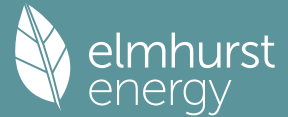


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Plot Reference	Plot 15				Issued on Date	22/12/2025	
Assessment Reference	Plot 15			Plot Type Ref			
Plot Address	Flat 4, 2 Cross Road Manchester, M21 9SU				SAP Version	10.2	
SAP Rating	90 B	DER	2.57	TER	9.59		
Environmental	98 A	% DER < TER				73.20	
CO ₂ Emissions (t/year)	0.17	DFEE	17.56	TFEE	18.32		
Compliance Check	See BREL	% DFEE < TFEE				4.18	
% DPER < TPER	46.36	DPER	27.12	TPER	50.57		
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	73.4100 (1b)	2.5000 (2b)	183.5250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	183.5250 (5)

2. Ventilation rate

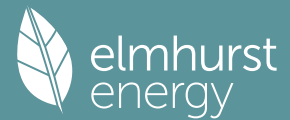
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	2.9200 (17)
Infiltration rate	0.1460 (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) = 0.1241 (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	0.1582	0.1551	0.1520	0.1365	0.1334	0.1179	0.1179	0.1148	0.1241	0.1334	0.1396	0.1458 (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	0.2982	0.2951	0.2920	0.2765	0.2734	0.2579	0.2579	0.2548	0.2641	0.2734	0.2796	0.2858 (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			3.6800	1.3258	4.8788		(27)
Window S/W			7.5200	1.3258	9.9697		(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999 (29a)
Flat Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100 (30)
Total net area of external elements Aum(A, m ²)			35.0400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.0950		(33)
Main dwelling							
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000 (32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000 (32)
Party Floor			73.4100			40.0000	2936.4000 (32d)
Party Ceiling			71.9200			30.0000	2157.6000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12092.7299 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							164.7286 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.7800	0.0370	0.6579
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	58.9800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.7700	0.0250	0.1442
E3 Sill	2.5000	0.0220	0.0550
E4 Jamb	10.4800	0.0170	0.1782
E16 Corner (normal)	2.6800	0.0420	0.1126
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E14 Flat roof	3.2300	0.1600	0.5168
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.1500	0.9390
E24 Eaves (insulation at ceiling level - inverted)	3.2300	0.1500	0.4845
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.4205 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	22.5154 (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	18.0616	17.8737	17.6858	16.7463	16.5584	15.6190	15.6190	15.4311	15.9948	16.5584	16.9342	17.3100	(38)
Heat transfer coeff	40.5771	40.3892	40.2013	39.2618	39.0739	38.1344	38.1344	37.9465	38.5102	39.0739	39.4497	39.8255	(39)
Average = Sum(39)m / 12 =												39.2148	
HLP	0.5527	0.5502	0.5476	0.5348	0.5323	0.5195	0.5195	0.5169	0.5246	0.5323	0.5374	0.5425	(40)
HLP (average)												0.5342	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766	(42a)
Hot water usage for baths	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171	(42b)
Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504	(42c)
Average daily hot water use (litres/day)												118.5607	(43)
Daily hot water use	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441	(44)
Energy conte	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255	(45)
Energy content (annual)										Total = Sum(45)m =		1969.2679	
Distribution loss (46)m = 0.15 x (45)m	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138	(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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2286.5989	(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	67.9200	59.7644	62.7920	53.6065	50.8615	44.6367	43.2151	45.6188	46.8746	53.6932	58.8248	66.9740	(65)

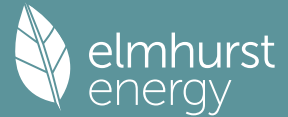
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9816	120.6582	108.9816	112.6143	108.9816	112.6143	108.9816	108.9816	112.6143	108.9816	112.6143	108.9816	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.1215	207.2500	201.8862	190.4673	176.0530	162.5056	153.4551	151.3266	156.6904	168.1093	182.5236	196.0710	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	(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)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	(71)
Water heating gains (Table 5)	91.2903	88.9350	84.3979	74.4534	68.3623	61.9954	58.0848	61.3156	65.1036	72.1683	81.7012	90.0188	(72)
Total internal gains	463.2831	474.7330	453.1555	435.4248	411.2867	395.0051	378.4113	379.5136	392.2980	407.1489	434.7288	452.9612	(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	3.6800	10.6334	0.4000	0.0000	0.7700	12.0523 (74)
South	7.5200	46.7521	0.4000	0.0000	0.7700	108.2853 (78)

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Solar gains	120.3376	200.3759	265.0420	318.1862	350.7456	346.7050	334.8143	310.1047	283.0399	218.6987	143.2230	103.6158 (83)
Total gains	583.6207	675.1090	718.1974	753.6110	762.0322	741.7101	713.2256	689.6183	675.3380	625.8476	577.9519	556.5770 (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	82.7830	83.1681	83.5569	85.5563	85.9677	88.0856	88.0856	88.5218	87.2260	85.9677	85.1488	84.3453
alpha	6.5189	6.5445	6.5705	6.7038	6.7312	6.8724	6.8724	6.9015	6.8151	6.7312	6.6766	6.6230
util living area	0.9223	0.8506	0.7628	0.6195	0.4752	0.3289	0.2352	0.2531	0.3930	0.6364	0.8458	0.9341 (86)
MIT	20.6726	20.8213	20.9174	20.9806	20.9969	20.9998	21.0000	21.0000	20.9993	20.9809	20.8595	20.6485 (87)
Th 2	20.4727	20.4750	20.4774	20.4890	20.4913	20.5030	20.5030	20.5054	20.4983	20.4913	20.4867	20.4820 (88)
util rest of house	0.9121	0.8349	0.7422	0.5955	0.4496	0.3034	0.2087	0.2259	0.3646	0.6081	0.8274	0.9251 (89)
MIT 2	20.0991	20.2777	20.3901	20.4701	20.4887	20.5029	20.5030	20.5053	20.4978	20.4734	20.3355	20.0783 (90)
Living area fraction									fLA = Living area / (4) =			0.3926 (91)
MIT	20.3243	20.4911	20.5972	20.6705	20.6882	20.6980	20.6981	20.6995	20.6947	20.6727	20.5412	20.3021 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3243	20.4911	20.5972	20.6705	20.6882	20.6980	20.6981	20.6995	20.6947	20.6727	20.5412	20.3021 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9090	0.8354	0.7470	0.6041	0.4595	0.3134	0.2191	0.2366	0.3758	0.6183	0.8294	0.9217 (94)
Useful gains	530.4894	563.9937	536.4822	455.2347	350.1711	232.4874	156.2756	163.1462	253.7622	386.9582	479.3562	513.0118 (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	650.2178	629.7131	566.7233	462.1312	351.2035	232.5425	156.2792	163.1521	253.9642	393.5781	530.2520	641.2756 (97)
Space heating kWh	89.0779	44.1634	22.4994	4.9655	0.7681	0.0000	0.0000	0.0000	0.0000	4.9251	36.6449	95.4283 (98a)
Space heating requirement - total per year (kWh/year)												298.4727
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	89.0779	44.1634	22.4994	4.9655	0.7681	0.0000	0.0000	0.0000	0.0000	4.9251	36.6449	95.4283 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												298.4727
Space heating per m2										(98c) / (4) =		4.0658 (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	89.0779	44.1634	22.4994	4.9655	0.7681	0.0000	0.0000	0.0000	0.0000	4.9251	36.6449	95.4283 (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)	89.0779	44.1634	22.4994	4.9655	0.7681	0.0000	0.0000	0.0000	0.0000	4.9251	36.6449	95.4283 (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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
Efficiency of water heater (217)m	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958 (216)
Fuel for water heating, kWh/month	67.2948	59.3970	62.8062	54.5130	52.3634	46.6617	45.6704	47.7744	48.6205	54.8420	59.0807	66.4667 (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	14.2622	12.8819	14.2622	13.8021	14.2622	13.8021	14.2622	14.2622	13.8021	14.2622	13.8021	14.2622 (231)
Lighting	20.1610	16.1739	14.5628	10.6694	8.2413	6.7332	7.5180	9.7722	12.6931	16.6540	18.8107	20.7214 (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												298.4727 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												343.5958

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Water heating fuel used	665.4910 (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)	167.9254 (230a)
Total electricity for the above, kWh/year	167.9254 (231)
Electricity for lighting (calculated in Appendix L)	162.7112 (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	1294.6002 (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	298.4727	0.1595	47.5977 (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)	665.4910	0.1412	93.9543 (264)
Space and water heating			141.5520 (265)
Pumps, fans and electric keep-hot	167.9254	0.1387	23.2933 (267)
Energy for lighting	162.7112	0.1443	23.4843 (268)
Total CO2, kg/year			188.3296 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5700 (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	298.4727	1.5902	474.6408 (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)	665.4910	1.5220	1012.9091 (278)
Space and water heating			1487.5499 (279)
Pumps, fans and electric keep-hot	167.9254	1.5128	254.0375 (281)
Energy for lighting	162.7112	1.5338	249.5718 (282)
Total Primary energy kWh/year			1991.1593 (286)
Dwelling Primary energy Rate (DPER)			27.1200 (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	73.4100 (1b)	x 2.5000 (2b)	= 183.5250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	183.5250 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1635 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4135 (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) = 0.3514 (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	0.4481	0.4393	0.4305	0.3866	0.3778	0.3339	0.3339	0.3251	0.3514	0.3778	0.3954	0.4129 (22b)
Effective ac	0.6004	0.5965	0.5927	0.5747	0.5714	0.5557	0.5557	0.5528	0.5618	0.5714	0.5782	0.5853 (25)

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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			11.2000	1.1450	12.8244			(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230			(29a)
Flat Roof	1.4900		1.4900	0.1100	0.1639			(30)
Total net area of external elements Aum(A, m2)			35.0400					(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	17.0113		(33)
Main dwelling								
Party Wall			55.4800	0.0000	0.0000			(32)
Corridor			23.5600	0.0000	0.0000			(32)

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

164.7286 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	17.7800	0.0700	1.2446	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	58.9800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	5.7700	0.0500	0.2885	
E3 Sill	2.5000	0.0500	0.1250	
E4 Jamb	10.4800	0.0500	0.5240	
E16 Corner (normal)	2.6800	0.0900	0.2412	
E18 Party wall between dwellings	5.3600	0.0600	0.3216	
E25 Staggered party wall between dwellings	5.3600	0.0600	0.3216	
E14 Flat roof	3.2300	0.0800	0.2584	
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.0200	0.1252	
E24 Eaves (insulation at ceiling level - inverted)	3.2300	0.2400	0.7752	

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

4.2253 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 21.2366 (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	36.3618	36.1257	35.8943	34.8073	34.6039	33.6572	33.6572	33.4818	34.0218	34.6039	35.0153	35.4454	(38)
Heat transfer coeff	57.5984	57.3623	57.1309	56.0439	55.8405	54.8938	54.8938	54.7185	55.2585	55.8405	56.2520	56.6821	(39)
Average = Sum(39)m / 12 =												56.0429	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7846	0.7814	0.7782	0.7634	0.7607	0.7478	0.7478	0.7454	0.7527	0.7607	0.7663	0.7721	(40)
HLP (average)												0.7634	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

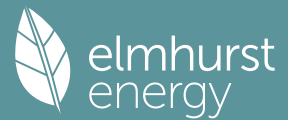
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766	(42a)
Hot water usage for baths	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171	(42b)
Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504	(42c)
Average daily hot water use (litres/day)												118.5607	(43)
Daily hot water use	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441	(44)
Energy conte	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255	(45)
Energy content (annual)										Total = Sum(45)m =		1969.2679	
Distribution loss (46)m = 0.15 x (45)m	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138	(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	250.8655	221.8281	235.4431	206.3143	199.5619	179.3376	176.5651	183.7944	186.0680	208.0782	222.0086	248.0204	(62)
WWHRS	-28.9010	-25.5603	-26.7653	-22.1627	-20.6548	-17.6745	-16.5670	-17.6174	-18.2867	-21.5580	-24.4226	-28.3658	(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	221.9645	196.2679	208.6778	184.1516	178.9071	161.6631	159.9981	166.1770	167.7813	186.5202	197.5860	219.6546	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2249.3493	(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	105.1959	93.4329	100.0679	89.6799	88.1375	80.7102	80.4910	82.8948	82.9480	90.9691	94.8983	104.2499	(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	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9816	120.6582	108.9816	112.6143	108.9816	112.6143	108.9816	108.9816	112.6143	108.9816	112.6143	108.9816	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.1215	207.2500	201.8862	190.4673	176.0530	162.5056	153.4551	151.3266	156.6904	168.1093	182.5236	196.0710	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

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Losses e.g. evaporation (negative values) (Table 5)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395 (71)
Water heating gains (Table 5)	141.3923	139.0371	134.4999	124.5555	118.4643	112.0975	108.1869	111.4177	115.2056	122.2703	131.8032	140.1209 (72)
Total internal gains	516.3852	527.8351	506.2575	488.5269	464.3887	445.1072	428.5133	429.6156	442.4001	460.2509	487.8309	506.0632 (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				3.6800	10.6334	0.6300	0.7000	0.7700	11.9589 (74)			
South				7.5200	46.7521	0.6300	0.7000	0.7700	107.4461 (78)			
Solar gains	119.4050	198.8230	262.9879	315.7202	348.0273	344.0180	332.2195	307.7014	280.8464	217.0038	142.1131	102.8128 (83)
Total gains	635.7902	726.6581	769.2454	804.2471	812.4160	789.1252	760.7328	737.3170	723.2464	677.2548	629.9439	608.8760 (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, n _{l,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.3192	58.5592	58.7964	59.9368	60.1551	61.1926	61.1926	61.3886	60.7887	60.1551	59.7151	59.2620
alpha	4.8879	4.9039	4.9198	4.9958	5.0103	5.0795	5.0795	5.0926	5.0526	5.0103	4.9810	4.9508
util living area	0.9509	0.9131	0.8603	0.7551	0.6129	0.4411	0.3169	0.3404	0.5172	0.7637	0.9087	0.9576 (86)
MIT	20.2140	20.4275	20.6328	20.8433	20.9527	20.9928	20.9989	20.9985	20.9839	20.8593	20.5369	20.1851 (87)
Th 2	20.2667	20.2695	20.2722	20.2851	20.2876	20.2988	20.2988	20.3009	20.2945	20.2876	20.2827	20.2776 (88)
util rest of house	0.9427	0.8999	0.8403	0.7246	0.5723	0.3942	0.2667	0.2891	0.4675	0.7284	0.8928	0.9504 (89)
MIT 2	19.3625	19.6262	19.8752	20.1282	20.2460	20.2939	20.2983	20.3001	20.2826	20.1521	19.7744	19.3354 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.3926 (91)
MIT	19.6968	19.9408	20.1726	20.4089	20.5235	20.5683	20.5734	20.5743	20.5579	20.4298	20.0738	19.6690 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6968	19.9408	20.1726	20.4089	20.5235	20.5683	20.5734	20.5743	20.5579	20.4298	20.0738	19.6690 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9352	0.8933	0.8374	0.7301	0.5860	0.4124	0.2864	0.3092	0.4863	0.7357	0.8877	0.9433 (94)
Useful gains	594.6038	649.1322	644.1514	587.1936	476.0566	325.4084	217.8398	228.0066	351.6905	498.2841	559.1742	574.3458 (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	886.8309	862.7742	781.1303	645.0047	492.7068	327.6229	218.1129	228.4105	356.8562	548.8995	729.7992	876.8152 (97)
Space heating kWh	217.4170	143.5675	101.9124	41.6239	12.3877	0.0000	0.0000	0.0000	0.0000	37.6579	122.8500	225.0372 (98a)
Space heating requirement - total per year (kWh/year)												902.4535
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	217.4170	143.5675	101.9124	41.6239	12.3877	0.0000	0.0000	0.0000	0.0000	37.6579	122.8500	225.0372 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												902.4535
Space heating per m ²										(98c) / (4) =		12.2933 (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	217.4170	143.5675	101.9124	41.6239	12.3877	0.0000	0.0000	0.0000	0.0000	37.6579	122.8500	225.0372 (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)	235.5547	155.5444	110.4143	45.0963	13.4211	0.0000	0.0000	0.0000	0.0000	40.7995	133.0986	243.8106 (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	221.9645	196.2679	208.6778	184.1516	178.9071	161.6631	159.9981	166.1770	167.7813	186.5202	197.5860	219.6546 (64)
Efficiency of water heater (217)m	84.0134	83.3696	82.5451	81.3195	80.3272	79.8000	79.8000	79.8000	79.8000	81.1821	83.0261	79.8000 (216)
Fuel for water heating, kWh/month	264.2014	235.4188	252.8046	226.4546	222.7229	202.5853	200.4989	208.2419	210.2522	229.7551	237.9806	261.1388 (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	22.6442	18.1660	16.3565	11.9835	9.2564	7.5625	8.4440	10.9758	14.2565	18.7053	21.1276	23.2736 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-19.6500	-29.1001	-43.9107	-51.9077	-58.1978	-55.1357	-54.4663	-50.3182	-43.3845	-34.3877	-22.0950	-16.8297 (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)

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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	-7.2217	-15.5157	-31.4518	-48.1507	-64.5684	-65.2077	-64.4375	-54.1402	-39.1391	-22.4808	-9.7348	-5.6866	(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												977.7394	(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												2752.0552	(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)												182.7518	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-907.1183	(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												3091.4282	(238)

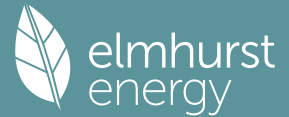
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	977.7394	0.2100	205.3253 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2752.0552	0.2100	577.9316 (264)
Space and water heating			783.2569 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	182.7518	0.1443	26.3767 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.3835	0.1336	-64.0291
PV Unit electricity exported	-427.7349	0.1253	-53.6123
Total			-117.6414 (269)
Total CO2, kg/year			703.9215 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5900 (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	977.7394	1.1300	1104.8455 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2752.0552	1.1300	3109.8224 (278)
Space and water heating			4214.6680 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	182.7518	1.5338	280.3109 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.3835	1.4936	-715.9965
PV Unit electricity exported	-427.7349	0.4601	-196.7824
Total			-912.7790 (283)
Total Primary energy kWh/year			3712.3007 (286)
Target Primary Energy Rate (TPER)			50.5700 (287)

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Plot Reference	Plot 15				Issued on Date	22/12/2025	
Assessment Reference	Plot 15			Plot Type Ref			
Plot Address	Flat 4, 2 Cross Road Manchester, M21 9SU				SAP Version	10.2	
SAP Rating	90 B	DER	2.57	TER	9.59		
Environmental	98 A	% DER < TER				73.20	
CO ₂ Emissions (t/year)	0.17	DFEE	17.56	TFEE	18.32		
Compliance Check	See BREL	% DFEE < TFEE				4.18	
% DPER < TPER	46.36	DPER	27.12	TPER	50.57		
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	73.4100 (1b)	2.5000 (2b)	183.5250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	183.5250 (5)

2. Ventilation rate

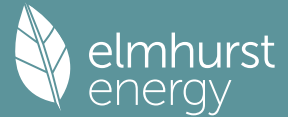
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1635 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.9200 (17)
Infiltration rate	0.3095 (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) = 0.2630 (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	0.3354	0.3288	0.3222	0.2894	0.2828	0.2499	0.2499	0.2433	0.2630	0.2828	0.2959	0.3091 (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	0.5562	0.5541	0.5519	0.5419	0.5400	0.5312	0.5312	0.5296	0.5346	0.5400	0.5438	0.5478 (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			3.6800	1.3258	4.8788		(27)
Window S/W			7.5200	1.3258	9.9697		(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999 (29a)
Flat Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100 (30)
Total net area of external elements Aum(A, m ²)			35.0400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.0950		(33)
Main dwelling							
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000 (32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000 (32)
Party Floor			73.4100			40.0000	2936.4000 (32d)
Party Ceiling			71.9200			30.0000	2157.6000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12092.7299 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							164.7286 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				17.7800	0.0370	0.6579	

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P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	58.9800	0.0000	0.0000										
E2 Other lintels (including other steel lintels)	5.7700	0.0250	0.1442										
E3 Sill	2.5000	0.0220	0.0550										
E4 Jamb	10.4800	0.0170	0.1782										
E16 Corner (normal)	2.6800	0.0420	0.1126										
E18 Party wall between dwellings	5.3600	0.0320	0.1715										
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608										
E14 Flat roof	3.2300	0.1600	0.5168										
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.1500	0.9390										
E24 Eaves (insulation at ceiling level - inverted)	3.2300	0.1500	0.4845										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												3.4205	(36)
Point Thermal bridges												0.0000	
Total fabric heat loss												(33) + (36) + (36a) =	22.5154 (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	33.6878	33.5555	33.4259	32.8169	32.7030	32.1726	32.1726	32.0744	32.3769	32.7030	32.9335	33.1744	(38)
Average = Sum(39)m / 12 =	56.2032	56.0709	55.9413	55.3323	55.2184	54.6880	54.6880	54.5898	54.8923	55.2184	55.4489	55.6899	(39)
	55.3318												
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.7656	0.7638	0.7620	0.7537	0.7522	0.7450	0.7450	0.7436	0.7478	0.7522	0.7553	0.7586	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.3260 (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	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171	(42b)
Average daily hot water use (litres/day)	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504	(42c)
												60.2750	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	65.7598	63.9560	61.9867	59.5354	57.3487	55.0761	54.6038	56.5692	58.5849	60.9187	63.3917	65.6675	(44)
Energy content (annual)	104.1475	91.0725	95.2712	81.5010	77.2023	67.7225	66.0386	70.0444	72.2410	82.6661	90.3130	102.8194	(45)
Distribution loss (46)m = 0.15 x (45)m													
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	88.5253	77.4117	80.9805	69.2758	65.6220	57.5641	56.1328	59.5378	61.4049	70.2662	76.7661	87.3965	(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	88.5253	77.4117	80.9805	69.2758	65.6220	57.5641	56.1328	59.5378	61.4049	70.2662	76.7661	87.3965	(64)
12Total per year (kWh/year)													
Electric shower(s)	50.6277	45.1097	49.2581	47.0064	47.8885	45.6809	47.2036	47.8885	47.0064	49.2581	48.3319	50.6277	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												575.8875	(64a)
Heat gains from water heating, kWh/month	34.7883	30.6303	32.5597	29.0706	28.3776	25.8113	25.8341	26.8566	27.1028	29.8811	31.2745	34.5061	(65)

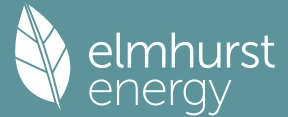
5. Internal gains (see Table 5 and 5a)													

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9816	120.6582	108.9816	112.6143	108.9816	112.6143	108.9816	108.9816	112.6143	108.9816	112.6143	108.9816	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.1215	207.2500	201.8862	190.4673	176.0530	162.5056	153.4551	151.3266	156.6904	168.1093	182.5236	196.0710	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	(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)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	(71)
Water heating gains (Table 5)	46.7584	45.5809	43.7630	40.3758	38.1419	35.8490	34.7233	36.0975	37.6428	40.1627	43.4368	46.3791	(72)
Total internal gains	418.7513	431.3788	412.5206	401.3472	381.0663	368.8587	355.0497	354.2955	364.8373	375.1434	396.4644	409.3215	(73)

6. Solar gains													

[Jan]													
	Area												
	m2												
	Solar flux												
	Table 6a												
	W/m2												
	Specific data												
	or Table 6b												
	Specific data												
	or Table 6c												
	Access												
	factor												
	Table 6d												
North	3.6800												
South	7.5200												
Solar gains	120.3376	200.3759	265.0420	318.1862	350.7456	346.7050	334.8143	310.1047	283.0399	218.6987	143.2230	103.6158	(83)
Total gains	539.0889	631.7548	677.5625	719.5334	731.8119	715.5637	689.8640	664.4002	647.8772	593.8421	539.6875	512.9373	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.7669	59.9079	60.0467	60.7076	60.8328	61.4228	61.4228	61.5333	61.1942	60.8328	60.5800	60.3178	21.0000 (85)
alpha	4.9845	4.9939	5.0031	5.0472	5.0555	5.0949	5.0949	5.1022	5.0796	5.0555	5.0387	5.0212	
util living area	0.9722	0.9428	0.8987	0.8032	0.6622	0.4825	0.3477	0.3763	0.5681	0.8206	0.9437	0.9773	(86)
MIT	20.0834	20.3205	20.5523	20.7968	20.9358	20.9895	20.9984	20.9976	20.9762	20.8069	20.4202	20.0378	(87)
Th 2	20.2832	20.2848	20.2864	20.2936	20.2950	20.3013	20.3013	20.3025	20.2988	20.2950	20.2922	20.2893	(88)
util rest of house	0.9671	0.9332	0.8824	0.7750	0.6210	0.4321	0.2930	0.3200	0.5155	0.7888	0.9326	0.9731	(89)
MIT 2	19.4496	19.6806	19.9027	20.1321	20.2502	20.2956	20.3007	20.3015	20.2849	20.1464	19.7862	19.4100	(90)
Living area fraction									fLA = Living area /	(4) =		0.3926	(91)
MIT	19.6984	19.9318	20.1577	20.3931	20.5194	20.5680	20.5746	20.5748	20.5563	20.4057	20.0351	19.6565	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6984	19.9318	20.1577	20.3931	20.5194	20.5680	20.5746	20.5748	20.5563	20.4057	20.0351	19.6565	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9621	0.9278	0.8792	0.7792	0.6344	0.4515	0.3145	0.3421	0.5352	0.7941	0.9280	0.9686	(94)
Useful gains	518.6828	586.1528	595.7191	560.6480	464.2778	323.0971	216.9471	227.2610	346.7119	471.5458	500.8411	496.8180	(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	865.4409	842.8468	764.0296	635.9378	486.9916	326.3773	217.3618	227.8993	354.4027	541.4552	717.2372	860.7679	(97)
Space heating kWh	257.9880	172.4984	125.2230	54.2086	16.8991	0.0000	0.0000	0.0000	0.0000	52.0126	155.8052	270.7787	(98a)
Space heating requirement - total per year (kWh/year)												1105.4138	
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	257.9880	172.4984	125.2230	54.2086	16.8991	0.0000	0.0000	0.0000	0.0000	52.0126	155.8052	270.7787	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1105.4138	
Space heating per m2										(98c) / (4) =		15.0581	(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	514.0677	404.6916	414.8827	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9580	0.9811	0.9758	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	492.4729	397.0276	404.8421	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	790.9713	763.2071	735.6125	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	214.9189	272.4375	246.0931	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	53.7297	68.1094	61.5233	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												183.3624	(107)
Energy for space heating												15.0581	(99)
Energy for space cooling												2.4978	(108)
Total												17.5559	(109)
Fabric Energy Efficiency (DFEE)												17.6	(109)

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

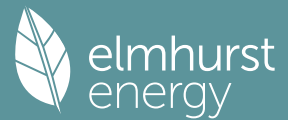
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	73.4100	x	183.5250	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	183.5250	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		

Full SAP Calculation Printout



Infiltration due to chimneys, flues and fans	$= (6a) + (6b) + (6c) + (6d) + (6e) + (6f) + (6g) + (7a) + (7b) + (7c) =$											30.0000 / (5) =	0.1635 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													5.0000 (17)
Infiltration rate													0.4135 (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) =	0.3514 (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)
	0.4481	0.4393	0.4305	0.3866	0.3778	0.3339	0.3339	0.3251	0.3514	0.3778	0.3954	0.4129	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.6004	0.5965	0.5927	0.5747	0.5714	0.5557	0.5557	0.5528	0.5618	0.5714	0.5782	0.5853	(25)

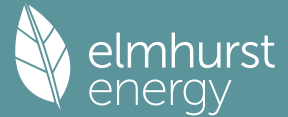
3. Heat losses and heat loss parameter

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			11.2000	1.1450	12.8244			(27)					
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230			(29a)					
Flat Roof	1.4900		1.4900	0.1100	0.1639			(30)					
Total net area of external elements Aum(A, m2)			35.0400					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	17.0113			(33)					
Main dwelling													
Party Wall			55.4800	0.0000	0.0000			(32)					
Corridor			23.5600	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								164.7286 (35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E7 Party floor between dwellings (in blocks of flats)				17.7800	0.0700		1.2446						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				58.9800	0.0000		0.0000						
E2 Other lintels (including other steel lintels)				5.7700	0.0500		0.2885						
E3 Sill				2.5000	0.0500		0.1250						
E4 Jamb				10.4800	0.0500		0.5240						
E16 Corner (normal)				2.6800	0.0900		0.2412						
E18 Party wall between dwellings				5.3600	0.0600		0.3216						
E25 Staggered party wall between dwellings				5.3600	0.0600		0.3216						
E14 Flat roof				3.2300	0.0800		0.2584						
E9 Balcony between dwellings, wall insulation continuous				6.2600	0.0200		0.1252						
E24 Eaves (insulation at ceiling level - inverted)				3.2300	0.2400		0.7752						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.2253 (36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	21.2366	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.3618	Feb 36.1257	Mar 35.8943	Apr 34.8073	May 34.6039	Jun 33.6572	Jul 33.6572	Aug 33.4818	Sep 34.0218	Oct 34.6039	Nov 35.0153	Dec 35.4454	(38)
Heat transfer coeff	57.5984	57.3623	57.1309	56.0439	55.8405	54.8938	54.8938	54.7185	55.2585	55.8405	56.2520	56.6821	(39)
Average = Sum(39)m / 12 =												56.0429	
HLP	Jan 0.7846	Feb 0.7814	Mar 0.7782	Apr 0.7634	May 0.7607	Jun 0.7478	Jul 0.7478	Aug 0.7454	Sep 0.7527	Oct 0.7607	Nov 0.7663	Dec 0.7721	(40)
HLP (average)												0.7634	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3260 (42)	
Hot water usage for mixer showers												0.0000 (42a)	
Hot water usage for baths												27.3094 (42b)	
Hot water usage for other uses												38.4504 (42c)	
Average daily hot water use (litres/day)												60.2750 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	65.7598	63.9560	61.9867	59.5354	57.3487	55.0761	54.6038	56.5692	58.5849	60.9187	63.3917	65.6675	(44)
Distribution loss (46)m = 0.15 x (45)m	104.1475	91.0725	95.2712	81.5010	77.2023	67.7225	66.0386	70.0444	72.2410	82.6661	90.3130	102.8194	(45)
Water storage loss (or HIU loss):	Total = Sum(45)m =											1001.0396	
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	(56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	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)
Total heat required for water heating calculated for each month	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)
WWHRS	88.5253	77.4117	80.9805	69.2758	65.6220	57.5641	56.1328	59.5378	61.4049	70.2662	76.7661	87.3965	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	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)
12Total per year (kWh/year)	88.5253	77.4117	80.9805	69.2758	65.6220	57.5641	56.1328	59.5378	61.4049	70.2662	76.7661	87.3965	(64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m =											850.8836 (64)	
Heat gains from water heating, kWh/month	50.6277	45.1097	49.2581	47.0064	47.8885	45.6809	47.2036	47.8885	47.0064	49.2581	48.3319	50.6277	(64a)
	34.7883	30.6303	32.5597	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =									575.8875 (64a)
	29.0706	28.3776	25.8113	25.8341	26.8566	27.1028	29.8811	31.2745	34.5061				(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9816	120.6582	108.9816	112.6143	108.9816	112.6143	108.9816	108.9816	112.6143	108.9816	112.6143	108.9816 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.1215	207.2500	201.8862	190.4673	176.0530	162.5056	153.4551	151.3266	156.6904	168.1093	182.5236	196.0710 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299 (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)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395 (71)
Water heating gains (Table 5)	46.7584	45.5809	43.7630	40.3758	38.1419	35.8490	34.7233	36.0975	37.6428	40.1627	43.4368	46.3791 (72)
Total internal gains	418.7513	431.3788	412.5206	401.3472	381.0663	368.8587	355.0497	354.2955	364.8373	375.1434	396.4644	409.3215 (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					3.6800	10.6334	0.6300	0.7000				0.7700			11.9589 (74)
South					7.5200	46.7521	0.6300	0.7000				0.7700			107.4461 (78)
Solar gains	119.4050	198.8230	262.9879	315.7202	348.0273	344.0180	332.2195	307.7014	280.8464	217.0038	142.1131	102.8128 (83)			
Total gains	538.1562	630.2019	675.5085	717.0674	729.0936	712.8767	687.2692	661.9968	645.6836	592.1472	538.5775	512.1343 (84)			

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.3192	58.5592	58.7964	59.9368	60.1551	61.1926	61.1926	61.3886	60.7887	60.1551	59.7151	59.2620
alpha	4.8879	4.9039	4.9198	4.9958	5.0103	5.0795	5.0795	5.0926	5.0526	5.0103	4.9810	4.9508
util living area	0.9734	0.9455	0.9035	0.8091	0.6692	0.4859	0.3503	0.3785	0.5729	0.8254	0.9455	0.9780 (86)
MIT	20.0363	20.2786	20.5195	20.7833	20.9305	20.9890	20.9983	20.9975	20.9748	20.7963	20.3972	20.0036 (87)
Th 2	20.2667	20.2695	20.2722	20.2851	20.2876	20.2988	20.2988	20.3009	20.2945	20.2876	20.2827	20.2776 (88)
util rest of house	0.9684	0.9363	0.8877	0.7811	0.6277	0.4350	0.2950	0.3218	0.5198	0.7938	0.9347	0.9739 (89)
MIT 2	19.3901	19.6274	19.8597	20.1127	20.2391	20.2928	20.2982	20.2999	20.2797	20.1305	19.7562	19.3669 (90)
Living area fraction	19.6438	19.8831	20.1187	20.3759	20.5105	20.5661	20.5730	20.5738	20.5526	20.3919	20.0078	0.3926 (91)
MIT	19.6438	19.8831	20.1187	20.3759	20.5105	20.5661	20.5730	20.5738	20.5526	20.3919	20.0078	19.6169 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6438	19.8831	20.1187	20.3759	20.5105	20.5661	20.5730	20.5738	20.5526	20.3919	20.0078	19.6169 (93)

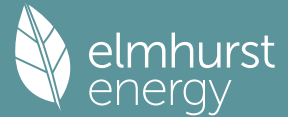
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9634	0.9306	0.8840	0.7849	0.6410	0.4546	0.3167	0.3440	0.5396	0.7987	0.9300	0.9693 (94)
Useful gains	518.4686	586.4928	597.1446	562.8031	467.3773	324.0674	217.6569	227.7185	348.3880	472.9649	500.8502	496.4343 (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	883.7781	859.4644	778.0504	643.1568	491.9854	327.5037	218.0947	228.3820	356.5595	546.7857	726.0898	873.8607 (97)
Space heating kWh	271.7902	183.4369	134.5939	57.8546	18.3084	0.0000	0.0000	0.0000	0.0000	54.9227	162.1725	280.8053 (98a)
Space heating requirement - total per year (kWh/year)												1163.8845
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	271.7902	183.4369	134.5939	57.8546	18.3084	0.0000	0.0000	0.0000	0.0000	54.9227	162.1725	280.8053 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1163.8845
Space heating per m ²												15.8546 (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	516.0016	406.2140	415.8604	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9565	0.9803	0.9751	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	493.5382	398.1955	405.4862	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	787.8307	760.1742	732.8034	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	211.8906	269.3122	243.5240	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	52.9727	67.3280	60.8810	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												181.1817 (107)
Energy for space heating												15.8546 (99)
Energy for space cooling												2.4681 (108)
Total												18.3227 (109)
Fabric Energy Efficiency (TFEE)												18.3 (109)

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Plot Reference	Plot 15				Issued on Date	22/12/2025	
Assessment Reference	Plot 15			Plot Type Ref			
Plot Address	Flat 4, 2 Cross Road Manchester, M21 9SU				SAP Version	10.2	
SAP Rating	90 B	DER	2.57	TER	9.59		
Environmental	98 A	% DER < TER				73.20	
CO ₂ Emissions (t/year)	0.17	DFEE	17.56	TFEE	18.32		
Compliance Check	See BREL	% DFEE < TFEE				4.18	
% DPER < TPER	46.36	DPER	27.12	TPER	50.57		
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	73.4100 (1b)	2.5000 (2b)	183.5250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	183.5250 (5)

2. Ventilation rate

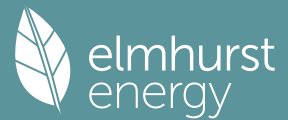
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	2.9200 (17)
Infiltration rate	0.1460 (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) = 0.1241 (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	0.1582	0.1551	0.1520	0.1365	0.1334	0.1179	0.1179	0.1148	0.1241	0.1334	0.1396	0.1458 (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	0.2982	0.2951	0.2920	0.2765	0.2734	0.2579	0.2579	0.2548	0.2641	0.2734	0.2796	0.2858 (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			3.6800	1.3258	4.8788		(27)
Window S/W			7.5200	1.3258	9.9697		(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999 (29a)
Flat Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100 (30)
Total net area of external elements Aum(A, m ²)			35.0400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.0950		(33)
Main dwelling							
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000 (32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000 (32)
Party Floor			73.4100			40.0000	2936.4000 (32d)
Party Ceiling			71.9200			30.0000	2157.6000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12092.7299 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							164.7286 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.7800	0.0370	0.6579
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	58.9800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.7700	0.0250	0.1442
E3 Sill	2.5000	0.0220	0.0550
E4 Jamb	10.4800	0.0170	0.1782
E16 Corner (normal)	2.6800	0.0420	0.1126
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E14 Flat roof	3.2300	0.1600	0.5168
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.1500	0.9390
E24 Eaves (insulation at ceiling level - inverted)	3.2300	0.1500	0.4845
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.4205 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	22.5154 (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	18.0616	17.8737	17.6858	16.7463	16.5584	15.6190	15.6190	15.4311	15.9948	16.5584	16.9342	17.3100	(38)
Heat transfer coeff	40.5771	40.3892	40.2013	39.2618	39.0739	38.1344	38.1344	37.9465	38.5102	39.0739	39.4497	39.8255	(39)
Average = Sum(39)m / 12 =												39.2148	
HLP	0.5527	0.5502	0.5476	0.5348	0.5323	0.5195	0.5195	0.5169	0.5246	0.5323	0.5374	0.5425	(40)
HLP (average)												0.5342	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766	(42a)
Hot water usage for baths	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171	(42b)
Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504	(42c)
Average daily hot water use (litres/day)												118.5607	(43)
Daily hot water use	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441	(44)
Energy conte	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255	(45)
Energy content (annual)										Total = Sum(45)m =		1969.2679	
Distribution loss (46)m = 0.15 x (45)m	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138	(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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2286.5989	(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	67.9200	59.7644	62.7920	53.6065	50.8615	44.6367	43.2151	45.6188	46.8746	53.6932	58.8248	66.9740	(65)

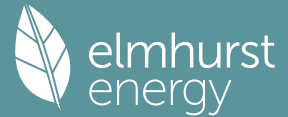
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9816	120.6582	108.9816	112.6143	108.9816	112.6143	108.9816	108.9816	112.6143	108.9816	112.6143	108.9816	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.1215	207.2500	201.8862	190.4673	176.0530	162.5056	153.4551	151.3266	156.6904	168.1093	182.5236	196.0710	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	(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)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	(71)
Water heating gains (Table 5)	91.2903	88.9350	84.3979	74.4534	68.3623	61.9954	58.0848	61.3156	65.1036	72.1683	81.7012	90.0188	(72)
Total internal gains	463.2831	474.7330	453.1555	435.4248	411.2867	395.0051	378.4113	379.5136	392.2980	407.1489	434.7288	452.9612	(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	3.6800	10.6334	0.4000	0.0000	0.7700	12.0523 (74)
South	7.5200	46.7521	0.4000	0.0000	0.7700	108.2853 (78)

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Solar gains	120.3376	200.3759	265.0420	318.1862	350.7456	346.7050	334.8143	310.1047	283.0399	218.6987	143.2230	103.6158 (83)
Total gains	583.6207	675.1090	718.1974	753.6110	762.0322	741.7101	713.2256	689.6183	675.3380	625.8476	577.9519	556.5770 (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	82.7830	83.1681	83.5569	85.5563	85.9677	88.0856	88.0856	88.5218	87.2260	85.9677	85.1488	84.3453
alpha	6.5189	6.5445	6.5705	6.7038	6.7312	6.8724	6.8724	6.9015	6.8151	6.7312	6.6766	6.6230
util living area	0.9223	0.8506	0.7628	0.6195	0.4752	0.3289	0.2352	0.2531	0.3930	0.6364	0.8458	0.9341 (86)
MIT	20.6726	20.8213	20.9174	20.9806	20.9969	20.9998	21.0000	21.0000	20.9993	20.9809	20.8595	20.6485 (87)
Th 2	20.4727	20.4750	20.4774	20.4890	20.4913	20.5030	20.5030	20.5054	20.4983	20.4913	20.4867	20.4820 (88)
util rest of house	0.9121	0.8349	0.7422	0.5955	0.4496	0.3034	0.2087	0.2259	0.3646	0.6081	0.8274	0.9251 (89)
MIT 2	20.0991	20.2777	20.3901	20.4701	20.4887	20.5029	20.5030	20.5053	20.4978	20.4734	20.3355	20.0783 (90)
Living area fraction									fLA = Living area / (4) =			0.3926 (91)
MIT	20.3243	20.4911	20.5972	20.6705	20.6882	20.6980	20.6981	20.6995	20.6947	20.6727	20.5412	20.3021 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3243	20.4911	20.5972	20.6705	20.6882	20.6980	20.6981	20.6995	20.6947	20.6727	20.5412	20.3021 (93)

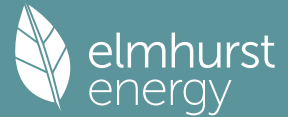
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9090	0.8354	0.7470	0.6041	0.4595	0.3134	0.2191	0.2366	0.3758	0.6183	0.8294	0.9217 (94)
Useful gains	530.4894	563.9937	536.4822	455.2347	350.1711	232.4874	156.2756	163.1462	253.7622	386.9582	479.3562	513.0118 (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	650.2178	629.7131	566.7233	462.1312	351.2035	232.5425	156.2792	163.1521	253.9642	393.5781	530.2520	641.2756 (97)
Space heating kWh	89.0779	44.1634	22.4994	4.9655	0.7681	0.0000	0.0000	0.0000	0.0000	4.9251	36.6449	95.4283 (98a)
Space heating requirement - total per year (kWh/year)												298.4727
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	89.0779	44.1634	22.4994	4.9655	0.7681	0.0000	0.0000	0.0000	0.0000	4.9251	36.6449	95.4283 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												298.4727
Space heating per m2										(98c) / (4) =		4.0658 (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	89.0779	44.1634	22.4994	4.9655	0.7681	0.0000	0.0000	0.0000	0.0000	4.9251	36.6449	95.4283 (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)	89.0779	44.1634	22.4994	4.9655	0.7681	0.0000	0.0000	0.0000	0.0000	4.9251	36.6449	95.4283 (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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
Efficiency of water heater (217)m	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958 (216)
Fuel for water heating, kWh/month	67.2948	59.3970	62.8062	54.5130	52.3634	46.6617	45.6704	47.7744	48.6205	54.8420	59.0807	66.4667 (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	14.2622	12.8819	14.2622	13.8021	14.2622	13.8021	14.2622	14.2622	13.8021	14.2622	13.8021	14.2622 (231)
Lighting	20.1610	16.1739	14.5628	10.6694	8.2413	6.7332	7.5180	9.7722	12.6931	16.6540	18.8107	20.7214 (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												298.4727 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												343.5958

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Water heating fuel used	665.4910 (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)	167.9254 (230a)
Total electricity for the above, kWh/year	167.9254 (231)
Electricity for lighting (calculated in Appendix L)	162.7112 (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	1294.6002 (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	298.4727	0.1595	47.5977 (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)	665.4910	0.1412	93.9543 (264)
Space and water heating			141.5520 (265)
Pumps, fans and electric keep-hot	167.9254	0.1387	23.2933 (267)
Energy for lighting	162.7112	0.1443	23.4843 (268)
Total CO2, kg/year			188.3296 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5700 (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	298.4727	1.5902	474.6408 (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)	665.4910	1.5220	1012.9091 (278)
Space and water heating			1487.5499 (279)
Pumps, fans and electric keep-hot	167.9254	1.5128	254.0375 (281)
Energy for lighting	162.7112	1.5338	249.5718 (282)
Total Primary energy kWh/year			1991.1593 (286)
Dwelling Primary energy Rate (DPER)			27.1200 (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	73.4100 (1b)	x 2.5000 (2b)	= 183.5250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	183.5250 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1635 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4135 (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) = 0.3514 (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	0.4481	0.4393	0.4305	0.3866	0.3778	0.3339	0.3339	0.3251	0.3514	0.3778	0.3954	0.4129 (22b)
Effective ac	0.6004	0.5965	0.5927	0.5747	0.5714	0.5557	0.5557	0.5528	0.5618	0.5714	0.5782	0.5853 (25)

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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			11.2000	1.1450	12.8244			(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230			(29a)
Flat Roof	1.4900		1.4900	0.1100	0.1639			(30)
Total net area of external elements Aum(A, m2)			35.0400					(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	17.0113		(33)
Main dwelling								
Party Wall			55.4800	0.0000	0.0000			(32)
Corridor			23.5600	0.0000	0.0000			(32)

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

164.7286 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	17.7800	0.0700	1.2446	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	58.9800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	5.7700	0.0500	0.2885	
E3 Sill	2.5000	0.0500	0.1250	
E4 Jamb	10.4800	0.0500	0.5240	
E16 Corner (normal)	2.6800	0.0900	0.2412	
E18 Party wall between dwellings	5.3600	0.0600	0.3216	
E25 Staggered party wall between dwellings	5.3600	0.0600	0.3216	
E14 Flat roof	3.2300	0.0800	0.2584	
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.0200	0.1252	
E24 Eaves (insulation at ceiling level - inverted)	3.2300	0.2400	0.7752	

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

4.2253 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 21.2366 (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	36.3618	36.1257	35.8943	34.8073	34.6039	33.6572	33.6572	33.4818	34.0218	34.6039	35.0153	35.4454	(38)
Heat transfer coeff	57.5984	57.3623	57.1309	56.0439	55.8405	54.8938	54.8938	54.7185	55.2585	55.8405	56.2520	56.6821	(39)
Average = Sum(39)m / 12 =												56.0429	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7846	0.7814	0.7782	0.7634	0.7607	0.7478	0.7478	0.7454	0.7527	0.7607	0.7663	0.7721	(40)
HLP (average)												0.7634	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

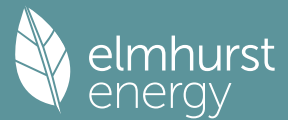
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766	(42a)
Hot water usage for baths	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171	(42b)
Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504	(42c)
Average daily hot water use (litres/day)												118.5607	(43)
Daily hot water use	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441	(44)
Energy conte	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255	(45)
Energy content (annual)										Total = Sum(45)m =		1969.2679	
Distribution loss (46)m = 0.15 x (45)m	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138	(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	250.8655	221.8281	235.4431	206.3143	199.5619	179.3376	176.5651	183.7944	186.0680	208.0782	222.0086	248.0204	(62)
WWHRS	-28.9010	-25.5603	-26.7653	-22.1627	-20.6548	-17.6745	-16.5670	-17.6174	-18.2867	-21.5580	-24.4226	-28.3658	(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	221.9645	196.2679	208.6778	184.1516	178.9071	161.6631	159.9981	166.1770	167.7813	186.5202	197.5860	219.6546	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2249.3493	(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	105.1959	93.4329	100.0679	89.6799	88.1375	80.7102	80.4910	82.8948	82.9480	90.9691	94.8983	104.2499	(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	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9816	120.6582	108.9816	112.6143	108.9816	112.6143	108.9816	108.9816	112.6143	108.9816	112.6143	108.9816	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.1215	207.2500	201.8862	190.4673	176.0530	162.5056	153.4551	151.3266	156.6904	168.1093	182.5236	196.0710	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

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Losses e.g. evaporation (negative values) (Table 5)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395 (71)
Water heating gains (Table 5)	141.3923	139.0371	134.4999	124.5555	118.4643	112.0975	108.1869	111.4177	115.2056	122.2703	131.8032	140.1209 (72)
Total internal gains	516.3852	527.8351	506.2575	488.5269	464.3887	445.1072	428.5133	429.6156	442.4001	460.2509	487.8309	506.0632 (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				3.6800	10.6334	0.6300	0.7000	0.7700	11.9589 (74)			
South				7.5200	46.7521	0.6300	0.7000	0.7700	107.4461 (78)			
Solar gains	119.4050	198.8230	262.9879	315.7202	348.0273	344.0180	332.2195	307.7014	280.8464	217.0038	142.1131	102.8128 (83)
Total gains	635.7902	726.6581	769.2454	804.2471	812.4160	789.1252	760.7328	737.3170	723.2464	677.2548	629.9439	608.8760 (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, n _{l,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.3192	58.5592	58.7964	59.9368	60.1551	61.1926	61.1926	61.3886	60.7887	60.1551	59.7151	59.2620
alpha	4.8879	4.9039	4.9198	4.9958	5.0103	5.0795	5.0795	5.0926	5.0526	5.0103	4.9810	4.9508
util living area	0.9509	0.9131	0.8603	0.7551	0.6129	0.4411	0.3169	0.3404	0.5172	0.7637	0.9087	0.9576 (86)
MIT	20.2140	20.4275	20.6328	20.8433	20.9527	20.9928	20.9989	20.9985	20.9839	20.8593	20.5369	20.1851 (87)
Th 2	20.2667	20.2695	20.2722	20.2851	20.2876	20.2988	20.2988	20.3009	20.2945	20.2876	20.2827	20.2776 (88)
util rest of house	0.9427	0.8999	0.8403	0.7246	0.5723	0.3942	0.2667	0.2891	0.4675	0.7284	0.8928	0.9504 (89)
MIT 2	19.3625	19.6262	19.8752	20.1282	20.2460	20.2939	20.2983	20.3001	20.2826	20.1521	19.7744	19.3354 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.3926 (91)
MIT	19.6968	19.9408	20.1726	20.4089	20.5235	20.5683	20.5734	20.5743	20.5579	20.4298	20.0738	19.6690 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6968	19.9408	20.1726	20.4089	20.5235	20.5683	20.5734	20.5743	20.5579	20.4298	20.0738	19.6690 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9352	0.8933	0.8374	0.7301	0.5860	0.4124	0.2864	0.3092	0.4863	0.7357	0.8877	0.9433 (94)
Useful gains	594.6038	649.1322	644.1514	587.1936	476.0566	325.4084	217.8398	228.0066	351.6905	498.2841	559.1742	574.3458 (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	886.8309	862.7742	781.1303	645.0047	492.7068	327.6229	218.1129	228.4105	356.8562	548.8995	729.7992	876.8152 (97)
Space heating kWh	217.4170	143.5675	101.9124	41.6239	12.3877	0.0000	0.0000	0.0000	0.0000	37.6579	122.8500	225.0372 (98a)
Space heating requirement - total per year (kWh/year)												902.4535
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	217.4170	143.5675	101.9124	41.6239	12.3877	0.0000	0.0000	0.0000	0.0000	37.6579	122.8500	225.0372 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												902.4535
Space heating per m ²										(98c) / (4) =		12.2933 (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	217.4170	143.5675	101.9124	41.6239	12.3877	0.0000	0.0000	0.0000	0.0000	37.6579	122.8500	225.0372 (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)	235.5547	155.5444	110.4143	45.0963	13.4211	0.0000	0.0000	0.0000	0.0000	40.7995	133.0986	243.8106 (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	221.9645	196.2679	208.6778	184.1516	178.9071	161.6631	159.9981	166.1770	167.7813	186.5202	197.5860	219.6546 (64)
Efficiency of water heater												79.8000 (216)
(217)m	84.0134	83.3696	82.5451	81.3195	80.3272	79.8000	79.8000	79.8000	79.8000	81.1821	83.0261	84.1141 (217)
Fuel for water heating, kWh/month	264.2014	235.4188	252.8046	226.4546	222.7229	202.5853	200.4989	208.2419	210.2522	229.7551	237.9806	261.1388 (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	22.6442	18.1660	16.3565	11.9835	9.2564	7.5625	8.4440	10.9758	14.2565	18.7053	21.1276	23.2736 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-19.6500	-29.1001	-43.9107	-51.9077	-58.1978	-55.1357	-54.4663	-50.3182	-43.3845	-34.3877	-22.0950	-16.8297 (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)

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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	-7.2217	-15.5157	-31.4518	-48.1507	-64.5684	-65.2077	-64.4375	-54.1402	-39.1391	-22.4808	-9.7348	-5.6866	(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												977.7394	(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												2752.0552	(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)												182.7518	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-907.1183	(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												3091.4282	(238)

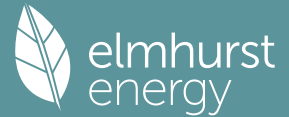
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	977.7394	0.2100	205.3253 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2752.0552	0.2100	577.9316 (264)
Space and water heating			783.2569 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	182.7518	0.1443	26.3767 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.3835	0.1336	-64.0291
PV Unit electricity exported	-427.7349	0.1253	-53.6123
Total			-117.6414 (269)
Total CO2, kg/year			703.9215 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5900 (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	977.7394	1.1300	1104.8455 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2752.0552	1.1300	3109.8224 (278)
Space and water heating			4214.6680 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	182.7518	1.5338	280.3109 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.3835	1.4936	-715.9965
PV Unit electricity exported	-427.7349	0.4601	-196.7824
Total			-912.7790 (283)
Total Primary energy kWh/year			3712.3007 (286)
Target Primary Energy Rate (TPER)			50.5700 (287)

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Plot Reference	Plot 15				Issued on Date	22/12/2025	
Assessment Reference	Plot 15			Plot Type Ref			
Plot Address	Flat 4, 2 Cross Road Manchester, M21 9SU				SAP Version	10.2	
SAP Rating	90 B	DER	2.57	TER	9.59		
Environmental	98 A	% DER < TER				73.20	
CO ₂ Emissions (t/year)	0.17	DFEE	17.56	TFEE	18.32		
Compliance Check	See BREL	% DFEE < TFEE				4.18	
% DPER < TPER	46.36	DPER	27.12	TPER	50.57		
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	73.4100 (1b)	2.5000 (2b)	183.5250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	183.5250 (5)

2. Ventilation rate

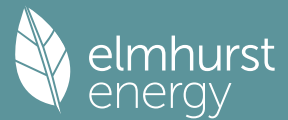
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	2.9200 (17)
Infiltration rate	0.1460 (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) = 0.1241 (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	0.1582	0.1551	0.1520	0.1365	0.1334	0.1179	0.1179	0.1148	0.1241	0.1334	0.1396	0.1458 (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	0.2982	0.2951	0.2920	0.2765	0.2734	0.2579	0.2579	0.2548	0.2641	0.2734	0.2796	0.2858 (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			3.6800	1.3258	4.8788		(27)
Window S/W			7.5200	1.3258	9.9697		(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999 (29a)
Flat Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100 (30)
Total net area of external elements Aum(A, m ²)			35.0400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0950		(33)
Main dwelling							
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000 (32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000 (32)
Party Floor			73.4100			40.0000	2936.4000 (32d)
Party Ceiling			71.9200			30.0000	2157.6000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12092.7299 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							164.7286 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.7800	0.0370	0.6579
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	58.9800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.7700	0.0250	0.1442
E3 Sill	2.5000	0.0220	0.0550
E4 Jamb	10.4800	0.0170	0.1782
E16 Corner (normal)	2.6800	0.0420	0.1126
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E14 Flat roof	3.2300	0.1600	0.5168
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.1500	0.9390
E24 Eaves (insulation at ceiling level - inverted)	3.2300	0.1500	0.4845
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.4205 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	22.5154 (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	18.0616	17.8737	17.6858	16.7463	16.5584	15.6190	15.6190	15.4311	15.9948	16.5584	16.9342	17.3100	(38)
Heat transfer coeff	40.5771	40.3892	40.2013	39.2618	39.0739	38.1344	38.1344	37.9465	38.5102	39.0739	39.4497	39.8255	(39)
Average = Sum(39)m / 12 =												39.2148	
HLP	0.5527	0.5502	0.5476	0.5348	0.5323	0.5195	0.5195	0.5169	0.5246	0.5323	0.5374	0.5425	(40)
HLP (average)												0.5342	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766	(42a)
Hot water usage for baths	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171	(42b)
Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504	(42c)
Average daily hot water use (litres/day)												118.5607	(43)
Daily hot water use	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441	(44)
Energy conte	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255	(45)
Energy content (annual)										Total = Sum(45)m =		1969.2679	
Distribution loss (46)m = 0.15 x (45)m	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138	(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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(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	67.9200	59.7644	62.7920	53.6065	50.8615	44.6367	43.2151	45.6188	46.8746	53.6932	58.8248	66.9740	(65)

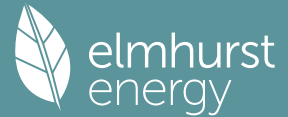
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0335	20.4581	16.6377	12.5958	9.4155	7.9490	8.5891	11.1645	14.9849	19.0268	22.2071	23.6736	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.1514	309.3283	301.3227	284.2795	262.7657	242.5456	229.0374	225.8605	233.8662	250.9093	272.4232	292.6432	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	(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)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	(71)
Water heating gains (Table 5)	91.2903	88.9350	84.3979	74.4534	68.3623	61.9954	58.0848	61.3156	65.1036	72.1683	81.7012	90.0188	(72)
Total internal gains	518.2768	516.5231	500.1598	469.1304	438.3450	410.2916	393.5130	396.1423	411.7563	439.9060	474.1331	504.1373	(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	3.6800	10.6334	0.4000	0.0000	0.7700	12.0523 (74)
South	7.5200	46.7521	0.4000	0.0000	0.7700	108.2853 (78)

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Solar gains	120.3376	200.3759	265.0420	318.1862	350.7456	346.7050	334.8143	310.1047	283.0399	218.6987	143.2230	103.6158 (83)
Total gains	638.6144	716.8991	765.2018	787.3166	789.0906	756.9966	728.3273	706.2470	694.7963	658.6048	617.3561	607.7531 (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	82.7830	83.1681	83.5569	85.5563	85.9677	88.0856	88.0856	88.5218	87.2260	85.9677	85.1488	84.3453
alpha	6.5189	6.5445	6.5705	6.7038	6.7312	6.8724	6.8724	6.9015	6.8151	6.7312	6.6766	6.6230
util living area	0.8913	0.8216	0.7270	0.5951	0.4592	0.3223	0.2304	0.2471	0.3821	0.6076	0.8129	0.9066 (86)
MIT	20.7452	20.8560	20.9373	20.9846	20.9975	20.9998	21.0000	21.0000	20.9994	20.9854	20.8903	20.7218 (87)
Th 2	20.4727	20.4750	20.4774	20.4890	20.4913	20.5030	20.5030	20.5054	20.4983	20.4913	20.4867	20.4820 (88)
util rest of house	0.8785	0.8046	0.7059	0.5716	0.4344	0.2973	0.2044	0.2206	0.3544	0.5800	0.7930	0.8952 (89)
MIT 2	20.1857	20.3174	20.4118	20.4740	20.4892	20.5029	20.5030	20.5053	20.4979	20.4777	20.3700	20.1664 (90)
Living area fraction									fLA = Living area / (4) =			0.3926 (91)
MIT	20.4053	20.5288	20.6181	20.6745	20.6887	20.6980	20.6981	20.6995	20.6948	20.6770	20.5742	20.3845 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4053	20.5288	20.6181	20.6745	20.6887	20.6980	20.6981	20.6995	20.6948	20.6770	20.5742	20.3845 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8768	0.8064	0.7117	0.5802	0.4440	0.3071	0.2146	0.2310	0.3653	0.5902	0.7965	0.8929 (94)
Useful gains	559.9244	578.0917	544.5891	456.8205	350.3842	232.4949	156.2761	163.1471	253.7984	388.6900	491.7240	542.6676 (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	653.5074	631.2350	567.5659	462.2878	351.2243	232.5432	156.2792	163.1522	253.9677	393.7486	531.5544	644.5541 (97)
Space heating kWh	69.6258	35.7123	17.0948	3.9365	0.6250	0.0000	0.0000	0.0000	0.0000	3.7637	28.6779	75.8036 (98a)
Space heating requirement - total per year (kWh/year)												235.2394
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	69.6258	35.7123	17.0948	3.9365	0.6250	0.0000	0.0000	0.0000	0.0000	3.7637	28.6779	75.8036 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												235.2394
Space heating per m2										(98c) / (4) =		3.2045 (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	69.6258	35.7123	17.0948	3.9365	0.6250	0.0000	0.0000	0.0000	0.0000	3.7637	28.6779	75.8036 (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)	69.6258	35.7123	17.0948	3.9365	0.6250	0.0000	0.0000	0.0000	0.0000	3.7637	28.6779	75.8036 (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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
Efficiency of water heater (217)m	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958 (216)
Fuel for water heating, kWh/month	67.2948	59.3970	62.8062	54.5130	52.3634	46.6617	45.6704	47.7744	48.6205	54.8420	59.0807	66.4667 (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	14.2622	12.8819	14.2622	13.8021	14.2622	13.8021	14.2622	14.2622	13.8021	14.2622	13.8021	14.2622 (231)
Lighting	20.1610	16.1739	14.5628	10.6694	8.2413	6.7332	7.5180	9.7722	12.6931	16.6540	18.8107	20.7214 (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												235.2394 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												343.5958
Water heating fuel used												665.4910 (219)

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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)	167.9254 (230a)
Total electricity for the above, kWh/year	167.9254 (231)
Electricity for lighting (calculated in Appendix L)	162.7112 (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	1231.3670 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	235.2394	16.4900	38.7910 (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)	665.4910	16.4900	109.7395 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	167.9254	16.4900	27.6909 (249)
Energy for lighting	162.7112	16.4900	26.8311 (250)
Additional standing charges			0.0000 (251)
Total energy cost			203.0524 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 0.6173 (257)
SAP value	89.9930
SAP rating (Section 12)	90 (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	235.2394	0.1595	37.5221 (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)	665.4910	0.1412	93.9543 (264)
Space and water heating			131.4764 (265)
Pumps, fans and electric keep-hot	167.9254	0.1387	23.2933 (267)
Energy for lighting	162.7112	0.1443	23.4843 (268)
Total CO2, kg/year			178.2539 (272)
CO2 emissions per m2			2.4300 (273)
EI value			97.9828
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

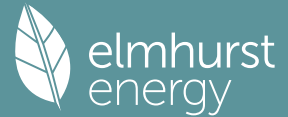
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	73.4100 (1b)	x 2.5000 (2b)	= 183.5250 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	183.5250 (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 = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	Yes
	Blower Door

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Measured/design AP50												2.9200 (17)
Infiltration rate												0.1460 (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) = 0.1241 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
Balanced mechanical ventilation with heat recovery	0.1334	0.1303	0.1303	0.1210	0.1241	0.1055	0.1024	0.1024	0.1055	0.1179	0.1179	0.1210 (22b)
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	0.2734	0.2703	0.2703	0.2610	0.2641	0.2455	0.2424	0.2424	0.2455	0.2579	0.2579	0.2610 (25)

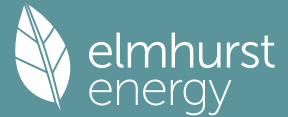
3. Heat losses and heat loss parameter

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			3.6800	1.3258	4.8788		(27)
Window S/W			7.5200	1.3258	9.9697		(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999 (29a)
Flat Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100 (30)
Total net area of external elements Aum(A, m2)			35.0400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.0950		(33)
Main dwelling							
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000 (32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000 (32)
Party Floor			73.4100			40.0000	2936.4000 (32d)
Party Ceiling			71.9200			30.0000	2157.6000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	12092.7299	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							164.7286 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				17.7800	0.0370	0.6579	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				58.9800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)				5.7700	0.0250	0.1442	
E3 Sill				2.5000	0.0220	0.0550	
E4 Jamb				10.4800	0.0170	0.1782	
E16 Corner (normal)				2.6800	0.0420	0.1126	
E18 Party wall between dwellings				5.3600	0.0320	0.1715	
E25 Staggered party wall between dwellings				5.3600	0.0300	0.1608	
E14 Flat roof				3.2300	0.1600	0.5168	
E9 Balcony between dwellings, wall insulation continuous				6.2600	0.1500	0.9390	
E24 Eaves (insulation at ceiling level - inverted)				3.2300	0.1500	0.4845	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.4205 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		22.5154 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers													
Hot water usage for baths	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766 (42a)	
Hot water usage for other uses	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171 (42b)	
Average daily hot water use (litres/day)	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504 (42c)	
												118.5607 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441 (44)	
Distribution loss (46)m = 0.15 x (45)m	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255 (45)	
Water storage loss (or HIU loss):	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138 (46)	
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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (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													

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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
	Total per year (kWh/year) = Sum(64)m =											2286.5989 (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	67.9200	59.7644	62.7920	53.6065	50.8615	44.6367	43.2151	45.6188	46.8746	53.6932	58.8248	66.9740 (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	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0335	20.4581	16.6377	12.5958	9.4155	7.9490	8.5891	11.1645	14.9849	19.0268	22.2071	23.6736 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.1514	309.3283	301.3227	284.2795	262.7657	242.5456	229.0374	225.8605	233.8662	250.9093	272.4232	292.6432 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819 (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)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395 (71)
Water heating gains (Table 5)	91.2903	88.9350	84.3979	74.4534	68.3623	61.9954	58.0848	61.3156	65.1036	72.1683	81.7012	90.0188 (72)
Total internal gains	518.2768	516.5231	500.1598	469.1304	438.3450	410.2916	393.5130	396.1423	411.7563	439.9060	474.1331	504.1373 (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				3.6800	9.3942	0.4000		0.0000	0.7700		10.6478 (74)	
South				7.5200	41.2355	0.4000		0.0000	0.7700		95.5081 (78)	
Solar gains	106.1559	181.3171	250.6009	306.9806	330.2024	334.2102	314.9500	287.8882	275.0128	208.1891	129.8386	93.4882 (83)
Total gains	624.4327	697.8402	750.7607	776.1110	768.5475	744.5018	708.4630	684.0304	686.7691	648.0951	603.9717	597.6255 (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	85.9677	86.3831	86.3831	87.6537	87.2260	89.8566	90.3105	90.3105	89.8566	88.0856	88.0856	87.6537
alpha	6.7312	6.7589	6.7589	6.8436	6.8151	6.9904	7.0207	7.0207	6.9904	6.8724	6.8724	6.8436
util living area	0.8656	0.7888	0.6835	0.5440	0.4054	0.2661	0.1943	0.2121	0.3428	0.5655	0.7771	0.8834 (86)
MIT	20.8184	20.9039	20.9629	20.9925	20.9991	21.0000	21.0000	21.0000	20.9998	20.9919	20.9283	20.7980 (87)
Th 2	20.4913	20.4937	20.4937	20.5007	20.4983	20.5124	20.5147	20.5147	20.5124	20.5030	20.5030	20.5007 (88)
util rest of house	0.8507	0.7700	0.6616	0.5204	0.3804	0.2416	0.1688	0.1857	0.3163	0.5378	0.7552	0.8699 (89)
MIT 2	20.2902	20.3904	20.4558	20.4936	20.4976	20.5124	20.5147	20.5147	20.5122	20.4957	20.4285	20.2750 (90)
Living area fraction	0.8507	0.7700	0.6616	0.5204	0.3804	0.2416	0.1688	0.1857	0.3163	0.5378	0.7552	0.8699 (89)
MIT	20.2902	20.3904	20.4558	20.4936	20.4976	20.5124	20.5147	20.5147	20.5122	20.4957	20.4285	20.2750 (90)
Temperature adjustment	20.4976	20.5920	20.6549	20.6895	20.6945	20.7038	20.7052	20.7052	20.7036	20.6905	20.6247	20.4804 (92)
adjusted MIT	20.4976	20.5920	20.6549	20.6895	20.6945	20.7038	20.7052	20.7052	20.7036	20.6905	20.6247	20.4804 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8509	0.7738	0.6686	0.5294	0.3902	0.2512	0.1788	0.1960	0.3267	0.5483	0.7607	0.8693 (94)
Ext temp.	531.3056	539.9574	501.9849	410.8616	299.8640	187.0466	126.6568	134.0951	224.3722	355.3585	459.4475	519.4998 (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	597.7367	575.2015	515.4290	413.4773	300.1659	187.0556	126.6574	134.0963	224.4330	358.1020	485.2502	593.2427 (97)
Space heating requirement - total per year (kWh/year)	49.4247	23.6840	10.0024	1.8833	0.2246	0.0000	0.0000	0.0000	0.0000	2.0411	18.5779	54.8647 (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)	49.4247	23.6840	10.0024	1.8833	0.2246	0.0000	0.0000	0.0000	0.0000	2.0411	18.5779	54.8647 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	49.4247	23.6840	10.0024	1.8833	0.2246	0.0000	0.0000	0.0000	0.0000	2.0411	18.5779	54.8647 (98c)
Space heating per m ²	(98c) / (4) =											2.1891 (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
	49.4247	23.6840	10.0024	1.8833	0.2246	0.0000	0.0000	0.0000	0.0000	2.0411	18.5779	54.8647 (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)

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Space heating fuel (main heating system)	49.4247	23.6840	10.0024	1.8833	0.2246	0.0000	0.0000	0.0000	0.0000	2.0411	18.5779	54.8647	(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 requirement	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(64)
Efficiency of water heater	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	(216)
Fuel for water heating, kWh/month	67.2948	59.3970	62.8062	54.5130	52.3634	46.6617	45.6704	47.7744	48.6205	54.8420	59.0807	66.4667	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2622	12.8819	14.2622	13.8021	14.2622	13.8021	14.2622	14.2622	13.8021	14.2622	13.8021	14.2622	(231)
Lighting	20.1610	16.1739	14.5628	10.6694	8.2413	6.7332	7.5180	9.7722	12.6931	16.6540	18.8107	20.7214	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												160.7028	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												343.5958	
Water heating fuel used												665.4910	(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)												167.9254	(230a)
Total electricity for the above, kWh/year												167.9254	(231)
Electricity for lighting (calculated in Appendix L)												162.7112	(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												1156.8303	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	160.7028	28.4300	45.6878	(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)	665.4910	28.4300	189.1991	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	167.9254	28.4300	47.7412	(249)
Energy for lighting	162.7112	28.4300	46.2588	(250)
Additional standing charges			0.0000	(251)
Total energy cost			328.8869	(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	160.7028	0.1599	25.7008	(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)	665.4910	0.1412	93.9543	(264)
Space and water heating			119.6551	(265)
Pumps, fans and electric keep-hot	167.9254	0.1387	23.2933	(267)
Energy for lighting	162.7112	0.1443	23.4843	(268)
Total CO2, kg/year			166.4327	(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	160.7028	1.5919	255.8235	(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)	665.4910	1.5220	1012.9091	(278)
Space and water heating			1268.7326	(279)
Pumps, fans and electric keep-hot	167.9254	1.5128	254.0375	(281)
Energy for lighting	162.7112	1.5338	249.5718	(282)
Total Primary energy kWh/year			1772.3420	(286)

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SAP 10 EPC IMPROVEMENTS

Plot 15

Current energy efficiency rating: B 90
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 Typical annual savings Energy Environmental
(none) efficiency impact
Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 90
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	Potential	Saving
Electricity	£329	£329	£0
Space heating	£93	£93	£0
Water heating	£189	£189	£0
Lighting	£46	£46	£0
Total cost of fuels	£329	£329	£0
Total cost of uses	£328	£328	£0
Delivered energy	16 kWh/m ²	16 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m ²	2 kg/m ²	2 kg/m ²	0 kg/m ²
Primary energy	24 kWh/m ²	24 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

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.4100 (1b)	x 2.5000 (2b)	= 183.5250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.5250 (5)

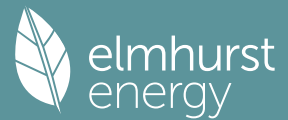
2. Ventilation rate

	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	= (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		2.9200	(17)
Infiltration rate		0.1460	(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) =		0.1241 (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	0.1582	0.1551	0.1520	0.1365	0.1334	0.1179	0.1179	0.1148	0.1241	0.1334	0.1396	0.1458 (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)

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Effective ac 0.2982 0.2951 0.2920 0.2765 0.2734 0.2579 0.2579 0.2548 0.2641 0.2734 0.2796 0.2858 (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			3.6800	1.3258	4.8788			(27)
Window S/W			7.5200	1.3258	9.9697			(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999	(29a)
Flat Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100	(30)
Total net area of external elements Aum(A, m2)			35.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.0950			(33)
Main dwelling								
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000	(32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000	(32)
Party Floor			73.4100			40.0000	2936.4000	(32d)
Party Ceiling			71.9200			30.0000	2157.6000	(32b)
Internal Wall			107.7800			9.0000	970.0200	(32c)

Heat capacity Cm = Sum(A x k)

(28)...(30) + (32) + (32a)...(32e) = 12092.7299 (34)

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

164.7286 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.7800	0.0370	0.6579
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	58.9800	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.7700	0.0250	0.1442
E3 Sill	2.5000	0.0220	0.0550
E4 Jamb	10.4800	0.0170	0.1782
E16 Corner (normal)	2.6800	0.0420	0.1126
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E14 Flat roof	3.2300	0.1600	0.5168
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.1500	0.9390
E24 Eaves (insulation at ceiling level - inverted)	3.2300	0.1500	0.4845

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

3.4205 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 22.5154 (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	18.0616	17.8737	17.6858	16.7463	16.5584	15.6190	15.6190	15.4311	15.9948	16.5584	16.9342	17.3100	(38)
Heat transfer coeff	40.5771	40.3892	40.2013	39.2618	39.0739	38.1344	38.1344	37.9465	38.5102	39.0739	39.4497	39.8255	(39)
Average = Sum(39)m / 12 =													39.2148

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5527	0.5502	0.5476	0.5348	0.5323	0.5195	0.5195	0.5169	0.5246	0.5323	0.5374	0.5425	(40)
HLP (average)													0.5342
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

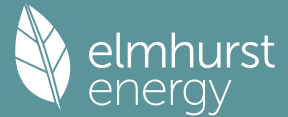
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers													
63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766		(42a)
Hot water usage for baths													
27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171		(42b)
Hot water usage for other uses													
38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504		(42c)
Average daily hot water use (litres/day)													118.5607 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441	(44)
Energy conte	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255	(45)
Energy content (annual)													Total = Sum(45)m = 1969.2679
Distribution loss (46)m = 0.15 x (45)m													
30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138		(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	26.9514	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	26.9514	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													
231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769		(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													
231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769		(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	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
67.9200	59.7644	62.7920	53.6065	50.8615	44.6367	43.2151	45.6188	46.8746	53.6932	58.8248	66.9740		(65)

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

Metabolic gains (Table 5), Watts													
(66)m	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
23.0335	20.4581	16.6377	12.5958	9.4155	7.9490	8.5891	11.1645	14.9849	19.0268	22.2071	23.6736		(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.1514	309.3283	301.3227	284.2795	262.7657	242.5456	229.0374	225.8605	233.8662	250.9093	272.4232	292.6432 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819 (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)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395 (71)
Water heating gains (Table 5)	91.2903	88.9350	84.3979	74.4534	68.3623	61.9954	58.0848	61.3156	65.1036	72.1683	81.7012	90.0188 (72)
Total internal gains	518.2768	516.5231	500.1598	469.1304	438.3450	410.2916	393.5130	396.1423	411.7563	439.9060	474.1331	504.1373 (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				3.6800	10.6334	0.4000	0.0000		0.7700	12.0523 (74)		
South				7.5200	46.7521	0.4000	0.0000		0.7700	108.2853 (78)		
Solar gains	120.3376	200.3759	265.0420	318.1862	350.7456	346.7050	334.8143	310.1047	283.0399	218.6987	143.2230	103.6158 (83)
Total gains	638.6144	716.8991	765.2018	787.3166	789.0906	756.9966	728.3273	706.2470	694.7963	658.6048	617.3561	607.7531 (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	82.7830	83.1681	83.5569	85.5563	85.9677	88.0856	88.0856	88.5218	87.2260	85.9677	85.1488	84.3453
alpha	6.5189	6.5445	6.5705	6.7038	6.7312	6.8724	6.8724	6.9015	6.8151	6.7312	6.6766	6.6230
util living area	0.8913	0.8216	0.7270	0.5951	0.4592	0.3223	0.2304	0.2471	0.3821	0.6076	0.8129	0.9066 (86)
MIT	20.7452	20.8560	20.9373	20.9846	20.9975	20.9998	21.0000	21.0000	20.9994	20.9854	20.8903	20.7218 (87)
Th 2	20.4727	20.4750	20.4774	20.4890	20.4913	20.5030	20.5030	20.5054	20.4983	20.4913	20.4867	20.4820 (88)
util rest of house	0.8785	0.8046	0.7059	0.5716	0.4344	0.2973	0.2044	0.2206	0.3544	0.5800	0.7930	0.8952 (89)
MIT 2	20.1857	20.3174	20.4118	20.4740	20.4892	20.5029	20.5030	20.5053	20.4979	20.4777	20.3700	20.1664 (90)
Living area fraction	20.4053	20.5288	20.6181	20.6745	20.6887	20.6980	20.6981	20.6995	FLA = Living area / (4) =	20.6770	20.5742	0.3926 (91)
MIT	20.4053	20.5288	20.6181	20.6745	20.6887	20.6980	20.6981	20.6995	20.6948	20.6770	20.5742	20.3845 (92)
Temperature adjustment	20.4053	20.5288	20.6181	20.6745	20.6887	20.6980	20.6981	20.6995	20.6948	20.6770	20.5742	0.0000
adjusted MIT	20.4053	20.5288	20.6181	20.6745	20.6887	20.6980	20.6981	20.6995	20.6948	20.6770	20.5742	20.3845 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8768	0.8064	0.7117	0.5802	0.4440	0.3071	0.2146	0.2310	0.3653	0.5902	0.7965	0.8929 (94)
Ext temp.	559.9244	578.0917	544.5891	456.8205	350.3842	232.4949	156.2761	163.1471	253.7984	388.6900	491.7240	542.6676 (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	653.5074	631.2350	567.5659	462.2878	351.2243	232.5432	156.2792	163.1522	253.9677	393.7486	531.5544	644.5541 (97)
Space heating kWh	69.6258	35.7123	17.0948	3.9365	0.6250	0.0000	0.0000	0.0000	0.0000	3.7637	28.6779	75.8036 (98a)
Space heating requirement - total per year (kWh/year)	69.6258	35.7123	17.0948	3.9365	0.6250	0.0000	0.0000	0.0000	0.0000	3.7637	28.6779	75.8036 (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)	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	69.6258	35.7123	17.0948	3.9365	0.6250	0.0000	0.0000	0.0000	0.0000	3.7637	28.6779	75.8036 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	69.6258	35.7123	17.0948	3.9365	0.6250	0.0000	0.0000	0.0000	0.0000	3.7637	28.6779	75.8036 (98c)
Space heating per m2	(98c) / (4) =											3.2045 (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	69.6258	35.7123	17.0948	3.9365	0.6250	0.0000	0.0000	0.0000	0.0000	3.7637	28.6779	75.8036 (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)	69.6258	35.7123	17.0948	3.9365	0.6250	0.0000	0.0000	0.0000	0.0000	3.7637	28.6779	75.8036 (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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
Water heating requirement	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
Efficiency of water heater	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958 (216)
Fuel for water heating, kWh/month	67.2948	59.3970	62.8062	54.5130	52.3634	46.6617	45.6704	47.7744	48.6205	54.8420	59.0807	66.4667 (217)
Space cooling fuel requirement												

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(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	0.0000	(221)
Pumps and Fa	14.2622	12.8819	14.2622	13.8021	14.2622	13.8021	14.2622	14.2622	13.8021	14.2622	13.8021	14.2622	13.8021	(231)
Lighting	20.1610	16.1739	14.5628	10.6694	8.2413	6.7332	7.5180	9.7722	12.6931	16.6540	18.8107	20.7214	(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													235.2394	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													343.5958	
Water heating fuel used													665.4910	(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)													167.9254	(230a)
Total electricity for the above, kWh/year													167.9254	(231)
Electricity for lighting (calculated in Appendix L)													162.7112	(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													1231.3670	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	235.2394	16.4900	38.7910	(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)	665.4910	16.4900	109.7395	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	167.9254	16.4900	27.6909	(249)
Energy for lighting	162.7112	16.4900	26.8311	(250)
Additional standing charges			0.0000	(251)
Total energy cost			203.0524	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6173	(257)
SAP value		89.9930	
SAP rating (Section 12)		90	(258)
SAP band		B	

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

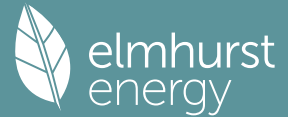
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	235.2394	0.1595	37.5221	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	665.4910	0.1412	93.9543	(264)
Space and water heating			131.4764	(265)
Pumps, fans and electric keep-hot	167.9254	0.1387	23.2933	(267)
Energy for lighting	162.7112	0.1443	23.4843	(268)
Total CO2, kg/year			178.2539	(272)
CO2 emissions per m2			2.4300	(273)
EI value			97.9828	
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

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	73.4100 (1b)	x 2.5000 (2b)	= 183.5250 (1b) - (3b)	
Ground floor				

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 73.4100
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 183.5250

2. Ventilation rate

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 2.9200 (17)
Infiltration rate 0.1460 (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) = 0.1241 (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
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
Adj infilt rate	0.1334	0.1303	0.1303	0.1210	0.1241	0.1055	0.1024	0.1024	0.1055	0.1179	0.1179	0.1210
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	0.2734	0.2703	0.2703	0.2610	0.2641	0.2455	0.2424	0.2424	0.2455	0.2579	0.2579	0.2610

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			3.6800	1.3258	4.8788		(27)
Window S/W			7.5200	1.3258	9.9697		(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999 (29a)
Flat Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100 (30)
Total net area of external elements Aum(A, m2)			35.0400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 19.0950		(33)
Main dwelling							
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000 (32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000 (32)
Party Floor			73.4100			40.0000	2936.4000 (32d)
Party Ceiling			71.9200			30.0000	2157.6000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)							
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							(28)...(30) + (32) + (32a)...(32e) = 12092.7299 (34)
List of Thermal Bridges							164.7286 (35)
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				17.7800	0.0370	0.6579	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				58.9800	0.0000	0.0000	
E2 Other lintels (including other steel lintels)				5.7700	0.0250	0.1442	
E3 Sill				2.5000	0.0220	0.0550	
E4 Jamb				10.4800	0.0170	0.1782	
E16 Corner (normal)				2.6800	0.0420	0.1126	
E18 Party wall between dwellings				5.3600	0.0320	0.1715	
E25 Staggered party wall between dwellings				5.3600	0.0300	0.1608	
E14 Flat roof				3.2300	0.1600	0.5168	
E9 Balcony between dwellings, wall insulation continuous				6.2600	0.1500	0.9390	
E24 Eaves (insulation at ceiling level - inverted)				3.2300	0.1500	0.4845	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.4205 (36)
Point Thermal Bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 22.5154 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	16.5584	16.3706	16.3706	15.8069	15.9948	14.8674	14.6795	14.6795	14.8674	15.6190	15.6190	15.8069
Heat transfer coeff	39.0739	38.8860	38.8860	38.3223	38.5102	37.3828	37.1949	37.1949	37.3828	38.1344	38.1344	38.3223
Average = Sum(39)m / 12 =												38.1187

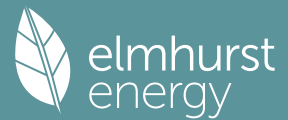
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.5323	0.5297	0.5297	0.5220	0.5246	0.5092	0.5067	0.5067	0.5092	0.5195	0.5195	0.5220
HLP (average)												0.5193
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3260 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766
Hot water usage for baths	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171
Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504
Average daily hot water use (litres/day)												118.5607

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441	(44)
Energy content (annual)	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255	(45)
Distribution loss (46)m = 0.15 x (45)m	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138	(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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(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	67.9200	59.7644	62.7920	53.6065	50.8615	44.6367	43.2151	45.6188	46.8746	53.6932	58.8248	66.9740	(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	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0335	20.4581	16.6377	12.5958	9.4155	7.9490	8.5891	11.1645	14.9849	19.0268	22.2071	23.6736	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.1514	309.3283	301.3227	284.2795	262.7657	242.5456	229.0374	225.8605	233.8662	250.9093	272.4232	292.6432	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	(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)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	(71)
Water heating gains (Table 5)	91.2903	88.9350	84.3979	74.4534	68.3623	61.9954	58.0848	61.3156	65.1036	72.1683	81.7012	90.0188	(72)
Total internal gains	518.2768	516.5231	500.1598	469.1304	438.3450	410.2916	393.5130	396.1423	411.7563	439.9060	474.1331	504.1373	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF			Access factor Table 6d	Gains W
North					3.6800	9.3942		0.4000		0.0000			0.7700	10.6478 (74)
South					7.5200	41.2355		0.4000		0.0000			0.7700	95.5081 (78)
Solar gains	106.1559	181.3171	250.6009	306.9806	330.2024	334.2102	314.9500	287.8882	275.0128	208.1891	129.8386			93.4882 (83)
Total gains	624.4327	697.8402	750.7607	776.1110	768.5475	744.5018	708.4630	684.0304	686.7691	648.0951	603.9717			597.6255 (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	85.9677	86.3831	86.3831	87.6537	87.2260	89.8566	90.3105	90.3105	89.8566	88.0856	88.0856	87.6537		
Feb	6.7312	6.7589	6.7589	6.8436	6.8151	6.9904	7.0207	7.0207	6.9904	6.8724	6.8724	6.8436		
util living area	0.8656	0.7888	0.6835	0.5440	0.4054	0.2661	0.1943	0.2121	0.3428	0.5655	0.7771	0.8834	(86)	
MIT	20.8184	20.9039	20.9629	20.9925	20.9991	21.0000	21.0000	21.0000	20.9998	20.9919	20.9283	20.7980	(87)	
Th 2	20.4913	20.4937	20.4937	20.5007	20.4983	20.5124	20.5147	20.5147	20.5124	20.5030	20.5030	20.5007	(88)	
util rest of house	0.8507	0.7700	0.6616	0.5204	0.3804	0.2416	0.1688	0.1857	0.3163	0.5378	0.7552	0.8699	(89)	
MIT 2	20.2902	20.3904	20.4558	20.4936	20.4976	20.5124	20.5147	20.5147	20.5122	20.4957	20.4285	20.2750	(90)	
Living area fraction									fLA = Living area / (4) =			0.3926	(91)	
MIT	20.4976	20.5920	20.6549	20.6895	20.6945	20.7038	20.7052	20.7052	20.7036	20.6905	20.6247	20.4804	(92)	
Temperature adjustment												0.0000		
adjusted MIT	20.4976	20.5920	20.6549	20.6895	20.6945	20.7038	20.7052	20.7052	20.7036	20.6905	20.6247	20.4804	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8509	0.7738	0.6686	0.5294	0.3902	0.2512	0.1788	0.1960	0.3267	0.5483	0.7607	0.8693	(94)
Useful gains	531.3056	539.9574	501.9849	410.8616	299.8640	187.0466	126.6568	134.0951	224.3722	355.3585	459.4475	519.4998	(95)
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	597.7367	575.2015	515.4290	413.4773	300.1659	187.0556	126.6574	134.0963	224.4330	358.1020	485.2502	593.2427	(97)
Space heating kWh	49.4247	23.6840	10.0024	1.8833	0.2246	0.0000	0.0000	0.0000	0.0000	2.0411	18.5779	54.8647	(98a)
Space heating requirement - total per year (kWh/year)												160.7028	
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)

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Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	49.4247	23.6840	10.0024	1.8833	0.2246	0.0000	0.0000	0.0000	0.0000	2.0411	18.5779	54.8647 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												160.7028
Space heating per m2												(98c) / (4) = 2.1891 (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	49.4247	23.6840	10.0024	1.8833	0.2246	0.0000	0.0000	0.0000	0.0000	2.0411	18.5779	54.8647 (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)	49.4247	23.6840	10.0024	1.8833	0.2246	0.0000	0.0000	0.0000	0.0000	2.0411	18.5779	54.8647 (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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
Efficiency of water heater	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958 (216)
Fuel for water heating, kWh/month	67.2948	59.3970	62.8062	54.5130	52.3634	46.6617	45.6704	47.7744	48.6205	54.8420	59.0807	66.4667 (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	14.2622	12.8819	14.2622	13.8021	14.2622	13.8021	14.2622	14.2622	13.8021	14.2622	13.8021	14.2622 (231)
Lighting	20.1610	16.1739	14.5628	10.6694	8.2413	6.7332	7.5180	9.7722	12.6931	16.6540	18.8107	20.7214 (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												160.7028 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												343.5958
Water heating fuel used												665.4910 (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)												167.9254 (230a)
Total electricity for the above, kWh/year												167.9254 (231)
Electricity for lighting (calculated in Appendix L)												162.7112 (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												1156.8303 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	160.7028	28.4300	45.6878 (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)	665.4910	28.4300	189.1991 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	167.9254	28.4300	47.7412 (249)
Energy for lighting	162.7112	28.4300	46.2588 (250)
Additional standing charges			0.0000 (251)
Total energy cost			328.8869 (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	160.7028	0.1599	25.7008 (261)

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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)	665.4910	0.1412	93.9543 (264)
Space and water heating			119.6551 (265)
Pumps, fans and electric keep-hot	167.9254	0.1387	23.2933 (267)
Energy for lighting	162.7112	0.1443	23.4843 (268)
Total CO2, kg/year			166.4327 (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	160.7028	1.5919	255.8235 (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)	665.4910	1.5220	1012.9091 (278)
Space and water heating			1268.7326 (279)
Pumps, fans and electric keep-hot	167.9254	1.5128	254.0375 (281)
Energy for lighting	162.7112	1.5338	249.5718 (282)
Total Primary energy kWh/year			1772.3420 (286)