 10 WORKSHEET FOR New Build (As Built) (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	50.3000 (1b)	2.5000 (2b)	125.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.7500 (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	2.8400	(17)
Infiltration rate	0.1420	(18)
Number of sides sheltered	2	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1207 (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	0.1539	0.1509	0.1479	0.1328	0.1298	0.1147	0.1147	0.1116	0.1207	0.1298	0.1358	0.1418 (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) =												72.0000 (23c)
Effective ac	0.2939	0.2909	0.2879	0.2728	0.2698	0.2547	0.2547	0.2516	0.2607	0.2698	0.2758	0.2818 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window N/E			1.9400	1.3258	2.4394		(27)
Window S/W			5.7300	1.3258	7.5966		(27)
EXT Wall	26.0200	7.5700	18.4500	0.1800	3.3210	110.0000	2029.5001 (29a)
Flat Roof	14.2400		14.2400	0.1500	2.1360	9.0000	128.1600 (30)
Total net area of external elements Aum(A, m ²)			40.2600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.4930		(33)
Main dwelling							
Party Wall			56.5200	0.0000	0.0000	45.0000	2543.4000 (32)
Corridor			24.9200	0.0000	0.0000	45.0000	1121.4000 (32)
Party Floor			50.3000			40.0000	2012.0000 (32d)
Party Ceiling			36.0600			30.0000	1081.8000 (32b)
Internal Wall			39.0000			9.0000	351.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9267.2601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							184.2398 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	9.7100	0.0370	0.3593
P4 Party wall - Roof (insulation at ceiling level)	6.9500	0.0400	0.2780
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	53.8300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0250	0.0935
E3 Sill	1.2500	0.0220	0.0275
E4 Jamb	7.5400	0.0170	0.1282
E16 Corner (normal)	5.3600	0.0420	0.2251
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E9 Balcony between dwellings, wall insulation continuous	4.9800	0.1500	0.7470
E24 Eaves (insulation at ceiling level - inverted)	6.7600	0.1500	1.0140
E15 Flat roof with parapet	16.7900	0.1320	2.2163
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.4212 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss		(33) + (36) + (36a) =	20.9142 (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	12.1958	12.0706	11.9454	11.3193	11.1941	10.5680	10.5680	10.4427	10.8184	11.1941	11.4445	11.6949	(38)
Heat transfer coeff	33.1100	32.9847	32.8595	32.2334	32.1082	31.4821	31.4821	31.3569	31.7326	32.1082	32.3586	32.6091	(39)
Average = Sum(39)m / 12 =												32.2021	
HLP	0.6582	0.6558	0.6533	0.6408	0.6383	0.6259	0.6259	0.6234	0.6309	0.6383	0.6433	0.6483	(40)
HLP (average)												0.6402	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6989 (42)
Hot water usage for mixer showers	52.7051	51.9130	50.7588	48.5505	46.9208	45.1034	44.0704	45.2159	46.4715	48.4228	50.6786	52.5031	(42a)
Hot water usage for baths	22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111	(42b)
Hot water usage for other uses	32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288	(42c)
Average daily hot water use (litres/day)												98.8376	(43)
Daily hot water use	107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430	(44)
Energy conte	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167	(45)
Energy content (annual)										Total = Sum(45)m =		1641.6717	
Distribution loss (46)m = 0.15 x (45)m	25.5433	22.4762	23.6150	20.1605	19.1282	16.7871	16.2524	17.1563	17.6285	20.1929	22.1228	25.1875	(46)
Water storage loss (or HIU loss):												201.0000	(47)
Store volume												1.6100	(48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400	(49)
Temperature factor from Table 2b												0.8694	(55)
Enter (49) or (54) in (55)													
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681	(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	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1959.0027	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	56.6210	49.8223	52.3465	44.6890	42.4008	37.2115	36.0262	38.0299	39.0766	44.7609	49.0389	55.8323	(65)

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

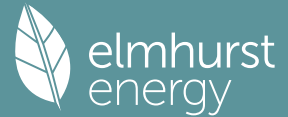
Metabolic gains (Table 5), Watts													
(66)m	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.8635	87.3132	78.8635	81.4923	78.8635	81.4923	78.8635	78.8635	81.4923	78.8635	81.4923	78.8635	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	(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)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	(71)
Water heating gains (Table 5)	76.1034	74.1404	70.3583	62.0681	56.9903	51.6826	48.4223	51.1155	54.2731	60.1624	68.1095	75.0434	(72)
Total internal gains	351.4641	359.4866	343.3844	329.4833	311.3755	298.9210	286.5012	287.6584	297.3152	308.8156	329.7926	343.8733	(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	1.8400	10.6334	0.4000	0.0000	0.7700	6.0262 (74)

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Efficiency of water heater	349.4100	
Water heating fuel used	560.6602 (219)	
Space cooling fuel	0.0000 (221)	
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)		
mechanical ventilation fans (SFP = 0.7500)	115.0612 (230a)	
Total electricity for the above, kWh/year	115.0612 (231)	
Electricity for lighting (calculated in Appendix L)	117.8308 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000 (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	1118.0215 (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	324.4693	0.1588	51.5180 (261)	
Space heating - main system 2	0.0000	0.0000	0.0000 (262)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	560.6602	0.1411	79.1169 (264)	
Space and water heating			130.6349 (265)	
Pumps, fans and electric keep-hot	115.0612	0.1387	15.9604 (267)	
Energy for lighting	117.8308	0.1443	17.0066 (268)	
Total CO2, kg/year			163.6020 (272)	
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2500 (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	324.4693	1.5877	515.1598 (275)	
Space heating - main system 2	0.0000	0.0000	0.0000 (276)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	560.6602	1.5218	853.2118 (278)	
Space and water heating			1368.3716 (279)	
Pumps, fans and electric keep-hot	115.0612	1.5128	174.0647 (281)	
Energy for lighting	117.8308	1.5338	180.7328 (282)	
Total Primary energy kWh/year			1723.1691 (286)	
Dwelling Primary energy Rate (DPER)			34.2600 (287)	

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

1. Overall dwelling characteristics

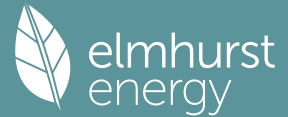
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	50.3000 (1b)	x 2.5000 (2b)	= 125.7500 (1b) - (3b)	
Ground floor				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	125.7500 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1590 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4090	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3477 (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	0.4433	0.4346	0.4259	0.3825	0.3738	0.3303	0.3303	0.3216	0.3477	0.3738	0.3911	0.4085 (22b)

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Effective ac 0.5983 0.5944 0.5907 0.5731 0.5699 0.5546 0.5546 0.5517 0.5604 0.5699 0.5765 0.5835 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			7.5700	1.1450	8.6679		(27)
EXT Wall	26.0200	7.5700	18.4500	0.1800	3.3210		(29a)
Flat Roof	14.2400		14.2400	0.1100	1.5664		(30)
Total net area of external elements Aum(A, m2)			40.2600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	13.5553		(33)
Main dwelling							
Party Wall			56.5200	0.0000	0.0000		(32)
Corridor			24.9200	0.0000	0.0000		(32)

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

184.2398 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	9.7100	0.0700	0.6797
P4 Party wall - Roof (insulation at ceiling level)	6.9500	0.1200	0.8340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	53.8300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0500	0.1870
E3 Sill	1.2500	0.0500	0.0625
E4 Jamb	7.5400	0.0500	0.3770
E16 Corner (normal)	5.3600	0.0900	0.4824
E18 Party wall between dwellings	5.3600	0.0600	0.3216
E25 Staggered party wall between dwellings	5.3600	0.0600	0.3216
E9 Balcony between dwellings, wall insulation continuous	4.9800	0.0200	0.0996
E24 Eaves (insulation at ceiling level - inverted)	6.7600	0.2400	1.6224
E15 Flat roof with parapet	16.7900	0.5600	9.4024

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

14.3902 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 27.9455 (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	24.8262	24.6679	24.5127	23.7838	23.6474	23.0125	23.0125	22.8949	23.2570	23.6474	23.9233	24.2117
Heat transfer coeff	52.7718	52.6135	52.4583	51.7293	51.5929	50.9580	50.9580	50.8404	51.2026	51.5929	51.8688	52.1573
Average = Sum(39)m / 12 =						50.9580	50.9580	50.8404	51.2026	51.5929	51.8688	52.1573

51.7286

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0491	1.0460	1.0429	1.0284	1.0257	1.0131	1.0131	1.0107	1.0179	1.0257	1.0312	1.0369
HLP (average)												1.0284
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

1.6989 (42)

Hot water usage for mixer showers	52.7051	51.9130	50.7588	48.5505	46.9208	45.1034	44.0704	45.2159	46.4715	48.4228	50.6786	52.5031
Hot water usage for baths	22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111
Hot water usage for other uses	32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288
Average daily hot water use (litres/day)						26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430
Energy conte	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167
Energy content (annual)										Total = Sum(45)m =		1641.6717

Distribution loss (46)m = 0.15 x (45)m

25.5433 22.4762 23.6150 20.1605 19.1282 16.7871 16.2524 17.1563 17.6285 20.1929 22.1228 25.1875 (46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (56)

If cylinder contains dedicated solar storage

23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month

216.8835 191.9273 204.0281 179.4949 174.1160 157.0061 154.9444 160.9706 162.6155 181.2140 192.5771 214.5116 (62)

WWHRS -24.0946 -21.3094 -22.3140 -18.4769 -17.2198 -14.7351 -13.8118 -14.6875 -15.2455 -17.9728 -20.3609 -23.6484 (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

192.7889 170.6179 181.7141 161.0180 156.8963 142.2710 141.1326 146.2831 147.3700 163.2413 172.2162 190.8632 (64)

Total per year (kWh/year) = Sum(64)m = 1966.4125 (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

93.8969 83.4909 89.6225 80.7625 79.6767 73.2850 73.3021 75.3058 75.1501 82.0368 85.1123 93.1082 (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	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

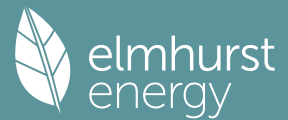
78.8635 87.3132 78.8635 81.4923 78.8635 81.4923 78.8635 78.8635 81.4923 78.8635 81.4923 78.8635 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

148.0131 149.5490 145.6785 137.4388 127.0376 117.2620 110.7313 109.1954 113.0658 121.3055 131.7067 141.4824 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

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Pumps, fans	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	31.4947 0.0000	31.4947 0.0000	31.4947 0.0000	31.4947 0.0000	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	(69) 3.0000 (70)
Losses e.g. evaporation	(negative values) (Table 5)												
Water heating gains	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	(71)
Total internal gains	126.2055	124.2424	120.4603	112.1701	107.0923	101.7847	98.5244	101.2175	104.3751	110.2645	118.2116	125.1455	(72)
	404.5661	412.5887	396.4864	382.5853	364.4776	349.0231	336.6032	337.7605	347.4173	361.9176	382.8947	396.9754	(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					1.8400	10.6334	0.6300	0.7000	0.7700			5.9795 (74)
South					5.7300	46.7521	0.6300	0.7000	0.7700			81.8705 (78)
Solar gains	87.8499	145.5098	190.2149	224.2276	243.1727	238.5651	231.1391	217.0032	201.7642	158.2232	104.4208	75.7284 (83)
Total gains	492.4161	558.0984	586.7014	606.8129	607.6502	587.5882	567.7424	554.7637	549.1815	520.1408	487.3155	472.7038 (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	48.7806	48.9274	49.0721	49.7637	49.8952	50.5169	50.5169	50.6337	50.2756	49.8952	49.6298	49.3553
alpha	4.2520	4.2618	4.2715	4.3176	4.3263	4.3678	4.3678	4.3756	4.3517	4.3263	4.3087	4.2904
util living area	0.9610	0.9352	0.8988	0.8243	0.7061	0.5353	0.3908	0.4159	0.6062	0.8247	0.9315	0.9661 (86)
MIT	19.8760	20.1036	20.3564	20.6520	20.8594	20.9678	20.9934	20.9913	20.9434	20.7019	20.2613	19.8410 (87)
Th 2	20.0426	20.0452	20.0477	20.0597	20.0620	20.0724	20.0724	20.0744	20.0684	20.0620	20.0574	20.0527 (88)
util rest of house	0.9529	0.9224	0.8791	0.7912	0.6542	0.4648	0.3104	0.3348	0.5363	0.7856	0.9159	0.9590 (89)
MIT 2	18.7647	19.0475	19.3577	19.7145	19.9415	20.0519	20.0698	20.0706	20.0290	19.7793	19.2561	18.7286 (90)
Living area fraction	19.3594	19.6127	19.8922	20.2162	20.4328	20.5421	20.5641	20.5634	20.5184	20.2731	19.7941	19.3239 (92)
MIT	19.3594	19.6127	19.8922	20.2162	20.4328	20.5421	20.5641	20.5634	20.5184	20.2731	19.7941	19.3239 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3594	19.6127	19.8922	20.2162	20.4328	20.5421	20.5641	20.5634	20.5184	20.2731	19.7941	19.3239 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9459	0.9157	0.8755	0.7971	0.6755	0.5011	0.3533	0.3780	0.5709	0.7951	0.9109	0.9523 (94)
Useful gains	465.7899	511.0665	513.6292	483.6680	410.4704	294.4499	200.5714	209.7245	313.5429	413.5522	443.8988	450.1479 (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	794.7139	774.0884	702.5306	585.3801	450.5482	302.7977	202.0031	211.6673	328.6375	499.0609	658.4273	788.8228 (97)
Space heating kWh	244.7195	176.7507	140.5426	73.2327	29.8179	0.0000	0.0000	0.0000	0.0000	63.6184	154.4605	251.9741 (98a)
Space heating requirement - total per year (kWh/year)												1135.1165
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	244.7195	176.7507	140.5426	73.2327	29.8179	0.0000	0.0000	0.0000	0.0000	63.6184	154.4605	251.9741 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1135.1165
Space heating per m ²										(98c) / (4) =		22.5669 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	244.7195	176.7507	140.5426	73.2327	29.8179	0.0000	0.0000	0.0000	0.0000	63.6184	154.4605	251.9741 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	265.1349	191.4959	152.2672	79.3421	32.3054	0.0000	0.0000	0.0000	0.0000	68.9257	167.3462	272.9947 (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	192.7889	170.6179	181.7141	161.0180	156.8963	142.2710	141.1326	146.2831	147.3700	163.2413	172.2162	190.8632 (64)
Efficiency of water heater (217)m	84.5958	84.1391	83.4904	82.4112	81.1129	79.8000	79.8000	79.8000	79.8000	82.1344	83.8166	79.8000 (216)
Fuel for water heating, kWh/month	227.8942	202.7808	217.6468	195.3836	193.4296	178.2845	176.8579	183.3121	184.6741	198.7489	205.4679	225.3839 (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	16.3863	13.1457	11.8362	8.6717	6.6983	5.4726	6.1104	7.9425	10.3166	13.5359	15.2888	16.8417 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-13.6309	-20.2773	-30.7412	-36.5291	-41.1420	-39.0690	-38.6181	-35.5985	-30.5608	-24.0636	-15.3659	-11.6660 (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)

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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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.7814	-10.2931	-20.8967	-32.0302	-42.9765	-43.3895	-35.9756	-25.9837	-14.9022	-6.4436	-3.7620	(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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											1229.8120	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											79.8000	
Water heating fuel used											2389.8643	(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)											132.2467	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-621.5509	(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											3216.3722	(238)

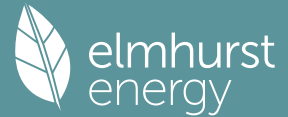
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1229.8120	0.2100	258.2605	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2389.8643	0.2100	501.8715	(264)
Space and water heating			760.1320	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.2467	0.1443	19.0873	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-337.2625	0.1335	-45.0088	
PV Unit electricity exported	-284.2884	0.1253	-35.6267	
Total			-80.6355	(269)
Total CO2, kg/year			710.5130	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1300	(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	1229.8120	1.1300	1389.6876	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2389.8643	1.1300	2700.5467	(278)
Space and water heating			4090.2343	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.2467	1.5338	202.8444	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-337.2625	1.4932	-503.5857	
PV Unit electricity exported	-284.2884	0.4600	-130.7670	
Total			-634.3527	(283)
Total Primary energy kWh/year			3788.8268	(286)
Target Primary Energy Rate (TPER)			75.3200	(287)

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Plot Reference	Plot 18				Issued on Date	22/12/2025	
Assessment Reference	Plot 18			Plot Type Ref			
Plot Address	Flat 5, 8 Cross Road Manchester, M21 9SB				SAP Version	10.2	
SAP Rating	89 B	DER	3.25	TER	14.13		
Environmental	98 A	% DER < TER				77.00	
CO ₂ Emissions (t/year)	0.14	DFEE	21.17	TFEE	30.23		
Compliance Check	See BREL	% DFEE < TFEE				29.96	
% DPER < TPER	54.52	DPER	34.26	TPER	75.32		
Assessor Details	Daniel Smith				Assessor ID	CJ06-0001	
Client	J Greenwood (Builders) Limited, Steve Brown						

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.3000 (1b)	2.5000 (2b)	125.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.7500 (5)

2. Ventilation rate

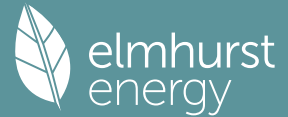
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	2.8400 (17)
Infiltration rate	0.1420 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1207 (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	0.1539	0.1509	0.1479	0.1328	0.1298	0.1147	0.1147	0.1116	0.1207	0.1298	0.1358	0.1418 (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) =												72.0000 (23c)
Effective ac	0.2939	0.2909	0.2879	0.2728	0.2698	0.2547	0.2547	0.2516	0.2607	0.2698	0.2758	0.2818 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window N/E			1.9400	1.3258	2.4394		(27)
Window S/W			5.7300	1.3258	7.5966		(27)
EXT Wall	26.0200	7.5700	18.4500	0.1800	3.3210	110.0000	2029.5001 (29a)
Flat Roof	14.2400		14.2400	0.1500	2.1360	9.0000	128.1600 (30)
Total net area of external elements Aum(A, m ²)			40.2600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 15.4930		(33)
Main dwelling							
Party Wall			56.5200	0.0000	0.0000	45.0000	2543.4000 (32)
Corridor			24.9200	0.0000	0.0000	45.0000	1121.4000 (32)
Party Floor			50.3000			40.0000	2012.0000 (32d)
Party Ceiling			36.0600			30.0000	1081.8000 (32b)
Internal Wall			39.0000			9.0000	351.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9267.2601 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							184.2398 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	9.7100	0.0370	0.3593
P4 Party wall - Roof (insulation at ceiling level)	6.9500	0.0400	0.2780
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	53.8300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0250	0.0935
E3 Sill	1.2500	0.0220	0.0275
E4 Jamb	7.5400	0.0170	0.1282
E16 Corner (normal)	5.3600	0.0420	0.2251
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E9 Balcony between dwellings, wall insulation continuous	4.9800	0.1500	0.7470
E24 Eaves (insulation at ceiling level - inverted)	6.7600	0.1500	1.0140
E15 Flat roof with parapet	16.7900	0.1320	2.2163
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.4212 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	20.9142 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	12.1958	12.0706	11.9454	11.3193	11.1941	10.5680	10.5680	10.4427	10.8184	11.1941	11.4445	11.6949 (38)
Average = Sum(39)m / 12 =	33.1100	32.9847	32.8595	32.2334	32.1082	31.4821	31.4821	31.3569	31.7326	32.1082	32.3586	32.6091 (39)
												32.2021
HLP	0.6582	0.6558	0.6533	0.6408	0.6383	0.6259	0.6259	0.6234	0.6309	0.6383	0.6433	0.6483 (40)
HLP (average)												0.6402
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6989 (42)
Hot water usage for mixer showers	52.7051	51.9130	50.7588	48.5505	46.9208	45.1034	44.0704	45.2159	46.4715	48.4228	50.6786	52.5031 (42a)
Hot water usage for baths	22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111 (42b)
Hot water usage for other uses	32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288 (42c)
Average daily hot water use (litres/day)												98.8376 (43)
Daily hot water use	107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430 (44)
Energy conte	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167 (45)
Energy content (annual)										Total = Sum(45)m =		1641.6717
Distribution loss (46)m = 0.15 x (45)m	25.5433	22.4762	23.6150	20.1605	19.1282	16.7871	16.2524	17.1563	17.6285	20.1929	22.1228	25.1875 (46)
Water storage loss (or HIU loss):												201.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8694 (55)
Enter (49) or (54) in (55)												
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (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	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (64)
								Total per year (kWh/year) = Sum(64)m =				1959.0027 (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	56.6210	49.8223	52.3465	44.6890	42.4008	37.2115	36.0262	38.0299	39.0766	44.7609	49.0389	55.8323 (65)

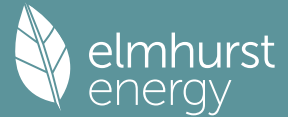
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6802	14.8152	12.0485	9.1215	6.8184	5.7564	6.2200	8.0850	10.8517	13.7787	16.0817	17.1438 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	220.9150	223.2075	217.4307	205.1326	189.6084	175.0179	165.2705	162.9781	168.7549	181.0530	196.5772	211.1677 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926 (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)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)	76.1034	74.1404	70.3583	62.0681	56.9903	51.6826	48.4223	51.1155	54.2731	60.1624	68.1095	75.0434 (72)
Total internal gains	394.5699	393.0343	380.7087	357.1934	334.2884	313.3282	300.7841	303.0499	314.7509	335.8654	361.6397	384.2261 (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	1.8400	10.6334	0.4000	0.0000	0.7700	6.0262 (74)
South	5.7300	46.7521	0.4000	0.0000	0.7700	82.5099 (78)

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Solar gains	88.5361	146.6463	191.7006	225.9789	245.0720	240.4285	232.9445	218.6981	203.3401	159.4590	105.2364	76.3199 (83)
Total gains	483.1060	539.6806	572.4093	583.1723	579.3604	553.7567	533.7286	521.7480	518.0910	495.3244	466.8762	460.5460 (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	77.7482	78.0433	78.3407	79.8624	80.1739	81.7683	81.7683	82.0948	81.1230	80.1739	79.5534	78.9424
alpha	6.1832	6.2029	6.2227	6.3242	6.3449	6.4512	6.4512	6.4730	6.4082	6.3449	6.3036	6.2628
util living area	0.9117	0.8541	0.7717	0.6504	0.5117	0.3635	0.2595	0.2764	0.4216	0.6551	0.8465	0.9250 (86)
MIT	20.6588	20.7872	20.8945	20.9674	20.9934	20.9994	20.9999	20.9999	20.9984	20.9712	20.8337	20.6295 (87)
Th 2	20.3779	20.3801	20.3823	20.3934	20.3956	20.4068	20.4068	20.4090	20.4023	20.3956	20.3912	20.3867 (88)
util rest of house	0.8989	0.8362	0.7480	0.6216	0.4795	0.3300	0.2245	0.2409	0.3855	0.6215	0.8252	0.9137 (89)
MIT 2	19.9961	20.1490	20.2732	20.3623	20.3901	20.4064	20.4067	20.4090	20.4012	20.3695	20.2161	19.9689 (90)
Living area fraction	20.3507	20.4906	20.6057	20.6861	20.7130	20.7238	20.7242	20.7252	20.7208	20.6915	20.5467	20.3224 (92)
MIT	20.3507	20.4906	20.6057	20.6861	20.7130	20.7238	20.7242	20.7252	20.7208	20.6915	20.5467	20.3224 (93)
Temperature adjustment												0.0000
adjusted MIT	20.3507	20.4906	20.6057	20.6861	20.7130	20.7238	20.7242	20.7252	20.7208	20.6915	20.5467	20.3224 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8983	0.8395	0.7568	0.6357	0.4964	0.3479	0.2432	0.2599	0.4048	0.6381	0.8309	0.9124 (94)
Useful gains	433.9694	453.0844	433.1855	370.6998	287.6084	192.6502	129.8283	135.6095	209.7117	316.0845	387.9153	420.1966 (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	531.4391	514.2510	463.5068	379.9071	289.3898	192.7892	129.8390	135.6259	210.0965	324.0214	435.1155	525.7380 (97)
Space heating kWh	72.5175	41.1040	22.5590	6.6293	1.3254	0.0000	0.0000	0.0000	0.0000	5.9050	33.9841	78.5228 (98a)
Space heating requirement - total per year (kWh/year)												262.5471
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	72.5175	41.1040	22.5590	6.6293	1.3254	0.0000	0.0000	0.0000	0.0000	5.9050	33.9841	78.5228 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												262.5471
Space heating per m2										(98c) / (4) =		5.2196 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (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	72.5175	41.1040	22.5590	6.6293	1.3254	0.0000	0.0000	0.0000	0.0000	5.9050	33.9841	78.5228 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	72.5175	41.1040	22.5590	6.6293	1.3254	0.0000	0.0000	0.0000	0.0000	5.9050	33.9841	78.5228 (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)
Space heating fuel used, main 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)
Water heating												
Water heating requirement	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100 (216)
Fuel for water heating, kWh/month	56.4494	49.8511	52.7703	45.9303	44.2095	39.4941	38.7227	40.4473	41.0995	46.2410	49.6744	55.7706 (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	9.7723	8.8266	9.7723	9.4571	9.7723	9.4571	9.7723	9.7723	9.4571	9.7723	9.4571	9.7723 (231)
Lighting	14.6001	11.7127	10.5460	7.7264	5.9681	4.8760	5.4443	7.0767	9.1920	12.0604	13.6222	15.0058 (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												262.5471 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												349.4100

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Water heating fuel used	560.6602 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500) mechanical ventilation fans (SFP = 0.7500)	115.0612 (230a)
Total electricity for the above, kWh/year	115.0612 (231)
Electricity for lighting (calculated in Appendix L)	117.8308 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	1056.0993 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	262.5471	16.4900	43.2940 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	560.6602	16.4900	92.4529 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	115.0612	16.4900	18.9736 (249)
Energy for lighting	117.8308	16.4900	19.4303 (250)
Additional standing charges			0.0000 (251)
Total energy cost			174.1508 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.6579 (257)
SAP value	89.3361
SAP rating (Section 12)	89 (258)
SAP band	B

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	262.5471	0.1588	41.7054 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	560.6602	0.1411	79.1169 (264)
Space and water heating			120.8223 (265)
Pumps, fans and electric keep-hot	115.0612	0.1387	15.9604 (267)
Energy for lighting	117.8308	0.1443	17.0066 (268)
Total CO2, kg/year			153.7893 (272)
CO2 emissions per m2			3.0600 (273)
EI value			97.8376
EI rating			98 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

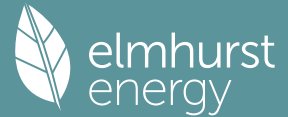
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	50.3000 (1b)	x 2.5000 (2b)	= 125.7500 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.7500 (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	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	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes

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

Blower Door
2.8400 (17)
0.1420 (18)
2 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor
(20) = 1 - [0.075 x (19)] = 0.8500 (20)
(21) = (18) x (20) = 0.1207 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.2000	4.2000	3.9000	4.0000	3.4000	3.3000	3.3000	3.4000	3.8000	3.8000	3.9000	(22)
Wind factor	1.0750	1.0500	1.0500	0.9750	1.0000	0.8500	0.8250	0.8250	0.8500	0.9500	0.9500	0.9750	(22a)
Adj infilt rate	0.1298	0.1267	0.1267	0.1177	0.1207	0.1026	0.0996	0.0996	0.1026	0.1147	0.1147	0.1177	(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) =												72.0000	(23c)
Effective ac	0.2698	0.2667	0.2667	0.2577	0.2607	0.2426	0.2396	0.2396	0.2426	0.2547	0.2547	0.2577	(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								
Window N/E			1.8400	1.3258	2.4394			(27)
Window S/W			5.7300	1.3258	7.5966			(27)
EXT Wall	26.0200	7.5700	18.4500	0.1800	3.3210	110.0000	2029.5001	(29a)
Flat Roof	14.2400		14.2400	0.1500	2.1360	9.0000	128.1600	(30)
Total net area of external elements Aum (A, m2)			40.2600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 15.4930			(33)
Main dwelling								
Party Wall			56.5200	0.0000	0.0000	45.0000	2543.4000	(32)
Corridor			24.9200	0.0000	0.0000	45.0000	1121.4000	(32)
Party Floor			50.3000			40.0000	2012.0000	(32d)
Party Ceiling			36.0600			30.0000	1081.8000	(32b)
Internal Wall			39.0000			9.0000	351.0000	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 9267.2601 (34)
184.2398 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	9.7100	0.0370	0.3593	
P4 Party wall - Roof (insulation at ceiling level)	6.9500	0.0400	0.2780	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	53.8300	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	3.7400	0.0250	0.0935	
E3 Sill	1.2500	0.0220	0.0275	
E4 Jamb	7.5400	0.0170	0.1282	
E16 Corner (normal)	5.3600	0.0420	0.2251	
E18 Party wall between dwellings	5.3600	0.0320	0.1715	
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608	
E9 Balcony between dwellings, wall insulation continuous	4.9800	0.1500	0.7470	
E24 Eaves (insulation at ceiling level - inverted)	6.7600	0.1500	1.0140	
E15 Flat roof with parapet	16.7900	0.1320	2.2163	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.4212 (36)
Point Thermal bridges			(36a) = 0.0000	
Total fabric heat loss			(33) + (36) + (36a) = 20.9142	(37)

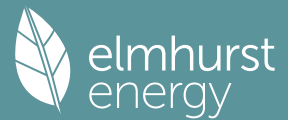
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
Jan 11.1941 Feb 11.0688 Mar 11.0688 Apr 10.6932 May 10.8184 Jun 10.0671 Jul 9.9419 Aug 9.9419 Sep 10.0671 Oct 10.5680 Nov 10.5680 Dec 10.6932 (38)
Heat transfer coeff 32.1082 31.9830 31.9830 31.6073 31.7326 30.9812 30.8560 30.8560 30.9812 31.4821 31.4821 31.6073 (39)
Average = Sum(39)m / 12 = 31.4717

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6383	0.6358	0.6358	0.6284	0.6309	0.6159	0.6134	0.6134	0.6159	0.6259	0.6259	0.6284	(40)
HLP (average)												0.6257	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6989 (42)
Hot water usage for mixer showers													
52.7051 51.9130 50.7588 48.5505 46.9208 45.1034 44.0704 45.2159 46.4715 48.4228 50.6786 52.5031 (42a)													
Hot water usage for baths													
22.7881 22.4497 21.9731 21.0944 20.4364 19.7068 19.3127 19.7859 20.3012 21.0819 21.9788 22.7111 (42b)													
Hot water usage for other uses													
32.0288 30.8641 29.6994 28.5348 27.3701 26.2054 26.2054 27.3701 28.5348 29.6994 30.8641 32.0288 (42c)													
Average daily hot water use (litres/day)													98.8376 (43)
Daily hot water use													
107.5220 105.2268 102.4314 98.1796 94.7273 91.0156 89.5885 92.3719 95.3074 99.2042 103.5214 107.2430 (44)													
Energy conte 170.2886 149.8416 157.4332 134.4030 127.5211 111.9143 108.3495 114.3757 117.5236 134.6191 147.4853 167.9167 (45)													
Energy content (annual)													Total = Sum(45)m = 1641.6717
Distribution loss (46)m = 0.15 x (45)m													
25.5433 22.4762 23.6150 20.1605 19.1282 16.7871 16.2524 17.1563 17.6285 20.1929 22.1228 25.1875 (46)													
Water storage loss (or HIU loss):													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss													
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)													
If cylinder contains dedicated solar storage													
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (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 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)													
Total heat required for water heating calculated for each month													
197.2400 174.1848 184.3846 160.4850 154.4725 137.9963 135.3009 141.3271 143.6056 161.5705 173.5673 194.8681 (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)													

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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	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (64)
	Total per year (kWh/year) = Sum(64)m =											1959.0027 (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	56.6210	49.8223	52.3465	44.6890	42.4008	37.2115	36.0262	38.0299	39.0766	44.7609	49.0389	55.8323 (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	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6802	14.8152	12.0485	9.1215	6.8184	5.7564	6.2200	8.0850	10.8517	13.7787	16.0817	17.1438	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	220.9150	223.2075	217.4307	205.1326	189.6084	175.0179	165.2705	162.9781	168.7549	181.0530	196.5772	211.1677	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	(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)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	(71)
Water heating gains (Table 5)	76.1034	74.1404	70.3583	62.0681	56.9903	51.6826	48.4223	51.1155	54.2731	60.1624	68.1095	75.0434	(72)
Total internal gains	394.5699	393.0343	380.7087	357.1934	334.2884	313.3282	300.7841	303.0499	314.7509	335.8654	361.6397	384.2261	(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					1.8400	9.3942	0.4000	0.0000	0.7700					5.3239 (74)
South					5.7300	41.2355	0.4000	0.0000	0.7700					72.7741 (78)
Solar gains	78.0980	132.6870	181.2315	217.9821	230.6766	231.7245	219.0857	202.9931	197.5428	151.7809	95.3961			68.8570 (83)
Total gains	472.6679	525.7213	561.9402	575.1755	564.9650	545.0527	519.8699	506.0430	512.2937	487.6463	457.0358	453.0832	(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	80.1739	80.4877	80.4877	81.4444	81.1230	83.0902	83.4274	83.4274	83.0902	81.7683	81.7683	81.4444	
alpha	6.3449	6.3658	6.3658	6.4296	6.4082	6.5393	6.5618	6.5618	6.5393	6.4512	6.4512	6.4296	
util living area	0.8924	0.8282	0.7337	0.5998	0.4534	0.3012	0.2196	0.2378	0.3806	0.6144	0.8175	0.9080	(86)
MIT	20.7393	20.8451	20.9308	20.9821	20.9972	20.9999	21.0000	21.0000	20.9993	20.9824	20.8813	20.7116	(87)
Th 2	20.3956	20.3978	20.3978	20.4045	20.4023	20.4157	20.4179	20.4179	20.4157	20.4068	20.4068	20.4045	(88)
util rest of house	0.8772	0.8080	0.7081	0.5700	0.4204	0.2680	0.1851	0.2023	0.3454	0.5799	0.7935	0.8944	(89)
MIT 2	20.1088	20.2329	20.3281	20.3882	20.4002	20.4156	20.4179	20.4179	20.4152	20.3914	20.2848	20.0842	(90)
Living area fraction									FLA = Living area / (4) =			0.5352	(91)
MIT	20.4462	20.5606	20.6506	20.7060	20.7197	20.7283	20.7294	20.7294	20.7278	20.7077	20.6040	20.4200	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4462	20.5606	20.6506	20.7060	20.7197	20.7283	20.7294	20.7294	20.7278	20.7077	20.6040	20.4200	(93)

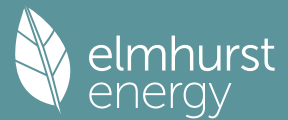
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	415.2430	427.7316	404.0329	336.5844	247.4240	155.7519	105.8162	111.9853	186.5883	291.3969	366.4180	405.4282	(94)
Ext temp.	5.2000	5.8000	7.4000	9.9000	12.9000	15.7000	17.3000	17.1000	14.7000	11.3000	7.9000	5.0000	(96)
Heat loss rate W	489.5290	472.0876	423.7951	341.5502	248.1395	155.7828	105.8187	111.9897	186.7499	296.1743	399.9493	487.3855	(97)
Space heating kWh	55.2688	29.8072	14.7030	3.5754	0.5324	0.0000	0.0000	0.0000	0.0000	3.5544	24.1425	60.9762	(98a)
Space heating requirement - total per year (kWh/year)												192.5599	
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	55.2688	29.8072	14.7030	3.5754	0.5324	0.0000	0.0000	0.0000	0.0000	3.5544	24.1425	60.9762	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												192.5599	
Space heating per m2										(98c) / (4) =		3.8282	(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)	
Fraction of main heating from main system 2												0.0000 (203)	
Fraction of total heating from main system 1												1.0000 (204)	
Fraction of total heating from main system 2												0.0000 (205)	
Efficiency of main space heating system 1 (in %)												100.0000 (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	55.2688	29.8072	14.7030	3.5754	0.5324	0.0000	0.0000	0.0000	0.0000	3.5544	24.1425	60.9762	(98)

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Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	55.2688	29.8072	14.7030	3.5754	0.5324	0.0000	0.0000	0.0000	0.0000	3.5544	24.1425	60.9762	(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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681	(64)
Efficiency of water heater												349.4100	(216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month	56.4494	49.8511	52.7703	45.9303	44.2095	39.4941	38.7227	40.4473	41.0995	46.2410	49.6744	55.7706	(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	9.7723	8.8266	9.7723	9.4571	9.7723	9.4571	9.7723	9.7723	9.4571	9.7723	9.4571	9.7723	(231)
Lighting	14.6001	11.7127	10.5460	7.7264	5.9681	4.8760	5.4443	7.0767	9.1920	12.0604	13.6222	15.0058	(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												192.5599	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												349.4100	
Water heating fuel used												560.6602	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)												115.0612	(230a)
Total electricity for the above, kWh/year												115.0612	(231)
Electricity for lighting (calculated in Appendix L)												117.8308	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(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												986.1121	(238)

10a. Fuel costs - using BEDF prices (587)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	192.5599	28.4300	54.7448	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	560.6602	28.4300	159.3957	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	115.0612	28.4300	32.7119	(249)
Energy for lighting	117.8308	28.4300	33.4993	(250)
Additional standing charges			0.0000	(251)
Total energy cost			280.3517	(255)

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	192.5599	0.1593	30.6771	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	560.6602	0.1411	79.1169	(264)
Space and water heating			109.7941	(265)
Pumps, fans and electric keep-hot	115.0612	0.1387	15.9604	(267)
Energy for lighting	117.8308	0.1443	17.0066	(268)
Total CO2, kg/year			142.7611	(272)

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	192.5599	1.5897	306.1055	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	560.6602	1.5218	853.2118	(278)
Space and water heating			1159.3173	(279)
Pumps, fans and electric keep-hot	115.0612	1.5128	174.0647	(281)
Energy for lighting	117.8308	1.5338	180.7328	(282)
Total Primary energy kWh/year			1514.1148	(286)

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SAP 10 EPC IMPROVEMENTS

Plot 18

Current energy efficiency rating: B 89
Current environmental impact rating: A 98

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures (none) Typical annual savings Energy efficiency Environmental impact
Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 587 TEST (28 Nov 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, North West England):

	Current £280	Potential £280	£0 Saving
Electricity			
Space heating	£87	£87	£0
Water heating	£159	£159	£0
Lighting	£33	£33	£0
Total cost of fuels	£280	£280	£0
Total cost of uses	£279	£279	£0
Delivered energy	20 kWh/m ²	20 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m ²	3 kg/m ²	3 kg/m ²	0 kg/m ²
Primary energy	30 kWh/m ²	30 kWh/m ²	0 kWh/m ²

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022) CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	50.3000 (1b)	x 2.5000 (2b)	= 125.7500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.7500 (5)

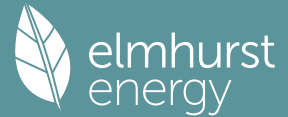
2. Ventilation rate

	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	2.8400 (17)	
Infiltration rate	0.1420 (18)	
Number of sides sheltered	2 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1207 (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	0.1539	0.1509	0.1479	0.1328	0.1298	0.1147	0.1147	0.1116	0.1207	0.1298	0.1358	0.1418 (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)

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If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 72.0000 (23c)

Effective ac 0.2939 0.2909 0.2879 0.2728 0.2698 0.2547 0.2547 0.2516 0.2607 0.2698 0.2758 0.2818 (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								
Window N/E			1.8400	1.3258	2.4394			(27)
Window S/W			5.7300	1.3258	7.5966			(27)
EXT Wall	26.0200	7.5700	18.4500	0.1800	3.3210	110.0000	2029.5001	(29a)
Flat Roof	14.2400		14.2400	0.1500	2.1360	9.0000	128.1600	(30)
Total net area of external elements Aum(A, m2)			40.2600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.4930			(33)
Main dwelling								
Party Wall			56.5200	0.0000	0.0000	45.0000	2543.4000	(32)
Corridor			24.9200	0.0000	0.0000	45.0000	1121.4000	(32)
Party Floor			50.3000			40.0000	2012.0000	(32d)
Party Ceiling			36.0600			30.0000	1081.8000	(32b)
Internal Wall			39.0000			9.0000	351.0000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9267.2601 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 184.2398 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	9.7100	0.0370	0.3593
P4 Party wall - Roof (insulation at ceiling level)	6.9500	0.0400	0.2780
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	53.8300	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0250	0.0935
E3 Sill	1.2500	0.0220	0.0275
E4 Jamb	7.5400	0.0170	0.1282
E16 Corner (normal)	5.3600	0.0420	0.2251
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E9 Balcony between dwellings, wall insulation continuous	4.9800	0.1500	0.7470
E24 Eaves (insulation at ceiling level - inverted)	6.7600	0.1500	1.0140
E15 Flat roof with parapet	16.7900	0.1320	2.2163

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.4212 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.9142 (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	12.1958	12.0706	11.9454	11.3193	11.1941	10.5680	10.5680	10.4427	10.8184	11.1941	11.4445	11.6949	(38)
Heat transfer coeff	33.1100	32.9847	32.8595	32.2334	32.1082	31.4821	31.4821	31.3569	31.7326	32.1082	32.3586	32.6091	(39)
Average = Sum(39)m / 12 =													32.2021

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6582	0.6558	0.6533	0.6408	0.6383	0.6259	0.6259	0.6234	0.6309	0.6383	0.6433	0.6483	(40)
HLP (average)													0.6402
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6989 (42)
Hot water usage for mixer showers												
52.7051	51.9130	50.7588	48.5505	46.9208	45.1034	44.0704	45.2159	46.4715	48.4228	50.6786	52.5031	(42a)
Hot water usage for baths												
22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111	(42b)
Hot water usage for other uses												
32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288	(42c)
Average daily hot water use (litres/day)												98.8376 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430	(44)
Energy conte	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167	(45)
Energy content (annual)													Total = Sum(45)m = 1641.6717

Distribution loss (46)m = 0.15 x (45)m

25.5433 22.4762 23.6150 20.1605 19.1282 16.7871 16.2524 17.1563 17.6285 20.1929 22.1228 25.1875 (46)

Water storage loss (or HIU loss):

Store volume 201.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)

Total storage loss

26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)

If cylinder contains dedicated solar storage

26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (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 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month

197.2400 174.1848 184.3846 160.4850 154.4725 137.9963 135.3009 141.3271 143.6056 161.5705 173.5673 194.8681 (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

197.2400 174.1848 184.3846 160.4850 154.4725 137.9963 135.3009 141.3271 143.6056 161.5705 173.5673 194.8681 (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)

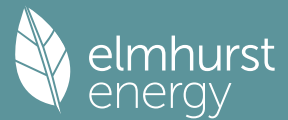
Heat gains from water heating, kWh/month

56.6210 49.8223 52.3465 44.6890 42.4008 37.2115 36.0262 38.0299 39.0766 44.7609 49.0389 55.8323 (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
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(66)m	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6802	14.8152	12.0485	9.1215	6.8184	5.7564	6.2200	8.0850	10.8517	13.7787	16.0817	17.1438	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	220.9150	223.2075	217.4307	205.1326	189.6084	175.0179	165.2705	162.9781	168.7549	181.0530	196.5772	211.1677	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	(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)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	(71)
Water heating gains (Table 5)	76.1034	74.1404	70.3583	62.0681	56.9903	51.6826	48.4223	51.1155	54.2731	60.1624	68.1095	75.0434	(72)
Total internal gains	394.5699	393.0343	380.7087	357.1934	334.2884	313.3282	300.7841	303.0499	314.7509	335.8654	361.6397	384.2261	(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					1.8400	10.6334	0.4000		0.0000		0.7700	6.0262 (74)	
South					5.7300	46.7521	0.4000		0.0000		0.7700	82.5099 (78)	
Solar gains	88.5361	146.6463	191.7006	225.9789	245.0720	240.4285	232.9445	218.6981	203.3401	159.4590	105.2364	76.3199 (83)	
Total gains	483.1060	539.6806	572.4093	583.1723	579.3604	553.7567	533.7286	521.7480	518.0910	495.3244	466.8762	460.5460 (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	77.7482	78.0433	78.3407	79.8624	80.1739	81.7683	81.7683	82.0948	81.1230	80.1739	79.5534	78.9424		
alpha	6.1832	6.2029	6.2227	6.3242	6.3449	6.4512	6.4512	6.4730	6.4082	6.3449	6.3036	6.2628		
util living area	0.9117	0.8541	0.7717	0.6504	0.5117	0.3635	0.2595	0.2764	0.4216	0.6551	0.8465	0.9250	(86)	
MIT	20.6588	20.7872	20.8945	20.9674	20.9934	20.9994	20.9999	20.9999	20.9984	20.9712	20.8337	20.6295	(87)	
Th 2	20.3779	20.3801	20.3823	20.3934	20.3956	20.4068	20.4068	20.4090	20.4023	20.3956	20.3912	20.3867	(88)	
util rest of house	0.8989	0.8362	0.7480	0.6216	0.4795	0.3300	0.2245	0.2409	0.3855	0.6215	0.8252	0.9137	(89)	
MIT 2	19.9961	20.1490	20.2732	20.3623	20.3901	20.4064	20.4067	20.4090	20.4012	20.3695	20.2161	19.9689	(90)	
Living area fraction									fLA = Living area / (4) =			0.5352	(91)	
MIT	20.3507	20.4906	20.6057	20.6861	20.7130	20.7238	20.7242	20.7252	20.7208	20.6915	20.5467	20.3224	(92)	
Temperature adjustment												0.0000		
adjusted MIT	20.3507	20.4906	20.6057	20.6861	20.7130	20.7238	20.7242	20.7252	20.7208	20.6915	20.5467	20.3224	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.8983	0.8395	0.7568	0.6357	0.4964	0.3479	0.2432	0.2599	0.4048	0.6381	0.8309	0.9124	(94)	
Ext temp.	433.9694	453.0844	433.1855	370.6998	287.6084	192.6502	129.8283	135.6095	209.7117	316.0845	387.9153	420.1966	(95)	
Heat loss rate W	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)	
Space heating kWh	531.4391	514.2510	463.5068	379.9071	289.3898	192.7892	129.8390	135.6259	210.0965	324.0214	435.1155	525.7380	(97)	
Space heating requirement - total per year (kWh/year)	72.5175	41.1040	22.5590	6.6293	1.3254	0.0000	0.0000	0.0000	0.0000	5.9050	33.9841	78.5228	(98a)	
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)	72.5175	41.1040	22.5590	6.6293	1.3254	0.0000	0.0000	0.0000	0.0000	5.9050	33.9841	78.5228	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												262.5471		
Space heating per m2										(98c) / (4) =		5.2196	(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)
Fraction of main heating from main system 2													0.0000	(203)
Fraction of total heating from main system 1													1.0000	(204)
Fraction of total heating from main system 2													0.0000	(205)
Efficiency of main space heating system 1 (in %)													100.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating efficiency (main heating system 1)	72.5175	41.1040	22.5590	6.6293	1.3254	0.0000	0.0000	0.0000	0.0000	5.9050	33.9841	78.5228	(98)	
Space heating fuel (main heating system)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating efficiency (main heating system 2)	72.5175	41.1040	22.5590	6.6293	1.3254	0.0000	0.0000	0.0000	0.0000	5.9050	33.9841	78.5228	(211)	
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	(212)	
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	(213)	
Space heating fuel used, main 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	(215)	
Water heating requirement	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681	(64)	
Efficiency of water heater	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)	
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)	

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Fuel for water heating, kWh/month	56.4494	49.8511	52.7703	45.9303	44.2095	39.4941	38.7227	40.4473	41.0995	46.2410	49.6744	55.7706 (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	9.7723	8.8266	9.7723	9.4571	9.7723	9.4571	9.7723	9.7723	9.4571	9.7723	9.4571	9.7723 (231)
Lighting	14.6001	11.7127	10.5460	7.7264	5.9681	4.8760	5.4443	7.0767	9.1920	12.0604	13.6222	15.0058 (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												262.5471 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												349.4100
Water heating fuel used												560.6602 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												115.0612 (230a)
Total electricity for the above, kWh/year												115.0612 (231)
Electricity for lighting (calculated in Appendix L)												117.8308 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (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												1056.0993 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	262.5471	16.4900	43.2940 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	560.6602	16.4900	92.4529 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	115.0612	16.4900	18.9736 (249)
Energy for lighting	117.8308	16.4900	19.4303 (250)
Additional standing charges			0.0000 (251)
Total energy cost			174.1508 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.6579 (257)
SAP value		89.3361
SAP rating (Section 12)		89 (258)
SAP band		B

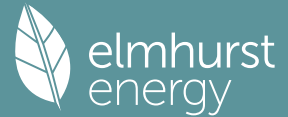
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	262.5471	0.1588	41.7054 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	560.6602	0.1411	79.1169 (264)
Space and water heating			120.8223 (265)
Pumps, fans and electric keep-hot	115.0612	0.1387	15.9604 (267)
Energy for lighting	117.8308	0.1443	17.0066 (268)
Total CO2, kg/year			153.7893 (272)
CO2 emissions per m2			3.0600 (273)
EI value			97.8376
EI rating			98 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

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Main dwelling		Area (m2)	Storey height (m)	Volume (m3)	
Ground floor		50.3000 (1b)	x 2.5000 (2b)	= 125.7500 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000				(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n)	=	125.7500 (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										0 * 10 =	0.0000 (7a)
Number of passive vents										0 * 10 =	0.0000 (7b)
Number of flueless gas fires										0 * 40 =	0.0000 (7c)
										Air changes per hour	
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											2.8400 (17)
Infiltration rate											0.1420 (18)
Number of sides sheltered											2 (19)
Shelter factor									(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =		0.1207 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	4.3000	4.2000	4.2000	3.9000	4.0000	3.4000	3.3000	3.3000	3.4000	3.8000	3.8000	3.9000	(22)
Wind factor	1.0750	1.0500	1.0500	0.9750	1.0000	0.8500	0.8250	0.8250	0.8500	0.9500	0.9500	0.9750	(22a)
Adj infilt rate	0.1298	0.1267	0.1267	0.1177	0.1207	0.1026	0.0996	0.0996	0.1026	0.1147	0.1147	0.1177	(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) =													72.0000 (23c)
Effective ac	0.2698	0.2667	0.2667	0.2577	0.2607	0.2426	0.2396	0.2396	0.2426	0.2547	0.2547	0.2577	(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								
Window N/E			1.8400	1.3258	2.4394			(27)
Window S/W			5.7300	1.3258	7.5966			(27)
EXT Wall	26.0200	7.5700	18.4500	0.1800	3.3210	110.0000	2029.5001	(29a)
Flat Roof	14.2400		14.2400	0.1500	2.1360	9.0000	128.1600	(30)
Total net area of external elements Aum(A, m2)			40.2600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.4930			(33)
Main dwelling								
Party Wall			56.5200	0.0000	0.0000	45.0000	2543.4000	(32)
Corridor			24.9200	0.0000	0.0000	45.0000	1121.4000	(32)
Party Floor			50.3000			40.0000	2012.0000	(32d)
Party Ceiling			36.0600			30.0000	1081.8000	(32b)
Internal Wall			39.0000			9.0000	351.0000	(32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9267.2601	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							184.2398	(35)

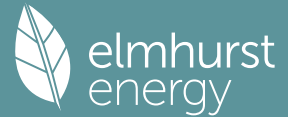
List of Thermal Bridges													
K1 Element					Length	Psi-value	Total						
E7 Party floor between dwellings (in blocks of flats)					9.7100	0.0370	0.3593						
P4 Party wall - Roof (insulation at ceiling level)					6.9500	0.0400	0.2780						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)					53.8300	0.0000	0.0000						
E2 Other lintels (including other steel lintels)					3.7400	0.0250	0.0935						
E3 Sill					1.2500	0.0220	0.0275						
E4 Jamb					7.5400	0.0170	0.1282						
E16 Corner (normal)					5.3600	0.0420	0.2251						
E18 Party wall between dwellings					5.3600	0.0320	0.1715						
E25 Staggered party wall between dwellings					5.3600	0.0300	0.1608						
E9 Balcony between dwellings, wall insulation continuous					4.9800	0.1500	0.7470						
E24 Eaves (insulation at ceiling level - inverted)					6.7600	0.1500	1.0140						
E15 Flat roof with parapet					16.7900	0.1320	2.2163						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												5.4212	(36)
Point Thermal Bridges												(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =	20.9142 (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	
	11.1941	11.0688	11.0688	10.6932	10.8184	10.0671	9.9419	9.9419	10.0671	10.5680	10.5680	10.6932	(38)
Heat transfer coeff	32.1082	31.9830	31.9830	31.6073	31.7326	30.9812	30.8560	30.8560	30.9812	31.4821	31.4821	31.6073	(39)
Average = Sum(39)m / 12 =												31.4717	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.6383	0.6358	0.6358	0.6284	0.6309	0.6159	0.6134	0.6134	0.6159	0.6259	0.6259	0.6284	(40)
HLP (average)												0.6257	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6989 (42)
Hot water usage for mixer showers													
	52.7051	51.9130	50.7588	48.5505	46.9208	45.1034	44.0704	45.2159	46.4715	48.4228	50.6786	52.5031	(42a)
Hot water usage for baths													
	22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111	(42b)

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Hot water usage for other uses	32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288 (42c)
Average daily hot water use (litres/day)												98.8376 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430 (44)
Energy content (annual)	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167 (45)
Distribution loss (46)m = 0.15 x (45)m	25.5433	22.4762	23.6150	20.1605	19.1282	16.7871	16.2524	17.1563	17.6285	20.1929	22.1228	25.1875 (46)
Water storage loss (or HIU loss):												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (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	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (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	56.6210	49.8223	52.3465	44.6890	42.4008	37.2115	36.0262	38.0299	39.0766	44.7609	49.0389	55.8323 (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	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6802	14.8152	12.0485	9.1215	6.8184	5.7564	6.2200	8.0850	10.8517	13.7787	16.0817	17.1438 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	220.9150	223.2075	217.4307	205.1326	189.6084	175.0179	165.2705	162.9781	168.7549	181.0530	196.5772	211.1677 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926 (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)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)	76.1034	74.1404	70.3583	62.0681	56.9903	51.6826	48.4223	51.1155	54.2731	60.1624	68.1095	75.0434 (72)
Total internal gains	394.5699	393.0343	380.7087	357.1934	334.2884	313.3282	300.7841	303.0499	314.7509	335.8654	361.6397	384.2261 (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					1.8400	9.3942		0.4000	0.0000	0.7700		5.3239 (74)
South					5.7300	41.2355		0.4000	0.0000	0.7700		72.7741 (78)
Solar gains	78.0980	132.6870	181.2315	217.9821	230.6766	231.7245	219.0857	202.9931	197.5428	151.7809	95.3961	68.8570 (83)
Total gains	472.6679	525.7213	561.9402	575.1755	564.9650	545.0527	519.8699	506.0430	512.2937	487.6463	457.0358	453.0832 (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	80.1739	80.4877	80.4877	81.4444	81.1230	83.0902	83.4274	83.4274	83.0902	81.7683	81.7683	81.4444
alpha	6.3449	6.3658	6.3658	6.4296	6.4082	6.5393	6.5618	6.5618	6.5393	6.4512	6.4512	6.4296
util living area	0.8924	0.8282	0.7337	0.5998	0.4534	0.3012	0.2196	0.2378	0.3806	0.6144	0.8175	0.9080 (86)
MIT	20.7393	20.8451	20.9308	20.9821	20.9972	20.9999	21.0000	21.0000	20.9993	20.9824	20.8813	20.7116 (87)
Th 2	20.3956	20.3978	20.3978	20.4045	20.4023	20.4157	20.4179	20.4179	20.4157	20.4068	20.4068	20.4045 (88)
util rest of house	0.8772	0.8080	0.7081	0.5700	0.4204	0.2680	0.1851	0.2023	0.3454	0.5799	0.7935	0.8944 (89)
MIT 2	20.1088	20.2329	20.3281	20.3882	20.4002	20.4156	20.4179	20.4179	20.4152	20.3914	20.2848	20.0842 (90)
Living area fraction	20.4462	20.5606	20.6506	20.7060	20.7197	20.7283	20.7294	20.7294	20.7278	20.7077	20.6040	20.4200 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4462	20.5606	20.6506	20.7060	20.7197	20.7283	20.7294	20.7294	20.7278	20.7077	20.6040	20.4200 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8785	0.8136	0.7190	0.5852	0.4379	0.2858	0.2035	0.2213	0.3642	0.5976	0.8017	0.8948 (94)
Ext temp.	415.2430	427.7316	404.0329	336.5844	247.4240	155.7519	105.8162	111.9853	186.5883	291.3969	366.4180	405.4282 (95)
Heat loss rate W	5.2000	5.8000	7.4000	9.9000	12.9000	15.7000	17.3000	17.1000	14.7000	11.3000	7.9000	5.0000 (96)
Space heating kWh	489.5290	472.0876	423.7951	341.5502	248.1395	155.7828	105.8187	111.9897	186.7499	296.1743	399.9493	487.3855 (97)

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Space heating requirement - total per year (kWh/year)	55.2688	29.8072	14.7030	3.5754	0.5324	0.0000	0.0000	0.0000	0.0000	3.5544	24.1425	60.9762 (98a)
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	192.5599
Solar heating contribution - total per year (kWh/year)	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)
Space heating kWh	55.2688	29.8072	14.7030	3.5754	0.5324	0.0000	0.0000	0.0000	0.0000	3.5544	24.1425	60.9762 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												192.5599
Space heating per m2										(98c) / (4) =		3.8282 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (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	55.2688	29.8072	14.7030	3.5754	0.5324	0.0000	0.0000	0.0000	0.0000	3.5544	24.1425	60.9762 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	55.2688	29.8072	14.7030	3.5754	0.5324	0.0000	0.0000	0.0000	0.0000	3.5544	24.1425	60.9762 (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)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (64)
Efficiency of water heater												349.4100 (216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100 (217)
Fuel for water heating, kWh/month	56.4494	49.8511	52.7703	45.9303	44.2095	39.4941	38.7227	40.4473	41.0995	46.2410	49.6744	55.7706 (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	9.7723	8.8266	9.7723	9.4571	9.7723	9.4571	9.7723	9.4571	9.7723	9.4571	9.7723	9.7723 (231)
Lighting	14.6001	11.7127	10.5460	7.7264	5.9681	4.8760	5.4443	7.0767	9.1920	12.0604	13.6222	15.0058 (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												192.5599 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												349.4100
Water heating fuel used												560.6602 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												115.0612 (230a)
Total electricity for the above, kWh/year												115.0612 (231)
Electricity for lighting (calculated in Appendix L)												117.8308 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (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												986.1121 (238)

10a. Fuel costs - using BEDF prices (587)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	192.5599	28.4300	54.7448 (240)
Space heating - main system 2	0.0000	28.4300	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	560.6602	28.4300	159.3957 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	115.0612	28.4300	32.7119 (249)
Energy for lighting	117.8308	28.4300	33.4993 (250)
Additional standing charges			0.0000 (251)
Total energy cost			280.3517 (255)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	192.5599	0.1593	30.6771 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	560.6602	0.1411	79.1169 (264)
Space and water heating			109.7941 (265)
Pumps, fans and electric keep-hot	115.0612	0.1387	15.9604 (267)
Energy for lighting	117.8308	0.1443	17.0066 (268)
Total CO2, kg/year			142.7611 (272)

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	192.5599	1.5897	306.1055 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	560.6602	1.5218	853.2118 (278)
Space and water heating			1159.3173 (279)
Pumps, fans and electric keep-hot	115.0612	1.5128	174.0647 (281)
Energy for lighting	117.8308	1.5338	180.7328 (282)
Total Primary energy kWh/year			1514.1148 (286)