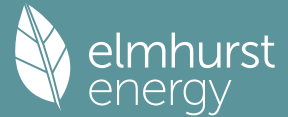


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Plot Reference	Plot 05				Issued on Date	22/12/2025	
Assessment Reference	Plot 05			Plot Type Ref			
Plot Address	Flat 2, 4 Cross Road Manchester, M21 9SX				SAP Version	10.2	
SAP Rating	88 B	DER	3.20	TER	11.43		
Environmental	98 A	% DER < TER				72.00	
CO ₂ Emissions (t/year)	0.19	DFEE	23.02	TFEE	26.72		
Compliance Check	See BREL	% DFEE < TFEE				13.84	
% DPER < TPER	44.69	DPER	33.45	TPER	60.48		
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	71.5300 (1b)	2.5000 (2b)	178.8250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5300		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	178.8250 (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)

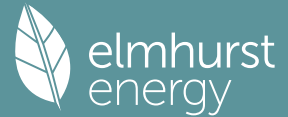
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.9000	(17)
Infiltration rate	0.1450	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1232 (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	0.1571	0.1541	0.1510	0.1356	0.1325	0.1171	0.1171	0.1140	0.1232	0.1325	0.1387	0.1448 (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	0.2971	0.2941	0.2910	0.2756	0.2725	0.2571	0.2571	0.2540	0.2632	0.2725	0.2787	0.2848 (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)
Ground Floor			71.5300	0.1100	7.8683	110.0000	7868.3000 (28a)
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)			106.5700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.9633		(33)
Main dwelling							
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000 (32)
Corridor			25.2500	0.0000	0.0000	45.0000	1136.2500 (32)
Party Ceiling			70.0400			30.0000	2101.2000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16970.4799 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							237.2498 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.5200	0.0370	0.4632
P1 Party wall - Ground floor	29.5100	0.0510	1.5050
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.5100	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
E5 Ground floor (normal)	12.5200	0.0670	0.8388
E16 Corner (normal)	2.6800	0.0420	0.1126
E18 Party wall between dwellings	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E14 Flat roof	3.2300	0.1600	0.5168
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.1408 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	31.1041 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.5351	17.3533	17.1715	16.2623	16.0805	15.1713	15.1713	14.9895	15.5350	16.0805	16.4441	16.8078 (38)
Heat transfer coeff	48.6392	48.4574	48.2756	47.3664	47.1846	46.2754	46.2754	46.0936	46.6391	47.1846	47.5482	47.9119 (39)
Average = Sum(39)m / 12 =												47.3209
HLP	0.6800	0.6774	0.6749	0.6622	0.6596	0.6469	0.6469	0.6444	0.6520	0.6596	0.6647	0.6698 (40)
HLP (average)												0.6616
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2827 (42)
Hot water usage for mixer showers	62.4928	61.5537	60.1852	57.5668	55.6344	53.4795	52.2547	53.6128	55.1016	57.4154	60.0900	62.2534 (42a)
Hot water usage for baths	26.9972	26.5962	26.0316	24.9906	24.2111	23.3467	22.8798	23.4405	24.0509	24.9758	26.0383	26.9059 (42b)
Hot water usage for other uses	38.0070	36.6249	35.2429	33.8608	32.4787	31.0967	31.0967	32.4787	33.8608	35.2429	36.6249	38.0070 (42c)
Average daily hot water use (litres/day)												117.1988 (43)
Daily hot water use	127.4971	124.7749	121.4597	116.4181	112.3242	107.9229	106.2311	109.5320	113.0134	117.6341	122.7533	127.1664 (44)
Energy conte	201.9242	177.6778	186.6790	159.3706	151.2100	132.7038	128.4773	135.6235	139.3568	159.6283	174.8846	199.1118 (45)
Energy content (annual)										Total = Sum(45)m =		1946.6476
Distribution loss (46)m = $0.15 \times (45)m$	30.2886	26.6517	28.0019	23.9056	22.6815	19.9056	19.2716	20.3435	20.9035	23.9442	26.2327	29.8668 (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	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2263.9786 (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	67.1398	59.0779	62.0708	52.9907	50.2773	44.1240	42.7187	45.0948	46.3361	53.0764	58.1491	66.2047 (65)

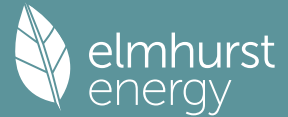
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.1430	117.5154	106.1430	109.6811	106.1430	109.6811	106.1430	106.1430	109.6811	106.1430	109.6811	106.1430 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8413	202.9254	197.6735	186.4929	172.3794	159.1147	150.2530	148.1689	153.4208	164.6014	178.7149	191.9796 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134 (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)	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076 (71)
Water heating gains (Table 5)	90.2417	87.9135	83.4285	73.5982	67.5770	61.2833	57.4176	60.6113	64.3557	71.3393	80.7627	88.9848 (72)
Total internal gains	454.4663	465.5947	444.4853	427.0126	403.3397	387.3194	371.0540	372.1635	384.6979	399.3240	426.3990	444.3477 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	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	574.8038	665.9706	709.5273	745.1988	754.0853	734.0244	705.8683	682.2682	667.7379	618.0227	569.6220	547.9636 (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	96.9181	97.2818	97.6482	99.5225	99.9060	101.8688	101.8688	102.2707	101.0745	99.9060	99.1419	98.3894
alpha	7.4612	7.4855	7.5099	7.6348	7.6604	7.7913	7.7913	7.8180	7.7383	7.6604	7.6095	7.5593
util living area	0.9766	0.9394	0.8764	0.7424	0.5780	0.4033	0.2884	0.3107	0.4811	0.7617	0.9383	0.9819 (86)
MIT	20.5698	20.7349	20.8659	20.9658	20.9950	20.9997	21.0000	21.0000	20.9990	20.9656	20.7825	20.5414 (87)
Th 2	20.3585	20.3608	20.3631	20.3744	20.3766	20.3879	20.3879	20.3902	20.3834	20.3766	20.3721	20.3676 (88)
util rest of house	0.9710	0.9272	0.8551	0.7104	0.5406	0.3648	0.2483	0.2696	0.4385	0.7245	0.9238	0.9775 (89)
MIT 2	19.8681	20.0709	20.2254	20.3431	20.3728	20.3878	20.3879	20.3902	20.3828	20.3467	20.1407	19.8406 (90)
Living area fraction									fLA = Living area / (4) =			0.4074 (91)
MIT	20.1540	20.3414	20.4863	20.5968	20.6262	20.6371	20.6373	20.6386	20.6338	20.5988	20.4021	20.1261 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1540	20.3414	20.4863	20.5968	20.6262	20.6371	20.6373	20.6386	20.6338	20.5988	20.4021	20.1261 (93)

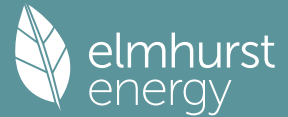
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9690	0.9268	0.8595	0.7220	0.5557	0.3805	0.2647	0.2863	0.4558	0.7381	0.9246	0.9755 (94)
Useful gains	556.9793	617.2022	609.8152	538.0108	419.0203	279.2756	186.8221	195.3648	304.3479	456.1728	526.6479	534.5335 (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	771.1243	748.2488	675.1971	554.0342	421.1804	279.3688	186.8265	195.3727	304.7310	471.7914	632.4932	763.0510 (97)
Space heating kWh	159.3238	88.0633	48.6441	11.5368	1.6071	0.0000	0.0000	0.0000	0.0000	11.6202	76.2086	170.0170 (98a)
Space heating requirement - total per year (kWh/year)												567.0211
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	159.3238	88.0633	48.6441	11.5368	1.6071	0.0000	0.0000	0.0000	0.0000	11.6202	76.2086	170.0170 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												567.0211
Space heating per m2										(98c) / (4) =		7.9270 (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	159.3238	88.0633	48.6441	11.5368	1.6071	0.0000	0.0000	0.0000	0.0000	11.6202	76.2086	170.0170 (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)	159.3238	88.0633	48.6441	11.5368	1.6071	0.0000	0.0000	0.0000	0.0000	11.6202	76.2086	170.0170 (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	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632 (64)
Efficiency of water heater (217)m	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270 (216)
Fuel for water heating, kWh/month	66.5284	58.7224	62.0970	53.9064	51.7870	46.1550	45.1792	47.2564	48.0889	54.2340	58.4159	65.7109 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	13.8969	12.5520	13.8969	13.4486	13.8969	13.4486	13.8969	13.8969	13.4486	13.8969	13.4486	13.8969 (231)
Lighting	19.6359	15.7527	14.1835	10.3915	8.0267	6.5579	7.3222	9.5177	12.3625	16.2203	18.3208	20.1817 (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												567.0211 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												344.0270

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Water heating fuel used	658.0816 (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)	163.6249 (230a)
Total electricity for the above, kWh/year	163.6249 (231)
Electricity for lighting (calculated in Appendix L)	158.4731 (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	1547.2006 (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	567.0211	0.1590	90.1650 (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)	658.0816	0.1412	92.9056 (264)
Space and water heating			183.0706 (265)
Pumps, fans and electric keep-hot	163.6249	0.1387	22.6968 (267)
Energy for lighting	158.4731	0.1443	22.8726 (268)
Total CO2, kg/year			228.6400 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2000 (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	567.0211	1.5886	900.7539 (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)	658.0816	1.5220	1001.6219 (278)
Space and water heating			1902.3757 (279)
Pumps, fans and electric keep-hot	163.6249	1.5128	247.5317 (281)
Energy for lighting	158.4731	1.5338	243.0713 (282)
Total Primary energy kWh/year			2392.9788 (286)
Dwelling Primary energy Rate (DPER)			33.4500 (287)

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

1. Overall dwelling characteristics

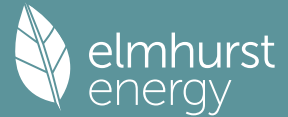
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	71.5300 (1b)	x 2.5000 (2b)	= 178.8250 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5300		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	178.8250 (5)

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) = 0.1678 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4178 (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) = 0.3551 (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	0.4527	0.4439	0.4350	0.3906	0.3817	0.3373	0.3373	0.3285	0.3551	0.3817	0.3995	0.4172 (22b)
Effective ac	0.6025	0.5985	0.5946	0.5763	0.5729	0.5569	0.5569	0.5539	0.5630	0.5729	0.5798	0.5870 (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)					
Ground Floor			71.5300	0.1300	9.2989			(28a)					
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)			106.5700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.3102			(33)					
Main dwelling													
Party Wall			53.8400	0.0000	0.0000			(32)					
Corridor			25.2500	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							237.2498	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E7 Party floor between dwellings (in blocks of flats)				12.5200	0.0700		0.8764						
P1 Party wall - Ground floor				29.5100	0.0800		2.3608						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				29.5100	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						
E5 Ground floor (normal)				12.5200	0.1600		2.0032						
E16 Corner (normal)				2.6800	0.0900		0.2412						
E18 Party wall between dwellings				2.6800	0.0600		0.1608						
E25 Staggered party wall between dwellings				8.0400	0.0600		0.4824						
E14 Flat roof				3.2300	0.0800		0.2584						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3207	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	33.6309	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.5543	Feb 35.3195	Mar 35.0893	Apr 34.0080	May 33.8057	Jun 32.8639	Jul 32.8639	Aug 32.6895	Sep 33.2267	Oct 33.8057	Nov 34.2149	Dec 34.6428	(38)
Heat transfer coeff	69.1853	68.9504	68.7202	67.6389	67.4366	66.4949	66.4949	66.3204	66.8576	67.4366	67.8459	68.2737	(39)
Average = Sum(39)m / 12 =												67.6380	
HLP	Jan 0.9672	Feb 0.9639	Mar 0.9607	Apr 0.9456	May 0.9428	Jun 0.9296	Jul 0.9296	Aug 0.9272	Sep 0.9347	Oct 0.9428	Nov 0.9485	Dec 0.9545	(40)
HLP (average)												0.9456	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

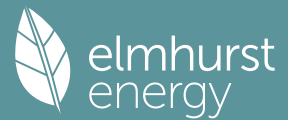
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2827	(42)
Hot water usage for mixer showers	62.4928	61.5537	60.1852	57.5668	55.6344	53.4795	52.2547	53.6128	55.1016	57.4154	60.0900	62.2534	(42a)	
Hot water usage for baths	26.9972	26.5962	26.0316	24.9906	24.2111	23.3467	22.8798	23.4405	24.0509	24.9758	26.0383	26.9059	(42b)	
Hot water usage for other uses	38.0070	36.6249	35.2429	33.8608	32.4787	31.0967	31.0967	32.4787	33.8608	35.2429	36.6249	38.0070	(42c)	
Average daily hot water use (litres/day)													117.1988	(43)
Daily hot water use	Jan 127.4971	Feb 124.7749	Mar 121.4597	Apr 116.4181	May 112.3242	Jun 107.9229	Jul 106.2311	Aug 109.5320	Sep 113.0134	Oct 117.6341	Nov 122.7533	Dec 127.1664	(44)	
Energy conte	201.9242	177.6778	186.6790	159.3706	151.2100	132.7038	128.4773	135.6235	139.3568	159.6283	174.8846	199.1118	(45)	
Energy content (annual)										Total = Sum(45)m =		1946.6476		
Distribution loss (46)m = 0.15 x (45)m	30.2886	26.6517	28.0019	23.9056	22.6815	19.9056	19.2716	20.3435	20.9035	23.9442	26.2327	29.8668	(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	248.5191	219.7635	233.2739	204.4625	197.8049	177.7956	175.0722	182.2184	184.4486	206.2232	219.9764	245.7067	(62)	
WWHRS	-28.5691	-25.2668	-26.4579	-21.9082	-20.4176	-17.4715	-16.3768	-17.4150	-18.0767	-21.3104	-24.1422	-28.0401	(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	219.9500	194.4967	206.8160	182.5543	177.3873	160.3241	158.6955	164.8034	166.3719	184.9128	195.8342	217.6666	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2229.8127	(64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
													0.0000	(64a)
Heat gains from water heating, kWh/month	104.4157	92.7464	99.3467	89.0642	87.5532	80.1975	79.9946	82.3707	82.4096	90.3523	94.2226	103.4806	(65)	

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

Metabolic gains (Table 5), Watts														
(66)m	Jan 114.1345	Feb 114.1345	Mar 114.1345	Apr 114.1345	May 114.1345	Jun 114.1345	Jul 114.1345	Aug 114.1345	Sep 114.1345	Oct 114.1345	Nov 114.1345	Dec 114.1345	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.1430	117.5154	106.1430	109.6811	106.1430	109.6811	106.1430	106.1430	109.6811	106.1430	109.6811	106.1430	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8413	202.9254	197.6735	186.4929	172.3794	159.1147	150.2530	148.1689	153.4208	164.6014	178.7149	191.9796	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	(69)	

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Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	(71)
Water heating gains (Table 5)	140.3437	138.0155	133.5305	123.7003	117.6791	111.3854	107.5197	110.7134	114.4578	121.4413	130.8647	139.0868 (72)
Total internal gains	507.5683	518.6967	497.5874	480.1146	456.4418	437.4215	421.1560	422.2656	434.8000	452.4260	479.5011	497.4498 (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	626.9733	717.5198	760.5752	795.8349	804.4691	781.4395	753.3755	729.9670	715.6463	669.4299	621.6141	600.2626 (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	68.1362	68.3683	68.5973	69.6939	69.9030	70.8930	70.8930	71.0795	70.5084	69.9030	69.4813	69.0459
alpha	5.5424	5.5579	5.5732	5.6463	5.6602	5.7262	5.7262	5.7386	5.7006	5.6602	5.6321	5.6031
util living area	0.9843	0.9668	0.9368	0.8612	0.7277	0.5368	0.3873	0.4163	0.6248	0.8689	0.9652	0.9872 (86)
MIT	20.1292	20.3260	20.5400	20.7838	20.9322	20.9901	20.9987	20.9981	20.9769	20.8055	20.4430	20.1008 (87)
Th 2	20.1107	20.1135	20.1162	20.1289	20.1313	20.1424	20.1424	20.1445	20.1381	20.1313	20.1265	20.1214 (88)
util rest of house	0.9800	0.9583	0.9207	0.8290	0.6745	0.4682	0.3124	0.3397	0.5545	0.8320	0.9547	0.9836 (89)
MIT 2	19.1155	19.3628	19.6269	19.9209	20.0772	20.1369	20.1420	20.1438	20.1238	19.9524	19.5216	19.0880 (90)
Living area fraction	19.5284	19.7552	19.9989	20.2724	20.4255	20.4845	20.4910	20.4918	20.4713	20.2999	19.8970	19.5006 (92)
MIT	19.5284	19.7552	19.9989	20.2724	20.4255	20.4845	20.4910	20.4918	20.4713	20.2999	19.8970	19.5006 (93)
Temperature adjustment												0.0000
adjusted MIT	19.5284	19.7552	19.9989	20.2724	20.4255	20.4845	20.4910	20.4918	20.4713	20.2999	19.8970	19.5006 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9764	0.9541	0.9183	0.8347	0.6932	0.4959	0.3429	0.3710	0.5823	0.8399	0.9514	0.9804 (94)
Useful gains	612.1807	684.6103	698.4362	664.2983	557.6759	387.5292	258.3569	270.7855	416.7289	562.2250	591.4303	588.5070 (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	1053.5836	1024.2707	927.6451	769.2200	588.4168	391.2862	258.7306	271.3691	425.9716	654.1307	868.2204	1044.6297 (97)
Space heating kWh	328.4038	228.2518	170.5315	75.5436	22.8712	0.0000	0.0000	0.0000	0.0000	68.3778	199.2889	339.3553 (98a)
Space heating requirement - total per year (kWh/year)												1432.6238
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	328.4038	228.2518	170.5315	75.5436	22.8712	0.0000	0.0000	0.0000	0.0000	68.3778	199.2889	339.3553 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1432.6238
Space heating per m2										(98c) / (4) =		20.0283 (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	328.4038	228.2518	170.5315	75.5436	22.8712	0.0000	0.0000	0.0000	0.0000	68.3778	199.2889	339.3553 (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)	355.8004	247.2934	184.7578	81.8457	24.7792	0.0000	0.0000	0.0000	0.0000	74.0821	215.9143	367.6655 (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	219.9500	194.4967	206.8160	182.5543	177.3873	160.3241	158.6955	164.8034	166.3719	184.9128	195.8342	217.6666 (64)	
Efficiency of water heater (217)m	84.9567	84.4196	83.6305	82.2396	80.7345	79.8000	79.8000	79.8000	79.8000	82.0448	84.0990	79.8000 (216)	
Fuel for water heating, kWh/month	258.8964	230.3929	247.2973	221.9785	219.7167	200.9074	198.8665	206.5205	208.4861	225.3803	232.8615	255.9229 (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	22.0544	17.6929	15.9305	11.6713	9.0153	7.3656	8.2240	10.6899	13.8852	18.2181	20.5773	22.6674 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-19.1649	-28.3919	-42.8583	-50.6847	-56.8471	-53.8656	-53.2131	-49.1508	-42.3630	-33.5608	-21.5535	-16.4133 (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)													

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(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	-7.0186	-15.0813	-30.5743	-46.8112	-62.7751	-63.3959	-62.6456	-52.6325	-38.0472	-21.8513	-9.4611	-5.5264	(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												1552.1385	(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												2707.2270	(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)												177.9918	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-883.8874	(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												3639.4698	(238)

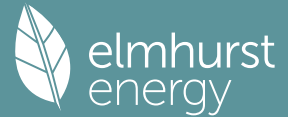
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1552.1385	0.2100	325.9491 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2707.2270	0.2100	568.5177 (264)
Space and water heating			894.4667 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	177.9918	0.1443	25.6897 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-468.0669	0.1336	-62.5135
PV Unit electricity exported	-415.8205	0.1253	-52.1182
Total			-114.6317 (269)
Total CO2, kg/year			817.4540 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4300 (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	1552.1385	1.1300	1753.9164 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2707.2270	1.1300	3059.1665 (278)
Space and water heating			4813.0829 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	177.9918	1.5338	273.0097 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-468.0669	1.4935	-699.0790
PV Unit electricity exported	-415.8205	0.4601	-191.2984
Total			-890.3774 (283)
Total Primary energy kWh/year			4325.8161 (286)
Target Primary Energy Rate (TPER)			60.4800 (287)

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Plot Reference	Plot 05				Issued on Date	22/12/2025	
Assessment Reference	Plot 05			Plot Type Ref			
Plot Address	Flat 2, 4 Cross Road Manchester, M21 9SX				SAP Version	10.2	
SAP Rating	88 B	DER	3.20	TER	11.43		
Environmental	98 A	% DER < TER				72.00	
CO ₂ Emissions (t/year)	0.19	DFEE	23.02	TFEE	26.72		
Compliance Check	See BREL	% DFEE < TFEE				13.84	
% DPER < TPER	44.69	DPER	33.45	TPER	60.48		
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	71.5300 (1b)	2.5000 (2b)	178.8250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	178.8250 (5)

2. Ventilation rate

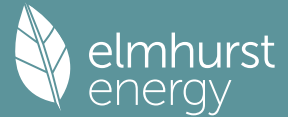
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1678 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.9000 (17)
Infiltration rate	0.3128 (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) = 0.2658 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3390	0.3323	0.3257	0.2924	0.2858	0.2526	0.2526	0.2459	0.2658	0.2858	0.2991	0.3124 (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	0.5574	0.5552	0.5530	0.5428	0.5408	0.5319	0.5319	0.5302	0.5353	0.5408	0.5447	0.5488 (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)
Ground Floor			71.5300	0.1100	7.8683	110.0000	7868.3000 (28a)
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)			106.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.9633		(33)
Main dwelling							
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000 (32)
Corridor			25.2500	0.0000	0.0000	45.0000	1136.2500 (32)
Party Ceiling			70.0400			30.0000	2101.2000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16970.4799 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							237.2498 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				12.5200	0.0370	0.4632	

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P1 Party wall - Ground floor	29.5100	0.0510	1.5050	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.5100	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	
E5 Ground floor (normal)	12.5200	0.0670	0.8388	
E16 Corner (normal)	2.6800	0.0420	0.1126	
E18 Party wall between dwellings	2.6800	0.0320	0.0858	
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412	
E14 Flat roof	3.2300	0.1600	0.5168	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				4.1408 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		31.1041 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)				
(38)m	Jan 32.8961	Feb 32.7645	Mar 32.6354	Apr 32.0294
Heat transfer coeff	64.0002	63.8686	63.7395	63.1335
Average = Sum(39)m / 12 =				63.1330
HLP	Jan 0.8947	Feb 0.8929	Mar 0.8911	Apr 0.8826
HLP (average)				0.8810
Days in mont	31	28	31	30
				31

4. Water heating energy requirements (kWh/year)				

Assumed occupancy				2.2827 (42)
Hot water usage for mixer showers				
0.0000	0.0000	0.0000	0.0000	0.0000
Hot water usage for baths	26.9972	26.5962	26.0316	24.9906
Hot water usage for other uses	38.0070	36.6249	35.2429	33.8608
Average daily hot water use (litres/day)				32.4787
	Jan 65.0042	Feb 63.2212	Mar 61.2745	Apr 58.8514
Daily hot water use	102.9508	90.0261	94.1766	80.5646
Energy conte				76.3153
Energy content (annual)				66.9444
Distribution loss (46)m = 0.15 x (45)m				65.2798
0.0000	0.0000	0.0000	0.0000	0.0000
Water storage loss (or HIU loss):				0.0000
Total storage loss				0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
If cylinder contains dedicated solar storage				0.0000
0.0000	0.0000	0.0000	0.0000	0.0000
Primary loss	0.0000	0.0000	0.0000	0.0000
Combi loss	0.0000	0.0000	0.0000	0.0000
Total heat required for water heating calculated for each month				0.0000
87.5082	76.5222	80.0501	68.4799	64.8680
WWHRS	0.0000	0.0000	0.0000	0.0000
PV diverter	0.0000	0.0000	0.0000	0.0000
Solar input	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000
Output from w/h	87.5082	76.5222	80.0501	68.4799
				64.8680
12Total per year (kWh/year)				56.9028
Electric shower(s)	50.0464	44.5917	48.6924	46.4666
				47.3385
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				46.6616
Heat gains from water heating, kWh/month				47.3385
34.3886	30.2785	32.1856	28.7366	25.5148
				25.5374
				26.5481
				26.7915
				29.5378
				30.9152
				34.1097 (65)

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

Metabolic gains (Table 5), Watts				
(66)m	Jan 114.1345	Feb 114.1345	Mar 114.1345	Apr 114.1345
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.1430	117.5154	106.1430	109.6811
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8413	202.9254	197.6735	186.4929
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4134	34.4134	34.4134	34.4134
Pumps, fans	0.0000	0.0000	0.0000	0.0000
Losses e.g. evaporation (negative values) (Table 5)	-91.3076	-91.3076	-91.3076	-91.3076
Water heating gains (Table 5)	46.2213	45.0573	43.2603	39.9120
Total internal gains	410.4459	422.7385	404.3171	393.3263
				373.4665
				361.4733
				347.9607
				347.2351
				357.5526
				367.6861
				388.5741
				401.2093 (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
North	3.6800	10.6334	0.4000	0.0000
South	7.5200	46.7521	0.4000	0.0000
				0.7700
				0.7700
Solar gains	120.3376	200.3759	265.0420	318.1862
Total gains	530.7835	623.1144	669.3591	711.5125
				724.2121
				708.1783
				682.7750
				657.3398
				640.5925
				586.3848
				531.7972
				103.6158 (83)
				504.8251 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	73.6564	73.8082	73.9576	74.6675	74.8019	75.4337	75.4337	75.5519	75.1891	74.8019	74.5306	74.2491
alpha	5.9104	5.9205	5.9305	5.9778	5.9868	6.0289	6.0289	6.0368	6.0126	5.9868	5.9687	5.9499
util living area	0.9919	0.9790	0.9544	0.8853	0.7530	0.5568	0.4017	0.4350	0.6532	0.8999	0.9797	0.9938 (86)
MIT	20.1100	20.3134	20.5313	20.7795	20.9329	20.9907	20.9989	20.9982	20.9767	20.7898	20.4110	20.0716 (87)
Th 2	20.1720	20.1735	20.1751	20.1823	20.1837	20.1900	20.1900	20.1911	20.1875	20.1837	20.1809	20.1781 (88)
util rest of house	0.9896	0.9734	0.9423	0.8572	0.7025	0.4897	0.3283	0.3594	0.5848	0.8692	0.9732	0.9920 (89)
MIT 2	19.3669	19.5678	19.7794	20.0138	20.1411	20.1858	20.1897	20.1906	20.1759	20.0285	19.6714	19.3339 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.6696	19.8715	20.0857	20.3257	20.4637	20.5137	20.5193	20.5196	20.5021	20.3387	19.9727	19.6344 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6696	19.8715	20.0857	20.3257	20.4637	20.5137	20.5193	20.5196	20.5021	20.3387	19.9727	19.6344 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9878	0.9709	0.9408	0.8625	0.7205	0.5168	0.3582	0.3902	0.6120	0.8756	0.9712	0.9905 (94)
Useful gains	524.3174	604.9815	629.7035	613.6808	521.8193	366.0214	244.6016	256.4992	392.0153	513.4639	516.4972	500.0477 (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	983.6603	956.2110	865.9483	721.3473	552.2874	369.5602	244.9267	257.0405	401.3858	613.7317	814.1932	979.9223 (97)
Space heating kWh	341.7512	236.0262	175.7662	77.5199	22.6682	0.0000	0.0000	0.0000	0.0000	74.5992	214.3411	357.0267 (98a)
Space heating requirement - total per year (kWh/year)	1499.6988											
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	341.7512	236.0262	175.7662	77.5199	22.6682	0.0000	0.0000	0.0000	0.0000	74.5992	214.3411	357.0267 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1499.6988											
Space heating per m2	(98c) / (4) = 20.9660 (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	587.4272	462.4427	474.1982	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9494	0.9794	0.9726	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	557.6833	452.9010	461.2073	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	784.0811	756.5917	728.9670	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	163.0064	225.9458	199.2132	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)												1.0000 (105)
	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	40.7516	56.4865	49.8033	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	147.0414 (107)											
Energy for space heating	20.9660 (99)											
Energy for space cooling	2.0557 (108)											
Total	23.0217 (109)											
Fabric Energy Efficiency (DFEE)	23.0 (109)											

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

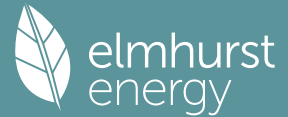
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	71.5300 (1b)	x 2.5000 (2b)	= 178.8250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	178.8250 (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	

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1678 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.4178 (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) = 0.3551 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infiltr rate	0.4527	0.4439	0.4350	0.3906	0.3817	0.3373	0.3373	0.3285	0.3551	0.3817	0.3995	0.4172	(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	0.6025	0.5985	0.5946	0.5763	0.5729	0.5569	0.5569	0.5539	0.5630	0.5729	0.5798	0.5870	(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)
Ground Floor			71.5300	0.1300	9.2989			(28a)
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)			106.5700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		26.3102			(33)
Main dwelling								
Party Wall			53.8400	0.0000	0.0000			(32)
Corridor			25.2500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								237.2498 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	12.5200	0.0700	0.8764	
P1 Party wall - Ground floor	29.5100	0.0800	2.3608	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.5100	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	
E5 Ground floor (normal)	12.5200	0.1600	2.0032	
E16 Corner (normal)	2.6800	0.0900	0.2412	
E18 Party wall between dwellings	2.6800	0.0600	0.1608	
E25 Staggered party wall between dwellings	8.0400	0.0600	0.4824	
E14 Flat roof	3.2300	0.0800	0.2584	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.3207 (36)

Point Thermal bridges

Total fabric heat loss	(33) + (36) + (36a) =	33.6309 (37)
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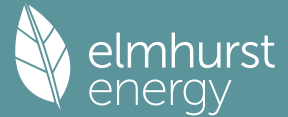
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	35.5543	35.3195	35.0893	34.0080	33.8057	32.8639	32.8639	32.6895	33.2267	33.8057	34.2149	34.6428	(38)
Heat transfer coeff	69.1853	68.9504	68.7202	67.6389	67.4366	66.4949	66.4949	66.3204	66.8576	67.4366	67.8459	68.2737	(39)
Average = Sum(39)m / 12 =												67.6380	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9672	0.9639	0.9607	0.9456	0.9428	0.9296	0.9296	0.9272	0.9347	0.9428	0.9485	0.9545	(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													2.2827 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	26.9972	26.5962	26.0316	24.9906	24.2111	23.3467	22.8798	23.4405	24.0509	24.9758	26.0383	26.9059	(42b)
Hot water usage for other uses	38.0070	36.6249	35.2429	33.8608	32.4787	31.0967	31.0967	32.4787	33.8608	35.2429	36.6249	38.0070	(42c)
Average daily hot water use (litres/day)												59.5825	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	65.0042	63.2212	61.2745	58.8514	56.6898	54.4433	53.9764	55.9192	57.9117	60.2187	62.6633	64.9129	(44)
Energy conte	102.9508	90.0261	94.1766	80.5646	76.3153	66.9444	65.2798	69.2396	71.4109	81.7162	89.2753	101.6380	(45)
Energy content (annual)										Total = Sum(45)m =		989.5378	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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	87.5082	76.5222	80.0501	68.4799	64.8680	56.9028	55.4879	58.8537	60.6993	69.4588	75.8840	86.3923	(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	87.5082	76.5222	80.0501	68.4799	64.8680	56.9028	55.4879	58.8537	60.6993	69.4588	75.8840	86.3923	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		841.1072	(64)
Electric shower(s)	50.0464	44.5917	48.6924	46.4666	47.3385	45.1564	46.6616	47.3385	46.4666	48.6924	47.7768	50.0464	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												569.2744	(64a)
Heat gains from water heating, kWh/month	34.3886	30.2785	32.1856	28.7366	28.0516	25.5148	25.5374	26.5481	26.7915	29.5378	30.9152	34.1097	(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	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.1430	117.5154	106.1430	109.6811	106.1430	109.6811	106.1430	106.1430	109.6811	106.1430	109.6811	106.1430 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8413	202.9254	197.6735	186.4929	172.3794	159.1147	150.2530	148.1689	153.4208	164.6014	178.7149	191.9796 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134 (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)	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076 (71)
Water heating gains (Table 5)	46.2213	45.0573	43.2603	39.9120	37.7038	35.4372	34.3244	35.6829	37.2104	39.7014	42.9378	45.8463 (72)
Total internal gains	410.4459	422.7385	404.3171	393.3263	373.4665	361.4733	347.9607	347.2351	357.5526	367.6861	388.5741	401.2093 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		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	529.8509	621.5615	667.3050	709.0466	721.4938	705.4913	680.1802	654.9365	638.3989	584.6899	530.6872	504.0221 (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	68.1362	68.3683	68.5973	69.6939	69.9030	70.8930	70.8930	71.0795	70.5084	69.9030	69.4813	69.0459
alpha	5.5424	5.5579	5.5732	5.6463	5.6602	5.7262	5.7262	5.7386	5.7006	5.6602	5.6321	5.6031
util living area	0.9928	0.9821	0.9619	0.9033	0.7845	0.5895	0.4282	0.4627	0.6871	0.9154	0.9825	0.9944 (86)
MIT	19.9818	20.1911	20.4257	20.7109	20.9006	20.9842	20.9978	20.9967	20.9631	20.7300	20.3153	19.9526 (87)
Th 2	20.1107	20.1135	20.1162	20.1289	20.1313	20.1424	20.1424	20.1445	20.1381	20.1313	20.1265	20.1214 (88)
util rest of house	0.9906	0.9770	0.9511	0.8771	0.7335	0.5163	0.3458	0.3783	0.6145	0.8870	0.9766	0.9927 (89)
MIT 2	19.1903	19.3985	19.6286	19.9054	20.0673	20.1354	20.1418	20.1435	20.1195	19.9295	19.5330	19.1700 (90)
Living area fraction	19.5128	19.7214	19.9533	20.2335	20.4068	20.4812	20.4905	20.4911	20.4632	20.2556	19.8517	19.4888 (92)
MIT	19.5128	19.7214	19.9533	20.2335	20.4068	20.4812	20.4905	20.4911	20.4632	20.2556	19.8517	19.4888 (93)
Temperature adjustment												0.0000
adjusted MIT	19.5128	19.7214	19.9533	20.2335	20.4068	20.4812	20.4905	20.4911	20.4632	20.2556	19.8517	19.4888 (93)

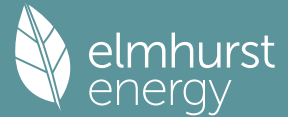
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9888	0.9743	0.9488	0.8806	0.7506	0.5457	0.3794	0.4127	0.6429	0.8916	0.9743	0.9912 (94)
Useful gains	523.9213	605.5904	633.1239	624.3854	541.5269	385.0106	258.0679	270.3073	410.4021	521.2912	517.0729	499.5753 (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	1052.4990	1021.9423	924.5150	766.5875	587.1564	391.0680	258.7012	271.3213	425.4283	651.1411	865.1501	1043.8263 (97)
Space heating kWh	393.2618	279.7885	216.7950	102.3855	33.9484	0.0000	0.0000	0.0000	0.0000	96.6084	250.6156	404.9228 (98a)
Space heating requirement - total per year (kWh/year)												1778.3259
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	393.2618	279.7885	216.7950	102.3855	33.9484	0.0000	0.0000	0.0000	0.0000	96.6084	250.6156	404.9228 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1778.3259
Space heating per m ²												24.8613 (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	625.0516	492.0619	504.0354	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9282	0.9679	0.9589	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	580.1442	476.2894	483.2951	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	780.9405	753.5588	726.1580	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	144.5733	206.2884	180.6900	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	36.1433	51.5721	45.1725	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												132.8879 (107)
Energy for space heating												24.8613 (99)
Energy for space cooling												1.8578 (108)
Total												26.7191 (109)
Fabric Energy Efficiency (TFEE)												26.7 (109)

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Plot Reference	Plot 05				Issued on Date	22/12/2025	
Assessment Reference	Plot 05			Plot Type Ref			
Plot Address	Flat 2, 4 Cross Road Manchester, M21 9SX				SAP Version	10.2	
SAP Rating	88 B	DER	3.20	TER	11.43		
Environmental	98 A	% DER < TER				72.00	
CO ₂ Emissions (t/year)	0.19	DFEE	23.02	TFEE	26.72		
Compliance Check	See BREL	% DFEE < TFEE				13.84	
% DPER < TPER	44.69	DPER	33.45	TPER	60.48		
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	71.5300 (1b)	2.5000 (2b)	178.8250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	178.8250 (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	2.9000	(17)
Infiltration rate	0.1450	(18)
Number of sides sheltered	2	(19)

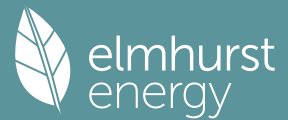
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1232 (21)

	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	0.1571	0.1541	0.1510	0.1356	0.1325	0.1171	0.1171	0.1140	0.1232	0.1325	0.1387	0.1448 (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	0.2971	0.2941	0.2910	0.2756	0.2725	0.2571	0.2571	0.2540	0.2632	0.2725	0.2787	0.2848 (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)
Ground Floor			71.5300	0.1100	7.8683	110.0000	7868.3000 (28a)
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)			106.5700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.9633		(33)
Main dwelling							
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000 (32)
Corridor			25.2500	0.0000	0.0000	45.0000	1136.2500 (32)
Party Ceiling			70.0400			30.0000	2101.2000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		16970.4799 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							237.2498 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.5200	0.0370	0.4632
P1 Party wall - Ground floor	29.5100	0.0510	1.5050
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.5100	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
E5 Ground floor (normal)	12.5200	0.0670	0.8388
E16 Corner (normal)	2.6800	0.0420	0.1126
E18 Party wall between dwellings	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E14 Flat roof	3.2300	0.1600	0.5168
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.1408 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	31.1041 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.5351	17.3533	17.1715	16.2623	16.0805	15.1713	15.1713	14.9895	15.5350	16.0805	16.4441	16.8078 (38)
Heat transfer coeff	48.6392	48.4574	48.2756	47.3664	47.1846	46.2754	46.2754	46.0936	46.6391	47.1846	47.5482	47.9119 (39)
Average = Sum(39)m / 12 =												47.3209
HLP	0.6800	0.6774	0.6749	0.6622	0.6596	0.6469	0.6469	0.6444	0.6520	0.6596	0.6647	0.6698 (40)
HLP (average)												0.6616
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2827 (42)
Hot water usage for mixer showers	62.4928	61.5537	60.1852	57.5668	55.6344	53.4795	52.2547	53.6128	55.1016	57.4154	60.0900	62.2534 (42a)
Hot water usage for baths	26.9972	26.5962	26.0316	24.9906	24.2111	23.3467	22.8798	23.4405	24.0509	24.9758	26.0383	26.9059 (42b)
Hot water usage for other uses	38.0070	36.6249	35.2429	33.8608	32.4787	31.0967	31.0967	32.4787	33.8608	35.2429	36.6249	38.0070 (42c)
Average daily hot water use (litres/day)												117.1988 (43)
Daily hot water use	127.4971	124.7749	121.4597	116.4181	112.3242	107.9229	106.2311	109.5320	113.0134	117.6341	122.7533	127.1664 (44)
Energy conte	201.9242	177.6778	186.6790	159.3706	151.2100	132.7038	128.4773	135.6235	139.3568	159.6283	174.8846	199.1118 (45)
Energy content (annual)										Total = Sum(45)m =		1946.6476
Distribution loss (46)m = $0.15 \times (45)m$	30.2886	26.6517	28.0019	23.9056	22.6815	19.9056	19.2716	20.3435	20.9035	23.9442	26.2327	29.8668 (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	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2263.9786 (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	67.1398	59.0779	62.0708	52.9907	50.2773	44.1240	42.7187	45.0948	46.3361	53.0764	58.1491	66.2047 (65)

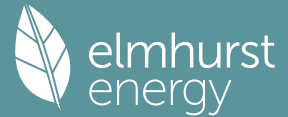
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345	114.1345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.1430	117.5154	106.1430	109.6811	106.1430	109.6811	106.1430	106.1430	109.6811	106.1430	109.6811	106.1430 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8413	202.9254	197.6735	186.4929	172.3794	159.1147	150.2530	148.1689	153.4208	164.6014	178.7149	191.9796 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134 (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)	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076 (71)
Water heating gains (Table 5)	90.2417	87.9135	83.4285	73.5982	67.5770	61.2833	57.4176	60.6113	64.3557	71.3393	80.7627	88.9848 (72)
Total internal gains	454.4663	465.5947	444.4853	427.0126	403.3397	387.3194	371.0540	372.1635	384.6979	399.3240	426.3990	444.3477 (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	574.8038	665.9706	709.5273	745.1988	754.0853	734.0244	705.8683	682.2682	667.7379	618.0227	569.6220	547.9636 (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	96.9181	97.2818	97.6482	99.5225	99.9060	101.8688	101.8688	102.2707	101.0745	99.9060	99.1419	98.3894
alpha	7.4612	7.4855	7.5099	7.6348	7.6604	7.7913	7.7913	7.8180	7.7383	7.6604	7.6095	7.5593
util living area	0.9766	0.9394	0.8764	0.7424	0.5780	0.4033	0.2884	0.3107	0.4811	0.7617	0.9383	0.9819 (86)
MIT	20.5698	20.7349	20.8659	20.9658	20.9950	20.9997	21.0000	21.0000	20.9990	20.9656	20.7825	20.5414 (87)
Th 2	20.3585	20.3608	20.3631	20.3744	20.3766	20.3879	20.3879	20.3902	20.3834	20.3766	20.3721	20.3676 (88)
util rest of house	0.9710	0.9272	0.8551	0.7104	0.5406	0.3648	0.2483	0.2696	0.4385	0.7245	0.9238	0.9775 (89)
MIT 2	19.8681	20.0709	20.2254	20.3431	20.3728	20.3878	20.3879	20.3902	20.3828	20.3467	20.1407	19.8406 (90)
Living area fraction									fLA = Living area / (4) =			0.4074 (91)
MIT	20.1540	20.3414	20.4863	20.5968	20.6262	20.6371	20.6373	20.6386	20.6338	20.5988	20.4021	20.1261 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1540	20.3414	20.4863	20.5968	20.6262	20.6371	20.6373	20.6386	20.6338	20.5988	20.4021	20.1261 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9690	0.9268	0.8595	0.7220	0.5557	0.3805	0.2647	0.2863	0.4558	0.7381	0.9246	0.9755 (94)
Useful gains	556.9793	617.2022	609.8152	538.0108	419.0203	279.2756	186.8221	195.3648	304.3479	456.1728	526.6479	534.5335 (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	771.1243	748.2488	675.1971	554.0342	421.1804	279.3688	186.8265	195.3727	304.7310	471.7914	632.4932	763.0510 (97)
Space heating kWh	159.3238	88.0633	48.6441	11.5368	1.6071	0.0000	0.0000	0.0000	0.0000	11.6202	76.2086	170.0170 (98a)
Space heating requirement - total per year (kWh/year)												567.0211
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	159.3238	88.0633	48.6441	11.5368	1.6071	0.0000	0.0000	0.0000	0.0000	11.6202	76.2086	170.0170 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												567.0211
Space heating per m2										(98c) / (4) =		7.9270 (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	159.3238	88.0633	48.6441	11.5368	1.6071	0.0000	0.0000	0.0000	0.0000	11.6202	76.2086	170.0170 (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)	159.3238	88.0633	48.6441	11.5368	1.6071	0.0000	0.0000	0.0000	0.0000	11.6202	76.2086	170.0170 (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	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632 (64)
Efficiency of water heater (217)m	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270 (216)
Fuel for water heating, kWh/month	66.5284	58.7224	62.0970	53.9064	51.7870	46.1550	45.1792	47.2564	48.0889	54.2340	58.4159	65.7109 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	13.8969	12.5520	13.8969	13.4486	13.8969	13.4486	13.8969	13.8969	13.4486	13.8969	13.4486	13.8969 (231)
Lighting	19.6359	15.7527	14.1835	10.3915	8.0267	6.5579	7.3222	9.5177	12.3625	16.2203	18.3208	20.1817 (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												567.0211 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												344.0270

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Water heating fuel used	658.0816 (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)	163.6249 (230a)
Total electricity for the above, kWh/year	163.6249 (231)
Electricity for lighting (calculated in Appendix L)	158.4731 (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	1547.2006 (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	567.0211	0.1590	90.1650 (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)	658.0816	0.1412	92.9056 (264)
Space and water heating			183.0706 (265)
Pumps, fans and electric keep-hot	163.6249	0.1387	22.6968 (267)
Energy for lighting	158.4731	0.1443	22.8726 (268)
Total CO2, kg/year			228.6400 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2000 (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	567.0211	1.5886	900.7539 (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)	658.0816	1.5220	1001.6219 (278)
Space and water heating			1902.3757 (279)
Pumps, fans and electric keep-hot	163.6249	1.5128	247.5317 (281)
Energy for lighting	158.4731	1.5338	243.0713 (282)
Total Primary energy kWh/year			2392.9788 (286)
Dwelling Primary energy Rate (DPER)			33.4500 (287)

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

1. Overall dwelling characteristics

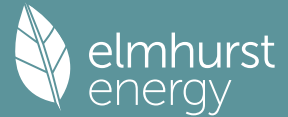
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	71.5300 (1b)	x 2.5000 (2b)	= 178.8250 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5300		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.8250 (5)

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) = 0.1678 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4178 (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) = 0.3551 (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	0.4527	0.4439	0.4350	0.3906	0.3817	0.3373	0.3373	0.3285	0.3551	0.3817	0.3995	0.4172 (22b)
Effective ac	0.6025	0.5985	0.5946	0.5763	0.5729	0.5569	0.5569	0.5539	0.5630	0.5729	0.5798	0.5870 (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)					
Ground Floor			71.5300	0.1300	9.2989			(28a)					
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)			106.5700					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.3102			(33)					
Main dwelling													
Party Wall			53.8400	0.0000	0.0000			(32)					
Corridor			25.2500	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							237.2498	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E7 Party floor between dwellings (in blocks of flats)				12.5200	0.0700		0.8764						
P1 Party wall - Ground floor				29.5100	0.0800		2.3608						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				29.5100	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						
E5 Ground floor (normal)				12.5200	0.1600		2.0032						
E16 Corner (normal)				2.6800	0.0900		0.2412						
E18 Party wall between dwellings				2.6800	0.0600		0.1608						
E25 Staggered party wall between dwellings				8.0400	0.0600		0.4824						
E14 Flat roof				3.2300	0.0800		0.2584						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3207	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	33.6309	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.5543	Feb 35.3195	Mar 35.0893	Apr 34.0080	May 33.8057	Jun 32.8639	Jul 32.8639	Aug 32.6895	Sep 33.2267	Oct 33.8057	Nov 34.2149	Dec 34.6428	(38)
Heat transfer coeff	69.1853	68.9504	68.7202	67.6389	67.4366	66.4949	66.4949	66.3204	66.8576	67.4366	67.8459	68.2737	(39)
Average = Sum(39)m / 12 =												67.6380	
HLP	Jan 0.9672	Feb 0.9639	Mar 0.9607	Apr 0.9456	May 0.9428	Jun 0.9296	Jul 0.9296	Aug 0.9272	Sep 0.9347	Oct 0.9428	Nov 0.9485	Dec 0.9545	(40)
HLP (average)												0.9456	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

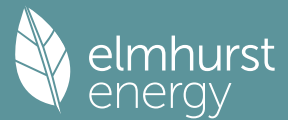
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2827	(42)
Hot water usage for mixer showers	62.4928	61.5537	60.1852	57.5668	55.6344	53.4795	52.2547	53.6128	55.1016	57.4154	60.0900	62.2534	(42a)	
Hot water usage for baths	26.9972	26.5962	26.0316	24.9906	24.2111	23.3467	22.8798	23.4405	24.0509	24.9758	26.0383	26.9059	(42b)	
Hot water usage for other uses	38.0070	36.6249	35.2429	33.8608	32.4787	31.0967	31.0967	32.4787	33.8608	35.2429	36.6249	38.0070	(42c)	
Average daily hot water use (litres/day)												117.1988	(43)	
Daily hot water use	Jan 127.4971	Feb 124.7749	Mar 121.4597	Apr 116.4181	May 112.3242	Jun 107.9229	Jul 106.2311	Aug 109.5320	Sep 113.0134	Oct 117.6341	Nov 122.7533	Dec 127.1664	(44)	
Energy conte	201.9242	177.6778	186.6790	159.3706	151.2100	132.7038	128.4773	135.6235	139.3568	159.6283	174.8846	199.1118	(45)	
Energy content (annual)										Total = Sum(45)m =		1946.6476		
Distribution loss (46)m = 0.15 x (45)m	30.2886	26.6517	28.0019	23.9056	22.6815	19.9056	19.2716	20.3435	20.9035	23.9442	26.2327	29.8668	(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	248.5191	219.7635	233.2739	204.4625	197.8049	177.7956	175.0722	182.2184	184.4486	206.2232	219.9764	245.7067	(62)	
WWHRS	-28.5691	-25.2668	-26.4579	-21.9082	-20.4176	-17.4715	-16.3768	-17.4150	-18.0767	-21.3104	-24.1422	-28.0401	(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	219.9500	194.4967	206.8160	182.5543	177.3873	160.3241	158.6955	164.8034	166.3719	184.9128	195.8342	217.6666	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2229.8127	(64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
												0.0000	(64a)	
Heat gains from water heating, kWh/month	104.4157	92.7464	99.3467	89.0642	87.5532	80.1975	79.9946	82.3707	82.4096	90.3523	94.2226	103.4806	(65)	

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

Metabolic gains (Table 5), Watts														
(66)m	Jan 114.1345	Feb 114.1345	Mar 114.1345	Apr 114.1345	May 114.1345	Jun 114.1345	Jul 114.1345	Aug 114.1345	Sep 114.1345	Oct 114.1345	Nov 114.1345	Dec 114.1345	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.1430	117.5154	106.1430	109.6811	106.1430	109.6811	106.1430	106.1430	109.6811	106.1430	109.6811	106.1430	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.8413	202.9254	197.6735	186.4929	172.3794	159.1147	150.2530	148.1689	153.4208	164.6014	178.7149	191.9796	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	34.4134	(69)	

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Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076 (71)
Water heating gains (Table 5)	140.3437	138.0155	133.5305	123.7003	117.6791	111.3854	107.5197	110.7134	114.4578	121.4413	130.8647	139.0868 (72)
Total internal gains	507.5683	518.6967	497.5874	480.1146	456.4418	437.4215	421.1560	422.2656	434.8000	452.4260	479.5011	497.4498 (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	626.9733	717.5198	760.5752	795.8349	804.4691	781.4395	753.3755	729.9670	715.6463	669.4299	621.6141	600.2626 (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	68.1362	68.3683	68.5973	69.6939	69.9030	70.8930	70.8930	71.0795	70.5084	69.9030	69.4813	69.0459
alpha	5.5424	5.5579	5.5732	5.6463	5.6602	5.7262	5.7262	5.7386	5.7006	5.6602	5.6321	5.6031
util living area	0.9843	0.9668	0.9368	0.8612	0.7277	0.5368	0.3873	0.4163	0.6248	0.8689	0.9652	0.9872 (86)
MIT	20.1292	20.3260	20.5400	20.7838	20.9322	20.9901	20.9987	20.9981	20.9769	20.8055	20.4430	20.1008 (87)
Th 2	20.1107	20.1135	20.1162	20.1289	20.1313	20.1424	20.1424	20.1445	20.1381	20.1313	20.1265	20.1214 (88)
util rest of house	0.9800	0.9583	0.9207	0.8290	0.6745	0.4682	0.3124	0.3397	0.5545	0.8320	0.9547	0.9836 (89)
MIT 2	19.1155	19.3628	19.6269	19.9209	20.0772	20.1369	20.1420	20.1438	20.1238	19.9524	19.5216	19.0880 (90)
Living area fraction	19.5284	19.7552	19.9989	20.2724	20.4255	20.4845	20.4910	20.4918	20.4713	20.2999	19.8970	19.5006 (92)
MIT	19.5284	19.7552	19.9989	20.2724	20.4255	20.4845	20.4910	20.4918	20.4713	20.2999	19.8970	19.5006 (93)
Temperature adjustment												0.0000
adjusted MIT	19.5284	19.7552	19.9989	20.2724	20.4255	20.4845	20.4910	20.4918	20.4713	20.2999	19.8970	19.5006 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9764	0.9541	0.9183	0.8347	0.6932	0.4959	0.3429	0.3710	0.5823	0.8399	0.9514	0.9804 (94)
Useful gains	612.1807	684.6103	698.4362	664.2983	557.6759	387.5292	258.3569	270.7855	416.7289	562.2250	591.4303	588.5070 (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	1053.5836	1024.2707	927.6451	769.2200	588.4168	391.2862	258.7306	271.3691	425.9716	654.1307	868.2204	1044.6297 (97)
Space heating kWh	328.4038	228.2518	170.5315	75.5436	22.8712	0.0000	0.0000	0.0000	0.0000	68.3778	199.2889	339.3553 (98a)
Space heating requirement - total per year (kWh/year)												1432.6238
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	328.4038	228.2518	170.5315	75.5436	22.8712	0.0000	0.0000	0.0000	0.0000	68.3778	199.2889	339.3553 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1432.6238
Space heating per m2										(98c) / (4) =		20.0283 (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	328.4038	228.2518	170.5315	75.5436	22.8712	0.0000	0.0000	0.0000	0.0000	68.3778	199.2889	339.3553 (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)	355.8004	247.2934	184.7578	81.8457	24.7792	0.0000	0.0000	0.0000	0.0000	74.0821	215.9143	367.6655 (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	219.9500	194.4967	206.8160	182.5543	177.3873	160.3241	158.6955	164.8034	166.3719	184.9128	195.8342	217.6666 (64)	
Efficiency of water heater (217)m	84.9567	84.4196	83.6305	82.2396	80.7345	79.8000	79.8000	79.8000	79.8000	82.0448	84.0990	79.8000 (216)	
Fuel for water heating, kWh/month	258.8964	230.3929	247.2973	221.9785	219.7167	200.9074	198.8665	206.5205	208.4861	225.3803	232.8615	255.9229 (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	22.0544	17.6929	15.9305	11.6713	9.0153	7.3656	8.2240	10.6899	13.8852	18.2181	20.5773	22.6674 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-19.1649	-28.3919	-42.8583	-50.6847	-56.8471	-53.8656	-53.2131	-49.1508	-42.3630	-33.5608	-21.5535	-16.4133 (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)													

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(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	-7.0186	-15.0813	-30.5743	-46.8112	-62.7751	-63.3959	-62.6456	-52.6325	-38.0472	-21.8513	-9.4611	-5.5264	(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												1552.1385	(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												2707.2270	(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)												177.9918	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-883.8874	(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												3639.4698	(238)

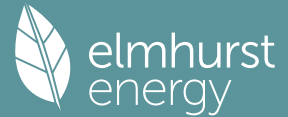
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1552.1385	0.2100	325.9491 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2707.2270	0.2100	568.5177 (264)
Space and water heating			894.4667 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	177.9918	0.1443	25.6897 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-468.0669	0.1336	-62.5135
PV Unit electricity exported	-415.8205	0.1253	-52.1182
Total			-114.6317 (269)
Total CO2, kg/year			817.4540 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4300 (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	1552.1385	1.1300	1753.9164 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2707.2270	1.1300	3059.1665 (278)
Space and water heating			4813.0829 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	177.9918	1.5338	273.0097 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-468.0669	1.4935	-699.0790
PV Unit electricity exported	-415.8205	0.4601	-191.2984
Total			-890.3774 (283)
Total Primary energy kWh/year			4325.8161 (286)
Target Primary Energy Rate (TPER)			60.4800 (287)

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Plot Reference	Plot 05				Issued on Date	22/12/2025	
Assessment Reference	Plot 05			Plot Type Ref			
Plot Address	Flat 2, 4 Cross Road Manchester, M21 9SX				SAP Version	10.2	
SAP Rating	88 B	DER	3.20	TER	11.43		
Environmental	98 A	% DER < TER				72.00	
CO ₂ Emissions (t/year)	0.19	DFEE	23.02	TFEE	26.72		
Compliance Check	See BREL	% DFEE < TFEE				13.84	
% DPER < TPER	44.69	DPER	33.45	TPER	60.48		
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	71.5300 (1b)	2.5000 (2b)	178.8250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	178.8250 (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)

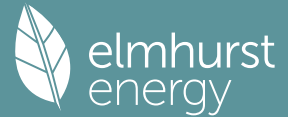
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.9000	(17)
Infiltration rate	0.1450	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1232 (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	0.1571	0.1541	0.1510	0.1356	0.1325	0.1171	0.1171	0.1140	0.1232	0.1325	0.1387	0.1448 (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	0.2971	0.2941	0.2910	0.2756	0.2725	0.2571	0.2571	0.2540	0.2632	0.2725	0.2787	0.2848 (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)
Ground Floor			71.5300	0.1100	7.8683	110.0000	7868.3000 (28a)
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)			106.5700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.9633		(33)
Main dwelling							
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000 (32)
Corridor			25.2500	0.0000	0.0000	45.0000	1136.2500 (32)
Party Ceiling			70.0400			30.0000	2101.2000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16970.4799 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							237.2498 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.5200	0.0370	0.4632
P1 Party wall - Ground floor	29.5100	0.0510	1.5050
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.5100	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
E5 Ground floor (normal)	12.5200	0.0670	0.8388
E16 Corner (normal)	2.6800	0.0420	0.1126
E18 Party wall between dwellings	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E14 Flat roof	3.2300	0.1600	0.5168
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.1408 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	31.1041 (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	17.5351	17.3533	17.1715	16.2623	16.0805	15.1713	15.1713	14.9895	15.5350	16.0805	16.4441	16.8078 (38)
Heat transfer coeff	48.6392	48.4574	48.2756	47.3664	47.1846	46.2754	46.2754	46.0936	46.6391	47.1846	47.5482	47.9119 (39)
Average = Sum(39)m / 12 =												47.3209
HLP	0.6800	0.6774	0.6749	0.6622	0.6596	0.6469	0.6469	0.6444	0.6520	0.6596	0.6647	0.6698 (40)
HLP (average)												0.6616
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2827 (42)
Hot water usage for mixer showers	62.4928	61.5537	60.1852	57.5668	55.6344	53.4795	52.2547	53.6128	55.1016	57.4154	60.0900	62.2534 (42a)
Hot water usage for baths	26.9972	26.5962	26.0316	24.9906	24.2111	23.3467	22.8798	23.4405	24.0509	24.9758	26.0383	26.9059 (42b)
Hot water usage for other uses	38.0070	36.6249	35.2429	33.8608	32.4787	31.0967	31.0967	32.4787	33.8608	35.2429	36.6249	38.0070 (42c)
Average daily hot water use (litres/day)												117.1988 (43)
Daily hot water use	127.4971	124.7749	121.4597	116.4181	112.3242	107.9229	106.2311	109.5320	113.0134	117.6341	122.7533	127.1664 (44)
Energy conte	201.9242	177.6778	186.6790	159.3706	151.2100	132.7038	128.4773	135.6235	139.3568	159.6283	174.8846	199.1118 (45)
Energy content (annual)										Total = Sum(45)m =		1946.6476
Distribution loss (46)m = 0.15 x (45)m	30.2886	26.6517	28.0019	23.9056	22.6815	19.9056	19.2716	20.3435	20.9035	23.9442	26.2327	29.8668 (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	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632 (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	67.1398	59.0779	62.0708	52.9907	50.2773	44.1240	42.7187	45.0948	46.3361	53.0764	58.1491	66.2047 (65)

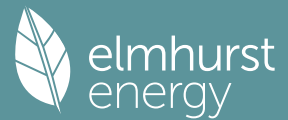
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4335	19.9252	16.2043	12.2677	9.1702	7.7419	8.3654	10.8737	14.5946	18.5312	21.6287	23.0570 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7631	302.8737	295.0351	278.3476	257.2827	237.4846	224.2582	221.1476	228.9862	245.6737	266.7387	286.5368 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788 (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)	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076 (71)
Water heating gains (Table 5)	90.2417	87.9135	83.4285	73.5982	67.5770	61.2833	57.4176	60.6113	64.3557	71.3393	80.7627	88.9848 (72)
Total internal gains	509.0709	507.3451	491.3005	460.8462	430.6626	403.1424	386.6739	389.2652	404.5692	432.1768	465.7626	495.2112 (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	629.4085	707.7210	756.3424	779.0323	781.4081	749.8474	721.4882	699.3699	687.6091	650.8756	608.9857	598.8270 (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	96.9181	97.2818	97.6482	99.5225	99.9060	101.8688	101.8688	102.2707	101.0745	99.9060	99.1419	98.3894
alpha	7.4612	7.4855	7.5099	7.6348	7.6604	7.7913	7.7913	7.8180	7.7383	7.6604	7.6095	7.5593
util living area	0.9620	0.9204	0.8456	0.7156	0.5586	0.3948	0.2822	0.3032	0.4673	0.7306	0.9166	0.9703 (86)
MIT	20.6455	20.7791	20.8963	20.9731	20.9960	20.9998	21.0000	21.0000	20.9992	20.9738	20.8234	20.6153 (87)
Th 2	20.3585	20.3608	20.3631	20.3744	20.3766	20.3879	20.3879	20.3902	20.3834	20.3766	20.3721	20.3676 (88)
util rest of house	0.9538	0.9057	0.8220	0.6835	0.5222	0.3571	0.2430	0.2630	0.4259	0.6932	0.8990	0.9635 (89)
MIT 2	19.9609	20.1226	20.2584	20.3500	20.3736	20.3878	20.3879	20.3902	20.3829	20.3542	20.1876	19.9319 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.2398	20.3900	20.5182	20.6039	20.6271	20.6371	20.6373	20.6386	20.6340	20.6067	20.4466	20.2103 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.2398	20.3900	20.5182	20.6039	20.6271	20.6371	20.6373	20.6386	20.6340	20.6067	20.4466	20.2103 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9521	0.9064	0.8280	0.6955	0.5369	0.3725	0.2589	0.2793	0.4427	0.7073	0.9012	0.9617 (94)
Useful gains	599.2352	641.4810	626.2402	541.7997	419.5069	279.2901	186.8228	195.3662	304.4250	460.3390	548.8276	575.8624 (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	775.2984	750.6070	676.7389	554.3694	421.2225	279.3701	186.8265	195.3728	304.7377	472.1596	634.6057	767.0833 (97)
Space heating kWh	130.9910	73.3327	37.5710	9.0502	1.2764	0.0000	0.0000	0.0000	0.0000	8.7945	61.7602	142.2683 (98a)
Space heating requirement - total per year (kWh/year)	465.0444											
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	130.9910	73.3327	37.5710	9.0502	1.2764	0.0000	0.0000	0.0000	0.0000	8.7945	61.7602	142.2683 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	465.0444											
Space heating per m2	(98c) / (4) = 6.5014 (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	130.9910	73.3327	37.5710	9.0502	1.2764	0.0000	0.0000	0.0000	0.0000	8.7945	61.7602	142.2683 (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)	130.9910	73.3327	37.5710	9.0502	1.2764	0.0000	0.0000	0.0000	0.0000	8.7945	61.7602	142.2683 (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	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632 (64)
Efficiency of water heater (217)m	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270 (216)
Fuel for water heating, kWh/month	66.5284	58.7224	62.0970	53.9064	51.7870	46.1550	45.1792	47.2564	48.0889	54.2340	58.4159	65.7109 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	13.8969	12.5520	13.8969	13.4486	13.8969	13.4486	13.8969	13.8969	13.4486	13.8969	13.4486	13.8969 (231)
Lighting	19.6359	15.7527	14.1835	10.3915	8.0267	6.5579	7.3222	9.5177	12.3625	16.2203	18.3208	20.1817 (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	465.0444 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	344.0270											
Water heating fuel used	658.0816 (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)	163.6249 (230a)
Total electricity for the above, kWh/year	163.6249 (231)
Electricity for lighting (calculated in Appendix L)	158.4731 (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	1445.2240 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	465.0444	16.4900	76.6858 (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)	658.0816	16.4900	108.5177 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	163.6249	16.4900	26.9817 (249)
Energy for lighting	158.4731	16.4900	26.1322 (250)
Additional standing charges			0.0000 (251)
Total energy cost			238.3174 (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] = 0.7362 (257)
SAP value	88.0655
SAP rating (Section 12)	88 (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	465.0444	0.1591	74.0074 (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)	658.0816	0.1412	92.9056 (264)
Space and water heating			166.9130 (265)
Pumps, fans and electric keep-hot	163.6249	0.1387	22.6968 (267)
Energy for lighting	158.4731	0.1443	22.8726 (268)
Total CO2, kg/year			212.4824 (272)
CO2 emissions per m2			2.9700 (273)
EI value			97.5566
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

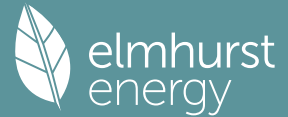
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	71.5300 (1b)	x 2.5000 (2b)	= 178.8250 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5300		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	178.8250 (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 2.9000 (17)
Infiltration rate 0.1450 (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) = 0.1232 (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
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
Balanced mechanical ventilation with heat recovery	0.1325	0.1294	0.1294	0.1202	0.1232	0.1048	0.1017	0.1017	0.1048	0.1171	0.1171	0.1202
If mechanical ventilation												0.5000
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000
Effective ac	0.2725	0.2694	0.2694	0.2602	0.2632	0.2448	0.2417	0.2417	0.2448	0.2571	0.2571	0.2602

3. Heat losses and heat loss parameter

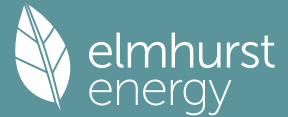
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Window N/E			3.6800	1.3258	4.8788		(27)
Window S/W			7.5200	1.3258	9.9697		(27)
Ground Floor			71.5300	0.1100	7.8683	110.0000	7868.3000
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999
Flat Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100
Total net area of external elements Aum(A, m2)			106.5700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.9633		(33)
Main dwelling							
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000
Corridor			25.2500	0.0000	0.0000	1136.2500	(32)
Party Ceiling			70.0400			30.0000	2101.2000
Internal Wall			107.7800			9.0000	970.0200
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16970.4799
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							237.2498
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				12.5200	0.0370	0.4632	
P1 Party wall - Ground floor				29.5100	0.0510	1.5050	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				29.5100	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	
E5 Ground floor (normal)				12.5200	0.0670	0.8388	
E16 Corner (normal)				2.6800	0.0420	0.1126	
E18 Party wall between dwellings				2.6800	0.0320	0.0858	
E25 Staggered party wall between dwellings				8.0400	0.0300	0.2412	
E14 Flat roof				3.2300	0.1600	0.5168	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1408
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	31.1041

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	16.0805	15.8986	15.8986	15.3531	15.5350	14.4440	14.2622	14.2622	14.4440	15.1713	15.1713	15.3531
Average = Sum(39)m / 12 =	47.1846	47.0027	47.0027	46.4572	46.6391	45.5481	45.3663	45.3663	45.5481	46.2754	46.2754	46.4572
HLP	0.6596	0.6571	0.6571	0.6495	0.6520	0.6368	0.6342	0.6342	0.6368	0.6469	0.6469	0.6495
HLP (average)												0.6467
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2827
Hot water usage for mixer showers												(42)
Hot water usage for baths	62.4928	61.5537	60.1852	57.5668	55.6344	53.4795	52.2547	53.6128	55.1016	57.4154	60.0900	62.2534
Hot water usage for other uses	26.9972	26.5962	26.0316	24.9906	24.2111	23.3467	22.8798	23.4405	24.0509	24.9758	26.0383	26.9059
Average daily hot water use (litres/day)	38.0070	36.6249	35.2429	33.8608	32.4787	31.0967	31.0967	32.4787	33.8608	35.2429	36.6249	38.0070
Daily hot water use	127.4971	124.7749	121.4597	116.4181	112.3242	107.9229	106.2311	109.5320	113.0134	117.6341	122.7533	127.1664
Energy content (annual)	201.9242	177.6778	186.6790	159.3706	151.2100	132.7038	128.4773	135.6235	139.3568	159.6283	174.8846	199.1118
Distribution loss (46)m = 0.15 x (45)m	30.2886	26.6517	28.0019	23.9056	22.6815	19.9056	19.2716	20.3435	20.9035	23.9442	26.2327	29.8668
Water storage loss (or HIU loss):												201.0000
Store volume												1.6100
a) If manufacturer declared loss factor is known (kWh/day):												0.5400
Temperature factor from Table 2b												0.8694
Enter (49) or (54) in (55)												(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
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
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
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
Total heat required for water heating calculated for each month	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632
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
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
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
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
Output from w/h												

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228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632 (64)
Total per year (kWh/year) = Sum(64)m =											2263.9786 (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											
67.1398	59.0779	62.0708	52.9907	50.2773	44.1240	42.7187	45.0948	46.3361	53.0764	58.1491	66.2047 (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	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4335	19.9252	16.2043	12.2677	9.1702	7.7419	8.3654	10.8737	14.5946	18.5312	21.6287	23.0570 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7631	302.8737	295.0351	278.3476	257.2827	237.4846	224.2582	221.1476	228.9862	245.6737	266.7387	286.5368 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788 (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)	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076 (71)
Water heating gains (Table 5)	90.2417	87.9135	83.4285	73.5982	67.5770	61.2833	57.4176	60.6113	64.3557	71.3393	80.7627	88.9848 (72)
Total internal gains	509.0709	507.3451	491.3005	460.8462	430.6626	403.1424	386.6739	389.2652	404.5692	432.1768	465.7626	495.2112 (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	615.2268	688.6622	741.9013	767.8268	760.8650	737.3526	701.6239	677.1534	679.5820	640.3659	595.6012	588.6994 (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	99.9060	100.2925	100.2925	101.4701	101.0745	103.4955	103.9103	103.9103	103.4955	101.8688	101.8688	101.4701
alpha	7.6604	7.6862	7.6862	7.7647	7.7383	7.8997	7.9274	7.9274	7.8997	7.7913	7.7913	7.7647
util living area												
	0.9505	0.9005	0.8093	0.6613	0.4954	0.3274	0.2392	0.2613	0.4220	0.6872	0.8939	0.9609 (86)
MIT												
	20.7232	20.8375	20.9332	20.9863	20.9985	21.0000	21.0000	21.0000	20.9997	20.9848	20.8726	20.6935 (87)
Th 2												
	20.3766	20.3789	20.3789	20.3857	20.3834	20.3970	20.3993	20.3993	20.3970	20.3879	20.3879	20.3857 (88)
util rest of house												
	0.9398	0.8827	0.7825	0.6275	0.4581	0.2901	0.2004	0.2210	0.3817	0.6480	0.8724	0.9522 (89)
MIT 2												
	20.0719	20.2078	20.3137	20.3739	20.3824	20.3970	20.3993	20.3993	20.3968	20.3756	20.2589	20.0442 (90)
Living area fraction												
	20.3373	20.4643	20.5661	20.6234	20.6334	20.6426	20.6440	20.6440	20.6424	20.6237	20.5089	20.3087 (91)
MIT												
	20.3373	20.4643	20.5661	20.6234	20.6334	20.6426	20.6440	20.6440	20.6424	20.6237	20.5089	20.3087 (92)
Temperature adjustment												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT												
	20.3373	20.4643	20.5661	20.6234	20.6334	20.6426	20.6440	20.6440	20.6424	20.6237	20.5089	20.3087 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9391	0.8853	0.7908	0.6407	0.4733	0.3053	0.2162	0.2374	0.3981	0.6633	0.8769	0.9510 (94)
Useful gains	577.7432	609.6451	586.7325	491.9564	360.0900	225.1143	151.7045	160.7770	270.5532	424.7601	522.3013	559.8270 (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												
	714.2449	689.2633	618.8411	498.1797	360.6789	225.1276	151.7052	160.7783	270.6663	431.4600	583.4814	711.2006 (97)
Space heating kWh												
	101.5573	53.5034	23.8888	4.4808	0.4382	0.0000	0.0000	0.0000	0.0000	4.9847	44.0497	112.6220 (98a)
Space heating requirement - total per year (kWh/year)												
												345.5249
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												
	101.5573	53.5034	23.8888	4.4808	0.4382	0.0000	0.0000	0.0000	0.0000	4.9847	44.0497	112.6220 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
												345.5249
Space heating per m ²												
												(98c) / (4) = 4.8305 (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												
	101.5573	53.5034	23.8888	4.4808	0.4382	0.0000	0.0000	0.0000	0.0000	4.9847	44.0497	112.6220 (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)

10a. Fuel costs - using BEDF prices (587)			
	Fuel kWh/year	Fuel price £/kWh	Fuel cost £/year
Space heating - main system 1	345.5249	28.4300	98.2327 (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)	658.0816	28.4300	187.0926 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	163.6249	28.4300	46.5186 (249)
Energy for lighting	158.4731	28.4300	45.0539 (250)
Additional standing charges			0.0000 (251)
Total energy cost			376.8978 (255)

13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	345.5249	1.5908	549.6626 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	658.0816	1.5220	1001.6219 (278)
Space and water heating			1551.2845 (279)
Pumps, fans and electric keep-hot	163.6249	1.5128	247.5317 (281)
Energy for lighting	158.4731	1.5338	243.0713 (282)
Total Primary energy kWh/year			2041.8876 (286)

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SAP 10 EPC IMPROVEMENTS

Plot 05

Current energy efficiency rating: B 88
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 88
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	£377	£377	£0
Space heating	£145	£145	£0
Water heating	£187	£187	£0
Lighting	£45	£45	£0
Total cost of fuels	£377	£377	£0
Total cost of uses	£377	£377	£0
Delivered energy	19 kWh/m ²	19 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m ²	3 kg/m ²	3 kg/m ²	0 kg/m ²
Primary energy	29 kWh/m ²	29 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	71.5300 (1b)	x 2.5000 (2b)	= 178.8250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.5300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.8250 (5)

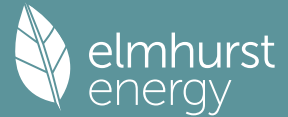
2. Ventilation rate

	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		2.9000 (17)	
Infiltration rate		0.1450 (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) =	0.1232 (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	0.1571	0.1541	0.1510	0.1356	0.1325	0.1171	0.1171	0.1140	0.1232	0.1325	0.1387	0.1448 (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 0.2971 0.2941 0.2910 0.2756 0.2725 0.2571 0.2571 0.2540 0.2632 0.2725 0.2787 0.2848 (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)
Ground Floor			71.5300	0.1100	7.8683	110.0000	7868.3000	(28a)
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)			106.5700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		26.9633			(33)
Main dwelling								
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000	(32)
Corridor			25.2500	0.0000	0.0000	45.0000	1136.2500	(32)
Party Ceiling			70.0400			30.0000	2101.2000	(32b)
Internal Wall			107.7800			9.0000	970.0200	(32c)

Heat capacity Cm = Sum(A x k)

(28) ... (30) + (32) + (32a) ... (32e) = 16970.4799 (34)

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

237.2498 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	12.5200	0.0370	0.4632
P1 Party wall - Ground floor	29.5100	0.0510	1.5050
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.5100	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
E5 Ground floor (normal)	12.5200	0.0670	0.8388
E16 Corner (normal)	2.6800	0.0420	0.1126
E18 Party wall between dwellings	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E14 Flat roof	3.2300	0.1600	0.5168

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

4.1408 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 31.1041 (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	17.5351	17.3533	17.1715	16.2623	16.0805	15.1713	15.1713	14.9895	15.5350	16.0805	16.4441	16.8078	(38)
Heat transfer coeff	48.6392	48.4574	48.2756	47.3664	47.1846	46.2754	46.2754	46.0936	46.6391	47.1846	47.5482	47.9119	(39)
Average = Sum(39)m / 12 =												47.3209	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6800	0.6774	0.6749	0.6622	0.6596	0.6469	0.6469	0.6444	0.6520	0.6596	0.6647	0.6698	(40)
HLP (average)												0.6616	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2827 (42)
Hot water usage for mixer showers													
62.4928	61.5537	60.1852	57.5668	55.6344	53.4795	52.2547	53.6128	55.1016	57.4154	60.0900	62.2534		(42a)
Hot water usage for baths													
26.9972	26.5962	26.0316	24.9906	24.2111	23.3467	22.8798	23.4405	24.0509	24.9758	26.0383	26.9059		(42b)
Hot water usage for other uses													
38.0070	36.6249	35.2429	33.8608	32.4787	31.0967	31.0967	32.4787	33.8608	35.2429	36.6249	38.0070		(42c)
Average daily hot water use (litres/day)												117.1988	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4971	124.7749	121.4597	116.4181	112.3242	107.9229	106.2311	109.5320	113.0134	117.6341	122.7533	127.1664	(44)
Energy conte	201.9242	177.6778	186.6790	159.3706	151.2100	132.7038	128.4773	135.6235	139.3568	159.6283	174.8846	199.1118	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
30.2886	26.6517	28.0019	23.9056	22.6815	19.9056	19.2716	20.3435	20.9035	23.9442	26.2327	29.8668		(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													
228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632		(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632		(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													
67.1398	59.0779	62.0708	52.9907	50.2773	44.1240	42.7187	45.0948	46.3361	53.0764	58.1491	66.2047		(65)

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

Metabolic gains (Table 5), Watts													
(66)m	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
22.4335	19.9252	16.2043	12.2677	9.1702	7.7419	8.3654	10.8737	14.5946	18.5312	21.6287	23.0570		(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7631	302.8737	295.0351	278.3476	257.2827	237.4846	224.2582	221.1476	228.9862	245.6737	266.7387	286.5368 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788 (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)	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076 (71)
Water heating gains (Table 5)	90.2417	87.9135	83.4285	73.5982	67.5770	61.2833	57.4176	60.6113	64.3557	71.3393	80.7627	88.9848 (72)
Total internal gains	509.0709	507.3451	491.3005	460.8462	430.6626	403.1424	386.6739	389.2652	404.5692	432.1768	465.7626	495.2112 (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	629.4085	707.7210	756.3424	779.0323	781.4081	749.8474	721.4882	699.3699	687.6091	650.8756	608.9857	598.8270 (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)												
tau	96.9181	97.2818	97.6482	99.5225	99.9060	101.8688	101.8688	102.2707	101.0745	99.9060	99.1419	98.3894
alpha	7.4612	7.4855	7.5099	7.6348	7.6604	7.7913	7.7913	7.8180	7.7383	7.6604	7.6095	7.5593
util living area	0.9620	0.9204	0.8456	0.7156	0.5586	0.3948	0.2822	0.3032	0.4673	0.7306	0.9166	0.9703 (86)
MIT	20.6455	20.7791	20.8963	20.9731	20.9960	20.9998	21.0000	21.0000	20.9992	20.9738	20.8234	20.6153 (87)
Th 2	20.3585	20.3608	20.3631	20.3744	20.3766	20.3879	20.3879	20.3902	20.3834	20.3766	20.3721	20.3676 (88)
util rest of house	0.9538	0.9057	0.8220	0.6835	0.5222	0.3571	0.2430	0.2630	0.4259	0.6932	0.8990	0.9635 (89)
MIT 2	19.9609	20.1226	20.2584	20.3500	20.3736	20.3878	20.3879	20.3902	20.3829	20.3542	20.1876	19.9319 (90)
Living area fraction	20.2398	20.3900	20.5182	20.6039	20.6271	20.6371	20.6373	20.6386	20.6340	20.6067	20.4466	20.2103 (92)
MIT	20.2398	20.3900	20.5182	20.6039	20.6271	20.6371	20.6373	20.6386	20.6340	20.6067	20.4466	20.2103 (93)
Temperature adjustment												0.0000
adjusted MIT	20.2398	20.3900	20.5182	20.6039	20.6271	20.6371	20.6373	20.6386	20.6340	20.6067	20.4466	20.2103 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	599.2352	641.4810	626.2402	541.7997	419.5069	279.2901	186.8228	195.3662	304.4250	460.3390	548.8276	575.8624 (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	775.2984	750.6070	676.7389	554.3694	421.2225	279.3701	186.8265	195.3728	304.7377	472.1596	634.6057	767.0833 (97)
Space heating kWh	130.9910	73.3327	37.5710	9.0502	1.2764	0.0000	0.0000	0.0000	0.0000	8.7945	61.7602	142.2683 (98a)
Space heating requirement - total per year (kWh/year)												465.0444
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	130.9910	73.3327	37.5710	9.0502	1.2764	0.0000	0.0000	0.0000	0.0000	8.7945	61.7602	142.2683 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												465.0444
Space heating per m2										(98c) / (4) =		6.5014 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	130.9910	73.3327	37.5710	9.0502	1.2764	0.0000	0.0000	0.0000	0.0000	8.7945	61.7602	142.2683 (98)
Space heating fuel (main heating system)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating efficiency (main heating system 2)	130.9910	73.3327	37.5710	9.0502	1.2764	0.0000	0.0000	0.0000	0.0000	8.7945	61.7602	142.2683 (211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632 (64)
Efficiency of water heater	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270 (216)
Fuel for water heating, kWh/month	66.5284	58.7224	62.0970	53.9064	51.7870	46.1550	45.1792	47.2564	48.0889	54.2340	58.4159	65.7109 (219)
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	(221)
Pumps and Fa	13.8969	12.5520	13.8969	13.4486	13.8969	13.4486	13.8969	13.8969	13.4486	13.8969	13.4486	13.8969	(231)
Lighting	19.6359	15.7527	14.1835	10.3915	8.0267	6.5579	7.3222	9.5177	12.3625	16.2203	18.3208	20.1817	(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												465.0444	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												344.0270	
Water heating fuel used												658.0816	(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)												163.6249	(230a)
Total electricity for the above, kWh/year												163.6249	(231)
Electricity for lighting (calculated in Appendix L)												158.4731	(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												1445.2240	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	465.0444	16.4900	76.6858	(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)	658.0816	16.4900	108.5177	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	163.6249	16.4900	26.9817	(249)
Energy for lighting	158.4731	16.4900	26.1322	(250)
Additional standing charges			0.0000	(251)
Total energy cost			238.3174	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):				0.3600	(256)
Energy cost factor (ECF)				0.7362	(257)
SAP value				88.0655	
SAP rating (Section 12)				88	(258)
SAP band				B	

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

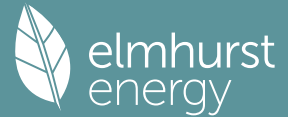
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	465.0444	0.1591	74.0074	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	658.0816	0.1412	92.9056	(264)
Space and water heating			166.9130	(265)
Pumps, fans and electric keep-hot	163.6249	0.1387	22.6968	(267)
Energy for lighting	158.4731	0.1443	22.8726	(268)
Total CO2, kg/year			212.4824	(272)
CO2 emissions per m2			2.9700	(273)
EI value			97.5566	
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	71.5300 (1b)	x 2.5000 (2b)	= 178.8250 (1b) - (3b)	
Ground floor				

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 71.5300
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 178.8250

2. Ventilation rate

			m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)	
Number of open flues	0 * 20 =	0.0000	(6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)	
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)	
Number of blocked chimneys	0 * 20 =	0.0000	(6f)	
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)	
Number of passive vents	0 * 10 =	0.0000	(7b)	
Number of flueless gas fires	0 * 40 =	0.0000	(7c)	
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000	/ (5) =	0.0000	(8)
Pressure test	Yes			
Pressure Test Method	Blower Door			
Measured/design AP50	2.9000 (17)			
Infiltration rate	0.1450 (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) = 0.1232 (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
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
	0.1325	0.1294	0.1294	0.1202	0.1232	0.1048	0.1017	0.1017	0.1048	0.1171	0.1171	0.1202
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000
Effective ac	0.2725	0.2694	0.2694	0.2602	0.2632	0.2448	0.2417	0.2417	0.2448	0.2571	0.2571	0.2602

3. Heat losses and heat loss parameter

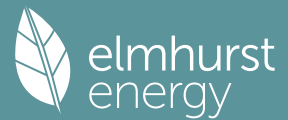
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
Window N/E			3.6800	1.3258	4.8788		(27)
Window S/W			7.5200	1.3258	9.9697		(27)
Ground Floor			71.5300	0.1100	7.8683	110.0000	7868.3000
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999
Flat Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100
Total net area of external elements Aum(A, m2)			106.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.9633		(33)
Main dwelling							
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000
Corridor			25.2500	0.0000	0.0000	45.0000	1136.2500
Party Ceiling			70.0400			30.0000	2101.2000
Internal Wall			107.7800			9.0000	970.0200
Heat capacity Cm = Sum(A x k)							
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				12.5200	0.0370	0.4632	
P1 Party wall - Ground floor				29.5100	0.0510	1.5050	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				29.5100	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	
E5 Ground floor (normal)				12.5200	0.0670	0.8388	
E16 Corner (normal)				2.6800	0.0420	0.1126	
E18 Party wall between dwellings				2.6800	0.0320	0.0858	
E25 Staggered party wall between dwellings				8.0400	0.0300	0.2412	
E14 Flat roof				3.2300	0.1600	0.5168	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.1408
Point Thermal Bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 31.1041

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	16.0805	15.8986	15.8986	15.3531	15.5350	14.4440	14.2622	14.2622	14.4440	15.1713	15.1713	15.3531
Average = Sum(39)m / 12 =	47.1846	47.0027	47.0027	46.4572	46.6391	45.5481	45.3663	45.3663	45.5481	46.2754	46.2754	46.4572
	46.2603											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6596	0.6571	0.6571	0.6495	0.6520	0.6368	0.6342	0.6342	0.6368	0.6469	0.6469	0.6495
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2827	(42)
Hot water usage for mixer showers	62.4928	61.5537	60.1852	57.5668	55.6344	53.4795	52.2547	53.6128	55.1016	57.4154	60.0900	62.2534	(42a)
Hot water usage for baths	26.9972	26.5962	26.0316	24.9906	24.2111	23.3467	22.8798	23.4405	24.0509	24.9758	26.0383	26.9059	(42b)
Hot water usage for other uses	38.0070	36.6249	35.2429	33.8608	32.4787	31.0967	31.0967	32.4787	33.8608	35.2429	36.6249	38.0070	(42c)
Average daily hot water use (litres/day)												117.1988	(43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.4971	124.7749	121.4597	116.4181	112.3242	107.9229	106.2311	109.5320	113.0134	117.6341	122.7533	127.1664	(44)
Energy content (annual)	201.9242	177.6778	186.6790	159.3706	151.2100	132.7038	128.4773	135.6235	139.3568	159.6283	174.8846	199.1118	(45)
Distribution loss (46)m = 0.15 x (45)m	30.2886	26.6517	28.0019	23.9056	22.6815	19.9056	19.2716	20.3435	20.9035	23.9442	26.2327	29.8668	(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	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632	(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	67.1398	59.0779	62.0708	52.9907	50.2773	44.1240	42.7187	45.0948	46.3361	53.0764	58.1491	66.2047	(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	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	136.9613	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4335	19.9252	16.2043	12.2677	9.1702	7.7419	8.3654	10.8737	14.5946	18.5312	21.6287	23.0570	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	299.7631	302.8737	295.0351	278.3476	257.2827	237.4846	224.2582	221.1476	228.9862	245.6737	266.7387	286.5368	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	50.9788	(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)	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	-91.3076	(71)
Water heating gains (Table 5)	90.2417	87.9135	83.4285	73.5982	67.5770	61.2833	57.4176	60.6113	64.3557	71.3393	80.7627	88.9848	(72)
Total internal gains	509.0709	507.3451	491.3005	460.8462	430.6626	403.1424	386.6739	389.2652	404.5692	432.1768	465.7626	495.2112	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	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	615.2268	688.6622	741.9013	767.8268	760.8650	737.3526	701.6239	677.1534	679.5820	640.3659	595.6012	588.6994 (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)														
tau	99.9060	100.2925	100.2925	101.4701	101.0745	103.4955	103.9103	103.9103	103.4955	101.8688	101.8688	101.4701		
alpha	7.6604	7.6862	7.6862	7.7647	7.7383	7.8997	7.9274	7.9274	7.8997	7.7913	7.7913	7.7647		
util living area	0.9505	0.9005	0.8093	0.6613	0.4954	0.3274	0.2392	0.2613	0.4220	0.6872	0.8939	0.9609	(86)	
MIT	20.7232	20.8375	20.9332	20.9863	20.9985	21.0000	21.0000	21.0000	20.9997	20.9848	20.8726	20.6935	(87)	
Th 2	20.3766	20.3789	20.3789	20.3857	20.3834	20.3970	20.3993	20.3993	20.3970	20.3879	20.3879	20.3857	(88)	
util rest of house	0.9398	0.8827	0.7825	0.6275	0.4581	0.2901	0.2004	0.2210	0.3817	0.6480	0.8724	0.9522	(89)	
MIT 2	20.0719	20.2078	20.3137	20.3739	20.3824	20.3970	20.3993	20.3993	20.3968	20.3756	20.2589	20.0442	(90)	
Living area fraction									FLA = Living area / (4) =			0.4074	(91)	
MIT	20.3373	20.4643	20.5661	20.6234	20.6334	20.6426	20.6440	20.6440	20.6424	20.6237	20.5089	20.3087	(92)	
Temperature adjustment												0.0000		
adjusted MIT	20.3373	20.4643	20.5661	20.6234	20.6334	20.6426	20.6440	20.6440	20.6424	20.6237	20.5089	20.3087	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9391	0.8853	0.7908	0.6407	0.4733	0.3053	0.2162	0.2374	0.3981	0.6633	0.8769	0.9510	(94)
Useful gains	577.7432	609.6451	586.7325	491.9564	360.0900	225.1143	151.7045	160.7770	270.5532	424.7601	522.3013	559.8270	(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	714.2449	689.2633	618.8411	498.1797	360.6789	225.1276	151.7052	160.7783	270.6663	431.4600	583.4814	711.2006	(97)
Space heating kWh	101.5573	53.5034	23.8888	4.4808	0.4382	0.0000	0.0000	0.0000	0.0000	4.9847	44.0497	112.6220	(98a)
Space heating requirement - total per year (kWh/year)												345.5249	
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												
101.5573	53.5034	23.8888	4.4808	0.4382	0.0000	0.0000	0.0000	0.0000	4.9847	44.0497	112.6220 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												345.5249
Space heating per m2											(98c) / (4) =	4.8305 (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	101.5573	53.5034	23.8888	4.4808	0.4382	0.0000	0.0000	0.0000	0.0000	4.9847	44.0497	112.6220 (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)	101.5573	53.5034	23.8888	4.4808	0.4382	0.0000	0.0000	0.0000	0.0000	4.9847	44.0497	112.6220 (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	228.8756	202.0210	213.6304	185.4526	178.1614	158.7858	155.4287	162.5749	165.4388	186.5797	200.9666	226.0632 (64)
Efficiency of water heater (217)m	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270	344.0270 (216)
Fuel for water heating, kWh/month	66.5284	58.7224	62.0970	53.9064	51.7870	46.1550	45.1792	47.2564	48.0889	54.2340	58.4159	65.7109 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	13.8969	12.5520	13.8969	13.4486	13.8969	13.4486	13.8969	13.8969	13.4486	13.8969	13.4486	13.8969 (231)
Lighting	19.6359	15.7527	14.1835	10.3915	8.0267	6.5579	7.3222	9.5177	12.3625	16.2203	18.3208	20.1817 (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												345.5249 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												344.0270
Water heating fuel used												658.0816 (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)												163.6249 (230a)
Total electricity for the above, kWh/year												163.6249 (231)
Electricity for lighting (calculated in Appendix L)												158.4731 (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												1325.7044 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	345.5249	28.4300	98.2327 (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)	658.0816	28.4300	187.0926 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	163.6249	28.4300	46.5186 (249)
Energy for lighting	158.4731	28.4300	45.0539 (250)
Additional standing charges			0.0000 (251)
Total energy cost			376.8978 (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	345.5249	0.1596	55.1548 (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)	658.0816	0.1412	92.9056 (264)
Space and water heating			148.0604 (265)
Pumps, fans and electric keep-hot	163.6249	0.1387	22.6968 (267)
Energy for lighting	158.4731	0.1443	22.8726 (268)
Total CO2, kg/year			193.6297 (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	345.5249	1.5908	549.6626 (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)	658.0816	1.5220	1001.6219 (278)
Space and water heating			1551.2845 (279)
Pumps, fans and electric keep-hot	163.6249	1.5128	247.5317 (281)
Energy for lighting	158.4731	1.5338	243.0713 (282)
Total Primary energy kWh/year			2041.8876 (286)