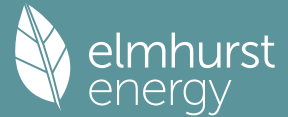


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Plot Reference	Plot 22				Issued on Date	22/12/2025	
Assessment Reference	Plot 22			Plot Type Ref			
Plot Address	Flat 5, 4 Cross Road Manchester, M21 9SX				SAP Version	10.2	
SAP Rating	89 B	DER	3.26	TER	13.57		
Environmental	98 A	% DER < TER				75.98	
CO ₂ Emissions (t/year)	0.14	DFEE	21.21	TFEE	27.64		
Compliance Check	See BREL	% DFEE < TFEE				23.27	
% DPER < TPER	52.52	DPER	34.34	TPER	72.34		
Assessor Details	Daniel Smith				Assessor ID	CJ06-0001	
Client	J Greenwood (Builders) Limited, Steve Brown						

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

1. Overall dwelling characteristics

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

2. Ventilation rate

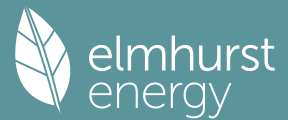
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.8800 (17)
Infiltration rate	0.1440 (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) = 0.1224 (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	0.1561	0.1530	0.1499	0.1346	0.1316	0.1163	0.1163	0.1132	0.1224	0.1316	0.1377	0.1438 (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	0.2961	0.2930	0.2899	0.2746	0.2716	0.2563	0.2563	0.2532	0.2624	0.2716	0.2777	0.2838 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window N/E			1.9400	1.3258	2.4394		(27)
Window S/W			5.7300	1.3258	7.5966		(27)
EXT Wall	29.2700	7.5700	21.7000	0.1800	3.9060	110.0000	2387.0001 (29a)
Flat Roof	14.5300		14.5300	0.1500	2.1795	9.0000	130.7700 (30)
Total net area of external elements Aum(A, m ²)			43.8000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.1215		(33)
Main dwelling							
Party Wall			53.5200	0.0000	0.0000	45.0000	2408.4000 (32)
Corridor			24.6800	0.0000	0.0000	45.0000	1110.6000 (32)
Party Floor			50.3000			40.0000	2012.0000 (32d)
Party Ceiling			35.7700			30.0000	1073.1000 (32b)
Internal Wall			39.0000			9.0000	351.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9472.8701 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.3274 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	10.8700	0.0370	0.4022
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	52.3000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0250	0.0935
E3 Sill	1.2500	0.0220	0.0275
E4 Jamb	7.5400	0.0170	0.1282
E16 Corner (normal)	8.0400	0.0420	0.3377
E18 Party wall between dwellings	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E9 Balcony between dwellings, wall insulation continuous	5.6200	0.1500	0.8430
E15 Flat roof with parapet	10.9700	0.1320	1.4480
E24 Eaves (insulation at ceiling level - inverted)	6.7800	0.1500	1.0170
P4 Party wall - Roof (insulation at ceiling level)	6.0600	0.0400	0.2424
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8665 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	20.9879 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.2857	12.1588	12.0318	11.3969	11.2699	10.6350	10.6350	10.5080	10.8889	11.2699	11.5239	11.7778	(38)
Heat transfer coeff	33.2737	33.1467	33.0197	32.3848	32.2578	31.6229	31.6229	31.4959	31.8769	32.2578	32.5118	32.7658	(39)
Average = Sum(39)m / 12 =												32.3531	
HLP	0.6615	0.6590	0.6565	0.6438	0.6413	0.6287	0.6287	0.6262	0.6337	0.6413	0.6464	0.6514	(40)
HLP (average)												0.6432	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6989 (42)
Hot water usage for mixer showers	52.7051	51.9130	50.7588	48.5505	46.9208	45.1034	44.0704	45.2159	46.4715	48.4228	50.6786	52.5031	(42a)
Hot water usage for baths	22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111	(42b)
Hot water usage for other uses	32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288	(42c)
Average daily hot water use (litres/day)												98.8376	(43)
Daily hot water use	107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430	(44)
Energy conte	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167	(45)
Energy content (annual)										Total = Sum(45)m =		1641.6717	
Distribution loss (46)m = 0.15 x (45)m	25.5433	22.4762	23.6150	20.1605	19.1282	16.7871	16.2524	17.1563	17.6285	20.1929	22.1228	25.1875	(46)
Water storage loss (or HIU loss):												201.0000	(47)
Store volume												1.6100	(48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400	(49)
Temperature factor from Table 2b												0.8694	(55)
Enter (49) or (54) in (55)													
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1959.0027	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	56.6210	49.8223	52.3465	44.6890	42.4008	37.2115	36.0262	38.0299	39.0766	44.7609	49.0389	55.8323	(65)

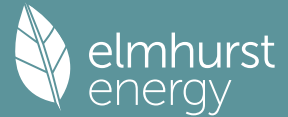
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.8635	87.3132	78.8635	81.4923	78.8635	81.4923	78.8635	78.8635	81.4923	78.8635	81.4923	78.8635	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	(71)
Water heating gains (Table 5)	76.1034	74.1404	70.3583	62.0681	56.9903	51.6826	48.4223	51.1155	54.2731	60.1624	68.1095	75.0434	(72)
Total internal gains	351.4641	359.4866	343.3844	329.4833	311.3755	298.9210	286.5012	287.6584	297.3152	308.8156	329.7926	343.8733	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.8400	10.6334	0.4000	0.0000	0.7700	6.0262 (74)

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South	5.7300		46.7521		0.4000		0.0000		0.7700		82.5099 (78)	
Solar gains	88.5361	146.6463	191.7006	225.9789	245.0720	240.4285	232.9445	218.6981	203.3401	159.4590	105.2364	76.3199 (83)
Total gains	440.0002	506.1329	535.0850	555.4622	556.4475	539.3495	519.4456	506.3566	500.6553	468.2746	435.0290	420.1932 (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	79.0821	79.3851	79.6903	81.2527	81.5725	83.2103	83.2103	83.5458	82.5474	81.5725	80.9353	80.3080
alpha	6.2721	6.2923	6.3127	6.4168	6.4382	6.5474	6.5474	6.5697	6.5032	6.4382	6.3957	6.3539
util living area	0.9410	0.8846	0.8109	0.6815	0.5344	0.3749	0.2678	0.2861	0.4382	0.6905	0.8807	0.9507 (86)
MIT	20.5785	20.7441	20.8663	20.9602	20.9922	20.9994	20.9999	20.9999	20.9982	20.9637	20.7944	20.5494 (87)
Th 2	20.3750	20.3772	20.3795	20.3907	20.3930	20.4043	20.4043	20.4065	20.3997	20.3930	20.3885	20.3840 (88)
util rest of house	0.9313	0.8686	0.7883	0.6521	0.5009	0.3401	0.2316	0.2492	0.4005	0.6562	0.8618	0.9422 (89)
MIT 2	19.8971	20.0968	20.2399	20.3527	20.3864	20.4038	20.4042	20.4065	20.3985	20.3599	20.1694	19.8695 (90)
Living area fraction	20.2618	20.4432	20.5751	20.6778	20.7106	20.7226	20.7230	20.7241	20.7195	fLA = Living area / (4) =	20.5039	0.5352 (91)
MIT	20.2618	20.4432	20.5751	20.6778	20.7106	20.7226	20.7230	20.7241	20.7195	20.6830	20.5039	20.2334 (92)
Temperature adjustment	20.2618	20.4432	20.5751	20.6778	20.7106	20.7226	20.7230	20.7241	20.7195	20.6830	20.5039	0.0000
adjusted MIT	20.2618	20.4432	20.5751	20.6778	20.7106	20.7226	20.7230	20.7241	20.7195	20.6830	20.5039	20.2334 (93)
8. Space heating requirement												
Utilisation	0.9293	0.8704	0.7956	0.6661	0.5185	0.3587	0.2510	0.2689	0.4206	0.6728	0.8655	0.9400 (94)
Useful gains	408.9013	440.5452	425.7354	370.0089	288.5242	193.4619	130.3713	136.1730	210.5647	315.0713	376.5333	394.9628 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	531.1072	515.2061	464.7567	381.4234	290.6631	193.6135	130.3828	136.1908	211.0084	325.2572	435.7854	525.3454 (97)
Space heating kWh	90.9212	50.1722	29.0318	8.2184	1.5913	0.0000	0.0000	0.0000	0.0000	7.5784	42.6615	97.0047 (98a)
Space heating requirement - total per year (kWh/year)												327.1795
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	90.9212	50.1722	29.0318	8.2184	1.5913	0.0000	0.0000	0.0000	0.0000	7.5784	42.6615	97.0047 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												327.1795
Space heating per m2										(98c) / (4) =		6.5046 (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	90.9212	50.1722	29.0318	8.2184	1.5913	0.0000	0.0000	0.0000	0.0000	7.5784	42.6615	97.0047 (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)	90.9212	50.1722	29.0318	8.2184	1.5913	0.0000	0.0000	0.0000	0.0000	7.5784	42.6615	97.0047 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (64)
Efficiency of water heater												349.4100 (216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100 (217)
Fuel for water heating, kWh/month	56.4494	49.8511	52.7703	45.9303	44.2095	39.4941	38.7227	40.4473	41.0995	46.2410	49.6744	55.7706 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	9.7723	8.8266	9.7723	9.4571	9.7723	9.4571	9.7723	9.4571	9.7723	9.4571	9.7723	9.7723 (231)
Lighting	14.6001	11.7127	10.5460	7.7264	5.9681	4.8760	5.4443	7.0767	9.1920	12.0604	13.6222	15.0058 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												327.1795 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	349.4100	
Water heating fuel used	560.6602 (219)	
Space cooling fuel	0.0000 (221)	
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)		
mechanical ventilation fans (SFP = 0.7500)	115.0612 (230a)	
Total electricity for the above, kWh/year	115.0612 (231)	
Electricity for lighting (calculated in Appendix L)	117.8308 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000 (233)	
Wind generation	0.0000 (234)	
Hydro-electric generation (Appendix N)	0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)	
Appendix Q - special features		
Energy saved or generated	-0.0000 (236)	
Energy used	0.0000 (237)	
Total delivered energy for all uses	1120.7317 (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	327.1795	0.1588	51.9592 (261)	
Space heating - main system 2	0.0000	0.0000	0.0000 (262)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	560.6602	0.1411	79.1169 (264)	
Space and water heating			131.0761 (265)	
Pumps, fans and electric keep-hot	115.0612	0.1387	15.9604 (267)	
Energy for lighting	117.8308	0.1443	17.0066 (268)	
Total CO2, kg/year			164.0431 (272)	
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2600 (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	327.1795	1.5878	519.5024 (275)	
Space heating - main system 2	0.0000	0.0000	0.0000 (276)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	560.6602	1.5218	853.2118 (278)	
Space and water heating			1372.7142 (279)	
Pumps, fans and electric keep-hot	115.0612	1.5128	174.0647 (281)	
Energy for lighting	117.8308	1.5338	180.7328 (282)	
Total Primary energy kWh/year			1727.5117 (286)	
Dwelling Primary energy Rate (DPER)			34.3400 (287)	

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

1. Overall dwelling characteristics

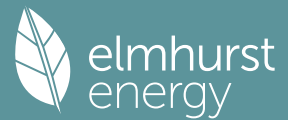
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	50.3000 (1b)	x 2.5000 (2b)	= 125.7500 (1b) - (3b)	
Ground floor				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	125.7500 (5)	

2. Ventilation rate

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4433	0.4346	0.4259	0.3825	0.3738	0.3303	0.3303	0.3216	0.3477	0.3738	0.3911	0.4085 (22b)

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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			7.5700	1.1450	8.6679		(27)
EXT Wall	29.2700	7.5700	21.7000	0.1800	3.9060		(29a)
Flat Roof	14.5300		14.5300	0.1100	1.5983		(30)
Total net area of external elements Aum(A, m2)			43.8000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		14.1722		(33)
Main dwelling							
Party Wall			53.5200	0.0000	0.0000		(32)
Corridor			24.6800	0.0000	0.0000		(32)

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

188.3274 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	10.8700	0.0700	0.7609
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	52.3000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0500	0.1870
E3 Sill	1.2500	0.0500	0.0625
E4 Jamb	7.5400	0.0500	0.3770
E16 Corner (normal)	8.0400	0.0900	0.7236
E18 Party wall between dwellings	2.6800	0.0600	0.1608
E25 Staggered party wall between dwellings	8.0400	0.0600	0.4824
E9 Balcony between dwellings, wall insulation continuous	5.6200	0.0200	0.1124
E15 Flat roof with parapet	10.9700	0.5600	6.1432
E24 Eaves (insulation at ceiling level - inverted)	6.7800	0.2400	1.6272
P4 Party wall - Roof (insulation at ceiling level)	6.0600	0.1200	0.7272

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

11.3642 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 25.5364 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.8262	24.6679	24.5127	23.7838	23.6474	23.0125	23.0125	22.8949	23.2570	23.6474	23.9233	24.2117
Heat transfer coeff	50.3627	50.2044	50.0492	49.3202	49.1838	48.5489	48.5489	48.4313	48.7935	49.1838	49.4597	49.7482
Average = Sum(39)m / 12 =												49.3195

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0012	0.9981	0.9950	0.9805	0.9778	0.9652	0.9652	0.9628	0.9700	0.9778	0.9833	0.9890
HLP (average)												0.9805
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

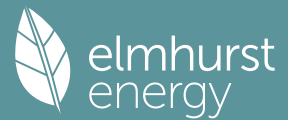
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6989
Hot water usage for mixer showers												(42)
Hot water usage for baths												(42a)
Hot water usage for other uses												(42b)
Average daily hot water use (litres/day)												(42c)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430
Energy conte	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167
Energy content (annual)										Total = Sum(45)m =		1641.6717
Distribution loss (46)m = 0.15 x (45)m												(46)
Water storage loss (or HIU loss):												
Store volume												150.0000
a) If manufacturer declared loss factor is known (kWh/day):												1.3938
Temperature factor from Table 2b												0.5400
Enter (49) or (54) in (55)												0.7527
Total storage loss												(56)
If cylinder contains dedicated solar storage												(57)
Primary loss												(59)
Combi loss												(61)
Total heat required for water heating calculated for each month												(62)
WWHRS												(63a)
PV diverter												(63b)
Solar input												(63c)
FGHRS												(63d)
Output from w/h												(64)
12Total per year (kWh/year)												(64)
Electric shower(s)												(64a)
Heat gains from water heating, kWh/month												(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												(69)

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Pumps, fans	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	31.4947 0.0000	31.4947 0.0000	31.4947 0.0000	31.4947 0.0000	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	(69) 3.0000 (70)
Losses e.g. evaporation	(negative values) (Table 5)												
Water heating gains	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	(71)
Total internal gains	126.2055	124.2424	120.4603	112.1701	107.0923	101.7847	98.5244	101.2175	104.3751	110.2645	118.2116	125.1455	(72)
	404.5661	412.5887	396.4864	382.5853	364.4776	349.0231	336.6032	337.7605	347.4173	361.9176	382.8947	396.9754	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					1.8400	10.6334	0.6300	0.7000			0.7700			5.9795 (74)
South					5.7300	46.7521	0.6300	0.7000			0.7700			81.8705 (78)
Solar gains	87.8499	145.5098	190.2149	224.2276	243.1727	238.5651	231.1391	217.0032	201.7642	158.2232	104.4208			75.7284 (83)
Total gains	492.4161	558.0984	586.7014	606.8129	607.6502	587.5882	567.7424	554.7637	549.1815	520.1408	487.3155			472.7038 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.2481	52.4128	52.5754	53.3524	53.5004	54.2001	54.2001	54.3316	53.9284	53.5004	53.2019	52.8935
alpha	4.4832	4.4942	4.5050	4.5568	4.5667	4.6133	4.6133	4.6221	4.5952	4.5667	4.5468	4.5262
util living area	0.9603	0.9326	0.8935	0.8131	0.6887	0.5152	0.3737	0.3980	0.5863	0.8134	0.9285	0.9656 (86)
MIT	19.9913	20.2109	20.4471	20.7155	20.8928	20.9780	20.9959	20.9945	20.9594	20.7564	20.3534	19.9578 (87)
Th 2	20.0823	20.0849	20.0875	20.0996	20.1019	20.1124	20.1124	20.1144	20.1084	20.1019	20.0973	20.0925 (88)
util rest of house	0.9521	0.9195	0.8731	0.7795	0.6377	0.4488	0.2995	0.3231	0.5195	0.7739	0.9125	0.9584 (89)
MIT 2	18.9361	19.2084	19.4968	19.8192	20.0109	20.0986	20.1108	20.1120	20.0805	19.8727	19.3977	18.9023 (90)
Living area fraction	19.5008	19.7449	20.0054	20.2989	20.4829	20.5692	20.5845	20.5843	20.5509	20.3457	19.9092	19.4672 (92)
MIT	19.5008	19.7449	20.0054	20.2989	20.4829	20.5692	20.5845	20.5843	20.5509	20.3457	19.9092	19.4672 (92)
Temperature adjustment	19.5008	19.7449	20.0054	20.2989	20.4829	20.5692	20.5845	20.5843	20.5509	20.3457	19.9092	19.4672 (93)
adjusted MIT	19.5008	19.7449	20.0054	20.2989	20.4829	20.5692	20.5845	20.5843	20.5509	20.3457	19.9092	19.4672 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9458	0.9140	0.8711	0.7874	0.6600	0.4834	0.3392	0.3631	0.5533	0.7853	0.9087	0.9524 (94)
Useful gains	465.7462	510.0922	511.0908	477.7954	401.0612	284.0571	192.5535	201.4247	303.8675	408.4714	442.8269	450.1980 (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	765.5546	745.2798	675.9341	562.1954	431.9749	289.7988	193.4436	202.6531	314.7608	479.3301	633.5388	759.5133 (97)
Space heating kWh	223.0574	158.0460	122.6434	60.7680	22.9997	0.0000	0.0000	0.0000	0.0000	52.7189	137.3125	230.1306 (98a)
Space heating requirement - total per year (kWh/year)												1007.6766
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	223.0574	158.0460	122.6434	60.7680	22.9997	0.0000	0.0000	0.0000	0.0000	52.7189	137.3125	230.1306 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1007.6766
Space heating per m ²										(98c) / (4) =		20.0333 (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	223.0574	158.0460	122.6434	60.7680	22.9997	0.0000	0.0000	0.0000	0.0000	52.7189	137.3125	230.1306	(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)	241.6657	171.2308	132.8747	65.8375	24.9185	0.0000	0.0000	0.0000	0.0000	57.1169	148.7676	249.3289	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	192.7889	170.6179	181.7141	161.0180	156.8963	142.2710	141.1326	146.2831	147.3700	163.2413	172.2162	190.8632	(64)
Efficiency of water heater (217)m	84.3877	83.8885	83.1978	82.0793	80.8476	79.8000	79.8000	79.8000	79.8000	81.8244	83.5568	79.8000	(216)
Fuel for water heating, kWh/month	228.4563	203.3865	218.4121	196.1737	194.0642	178.2845	176.8579	183.3121	184.6741	199.5019	206.1067	225.9260	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.3863	13.1457	11.8362	8.6717	6.6983	5.4726	6.1104	7.9425	10.3166	13.5359	15.2888	16.8417	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-13.6309	-20.2773	-30.7412	-36.5291	-41.1420	-39.0690	-38.6181	-35.5985	-30.5608	-24.0636	-15.3659	-11.6660	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

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Electricity generated by hydro-electric generators (Appendix M) (negative quantity)											
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)											
(233b)m	-4.7814	-10.2931	-20.8967	-32.0302	-42.9765	-43.3895	-35.9756	-25.9837	-14.9022	-6.4436	(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	(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	(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	(235d)
Annual totals kWh/year											
Space heating fuel - main system 1											1091.7406 (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											2395.1559 (219)
Space cooling fuel											0.0000 (221)
Electricity for pumps and fans:											
Total electricity for the above, kWh/year											86.0000 (231)
Electricity for lighting (calculated in Appendix L)											132.2467 (232)
Energy saving/generation technologies (Appendices M ,N and Q)											
PV generation											-621.5509 (233)
Wind generation											0.0000 (234)
Hydro-electric generation (Appendix N)											0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)											0.0000 (235)
Appendix Q - special features											
Energy saved or generated											-0.0000 (236)
Energy used											0.0000 (237)
Total delivered energy for all uses											3083.5924 (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	1091.7406	0.2100	229.2655 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2395.1559	0.2100	502.9827 (264)
Space and water heating			732.2483 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	132.2467	0.1443	19.0873 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-337.2625	0.1335	-45.0088
PV Unit electricity exported	-284.2884	0.1253	-35.6267
Total			-80.6355 (269)
Total CO2, kg/year			682.6293 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5700 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1091.7406	1.1300	1233.6669 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2395.1559	1.1300	2706.5262 (278)
Space and water heating			3940.1931 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	132.2467	1.5338	202.8444 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-337.2625	1.4932	-503.5857
PV Unit electricity exported	-284.2884	0.4600	-130.7670
Total			-634.3527 (283)
Total Primary energy kWh/year			3638.7856 (286)
Target Primary Energy Rate (TPER)			72.3400 (287)

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Plot Reference	Plot 22			Issued on Date	22/12/2025
Assessment Reference	Plot 22	Plot Type Ref			
Plot Address	Flat 5, 4 Cross Road Manchester, M21 9SX			SAP Version	10.2
SAP Rating	89 B	DER	3.26	TER	13.57
Environmental	98 A	% DER < TER			75.98
CO ₂ Emissions (t/year)	0.14	DFEE	21.21	TFEE	27.64
Compliance Check	See BREL	% DFEE < TFEE			23.27
% DPER < TPER	52.52	DPER	34.34	TPER	72.34
Assessor Details	Daniel Smith			Assessor ID	CJ06-0001
Client	J Greenwood (Builders) Limited, Steve Brown				

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

1. Overall dwelling characteristics

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

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1590 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.8800 (17)
Infiltration rate	0.3030 (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) = 0.2576 (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	0.3284	0.3220	0.3155	0.2833	0.2769	0.2447	0.2447	0.2383	0.2576	0.2769	0.2898	0.3027 (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	0.5539	0.5518	0.5498	0.5401	0.5383	0.5299	0.5299	0.5284	0.5332	0.5383	0.5420	0.5458 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window N/E			1.8400	1.3258	2.4394		(27)
Window S/W			5.7300	1.3258	7.5966		(27)
EXT Wall	29.2700	7.5700	21.7000	0.1800	3.9060	110.0000	2387.0001 (29a)
Flat Roof	14.5300		14.5300	0.1500	2.1795	9.0000	130.7700 (30)
Total net area of external elements Aum(A, m ²)			43.8000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.1215		(33)
Main dwelling							
Party Wall			53.5200	0.0000	0.0000	45.0000	2408.4000 (32)
Corridor			24.6800	0.0000	0.0000	45.0000	1110.6000 (32)
Party Floor			50.3000			40.0000	2012.0000 (32d)
Party Ceiling			35.7700			30.0000	1073.1000 (32b)
Internal Wall			39.0000			9.0000	351.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9472.8701 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.3274 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				10.8700	0.0370	0.4022	

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P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	52.3000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0250	0.0935
E3 Sill	1.2500	0.0220	0.0275
E4 Jamb	7.5400	0.0170	0.1282
E16 Corner (normal)	8.0400	0.0420	0.3377
E18 Party wall between dwellings	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E9 Balcony between dwellings, wall insulation continuous	5.6200	0.1500	0.8430
E15 Flat roof with parapet	10.9700	0.1320	1.4480
E24 Eaves (insulation at ceiling level - inverted)	6.7800	0.1500	1.0170
P4 Party wall - Roof (insulation at ceiling level)	6.0600	0.0400	0.2424
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8665 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	20.9879 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	22.9868	22.8999	22.8147	22.4146	22.3397	21.9912	21.9912	21.9267	22.1255	22.3397	22.4912	22.6495 (38)
Average = Sum(39)m / 12 =	43.9747	43.8878	43.8026	43.4025	43.3277	42.9792	42.9792	42.9146	43.1134	43.3277	43.4791	43.6374 (39)
												43.4022
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8742	0.8725	0.8708	0.8629	0.8614	0.8545	0.8545	0.8532	0.8571	0.8614	0.8644	0.8675 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6989 (42)
Hot water usage for mixer showers												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111 (42b)
Hot water usage for other uses	32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288 (42c)
Average daily hot water use (litres/day)												50.2453 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	54.8169	53.3138	51.6725	49.6291	47.8064	45.9121	45.5181	47.1560	48.8360	50.7814	52.8429	54.7399 (44)
Distribution loss (46)m = 0.15 x (45)m	86.8166	75.9182	79.4188	67.9398	64.3567	56.4543	55.0501	58.3890	60.2196	68.9098	75.2844	85.7095 (45)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	73.7941	64.5304	67.5060	57.7488	54.7032	47.9862	46.7926	49.6306	51.1867	58.5733	63.9917	72.8530 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	73.7941	64.5304	67.5060	57.7488	54.7032	47.9862	46.7926	49.6306	51.1867	58.5733	63.9917	72.8530 (64)
12Total per year (kWh/year)												709.2967 (64)
Electric shower(s)	42.2080	37.6077	41.0661	39.1889	39.9243	38.0839	39.3533	39.9243	39.1889	41.0661	40.2939	42.2080 (64a)
Heat gains from water heating, kWh/month	29.0005	25.5345	27.1430	24.2344	23.6569	21.5175	21.5365	22.3887	22.5939	24.9099	26.0714	28.7653 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												480.1132 (64a)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	78.8635	87.3132	78.8635	81.4923	78.8635	81.4923	78.8635	78.8635	81.4923	78.8635	81.4923	78.8635 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824 (68)
Pumps, fans	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Total internal gains	38.9792	37.9978	36.4826	33.6589	31.7968	29.8854	28.9469	30.0924	31.3804	33.4810	36.2103	38.6630 (72)
	314.3399	323.3441	309.5087	301.0741	286.1821	277.1238	267.0257	266.6353	274.4226	282.1341	297.8934	307.4929 (73)

6. Solar gains												
[Jan]				Area	Solar flux		g		FF		Access	Gains
				m2	Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
North				1.8400	10.6334		0.4000		0.0000		0.7700	6.0262 (74)
South				5.7300	46.7521		0.4000		0.0000		0.7700	82.5099 (78)
Solar gains	88.5361	146.6463	191.7006	225.9789	245.0720	240.4285	232.9445	218.6981	203.3401	159.4590	105.2364	76.3199 (83)
Total gains	402.8759	469.9903	501.2093	527.0530	531.2540	517.5523	499.9702	485.3335	477.7627	441.5931	403.1298	383.8128 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.8379	59.9563	60.0729	60.6267	60.7315	61.2239	61.2239	61.3160	61.0333	60.7315	60.5199	60.3004
alpha	4.9892	4.9971	5.0049	5.0418	5.0488	5.0816	5.0816	5.0877	5.0689	5.0488	5.0347	5.0200
util living area	0.9768	0.9522	0.9151	0.8330	0.7026	0.5212	0.3766	0.4043	0.6001	0.8430	0.9525	0.9811 (86)
MIT	20.0376	20.2682	20.5012	20.7561	20.9159	20.9850	20.9976	20.9966	20.9694	20.7781	20.3763	19.9916 (87)
Th 2	20.1894	20.1909	20.1924	20.1992	20.2004	20.2064	20.2064	20.2075	20.2041	20.2004	20.1979	20.1952 (88)
util rest of house	0.9718	0.9427	0.8986	0.8030	0.6557	0.4604	0.3095	0.3358	0.5385	0.8088	0.9414	0.9770 (89)
MIT 2	19.3220	19.5468	19.7702	20.0090	20.1439	20.1988	20.2056	20.2063	20.1873	20.0338	19.6602	19.2817 (90)
Living area fraction									FLA = Living area / (4) =			0.5352 (91)
MIT	19.7050	19.9329	20.1614	20.4088	20.5571	20.6195	20.6295	20.6292	20.6059	20.4322	20.0434	19.6616 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7050	19.9329	20.1614	20.4088	20.5571	20.6195	20.6295	20.6292	20.6059	20.4322	20.0434	19.6616 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9683	0.9392	0.8979	0.8113	0.6772	0.4924	0.3454	0.3724	0.5701	0.8193	0.9390	0.9737 (94)
Useful gains	390.0916	441.4302	450.0239	427.6047	359.7780	254.8414	172.6648	180.7317	272.3848	361.8073	378.5223	373.7282 (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	677.4284	659.7598	598.4063	499.5123	383.7578	258.7149	173.1833	181.4959	280.4920	426.0041	562.7683	674.7055 (97)
Space heating kWh	213.7786	146.7175	110.3964	51.7735	17.8410	0.0000	0.0000	0.0000	0.0000	47.7625	132.6571	223.9271 (98a)
Space heating requirement - total per year (kWh/year)												944.8537
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	213.7786	146.7175	110.3964	51.7735	17.8410	0.0000	0.0000	0.0000	0.0000	47.7625	132.6571	223.9271 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												944.8537
Space heating per m2										(98c) / (4) =		18.7844 (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	404.0043	318.0459	326.1513	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9435	0.9739	0.9679	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	381.1877	309.7353	315.6796	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	573.6952	554.8174	539.2545	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	138.6054	182.3411	166.3398	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.6513	45.5853	41.5849	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												121.8216 (107)
Energy for space heating												18.7844 (99)
Energy for space cooling												2.4219 (108)
Total												21.2063 (109)
Fabric Energy Efficiency (DFEE)												21.2 (109)

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

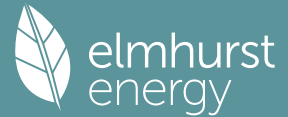
1. Overall dwelling characteristics

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

2. Ventilation rate

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

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1590 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.4090 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3477 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4433	0.4346	0.4259	0.3825	0.3738	0.3303	0.3303	0.3216	0.3477	0.3738	0.3911	0.4085	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5983	0.5944	0.5907	0.5731	0.5699	0.5546	0.5546	0.5517	0.5604	0.5699	0.5765	0.5835	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opening Type			7.5700	1.1450	8.6679			(27)
EXT Wall	29.2700	7.5700	21.7000	0.1800	3.9060			(29a)
Flat Roof	14.5300		14.5300	0.1100	1.5983			(30)
Total net area of external elements Aum(A, m2)			43.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		14.1722			(33)
Main dwelling								
Party Wall			53.5200	0.0000	0.0000			(32)
Corridor			24.6800	0.0000	0.0000			(32)

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

188.3274 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	10.8700	0.0700	0.7609
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	52.3000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0500	0.1870
E3 Sill	1.2500	0.0500	0.0625
E4 Jamb	7.5400	0.0500	0.3770
E16 Corner (normal)	8.0400	0.0900	0.7236
E18 Party wall between dwellings	2.6800	0.0600	0.1608
E25 Staggered party wall between dwellings	8.0400	0.0600	0.4824
E9 Balcony between dwellings, wall insulation continuous	5.6200	0.0200	0.1124
E15 Flat roof with parapet	10.9700	0.5600	6.1432
E24 Eaves (insulation at ceiling level - inverted)	6.7800	0.2400	1.6272
P4 Party wall - Roof (insulation at ceiling level)	6.0600	0.1200	0.7272

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

11.3642 (36)

Point Thermal Bridges

Total fabric heat loss (33) + (36) + (36a) = 25.5364 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.8262	24.6679	24.5127	23.7838	23.6474	23.0125	23.0125	22.8949	23.2570	23.6474	23.9233	24.2117	(38)
Heat transfer coeff	50.3627	50.2044	50.0492	49.3202	49.1838	48.5489	48.5489	48.4313	48.7935	49.1838	49.4597	49.7482	(39)
Average = Sum(39)m / 12 =												49.3195	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0012	0.9981	0.9950	0.9805	0.9778	0.9652	0.9652	0.9628	0.9700	0.9778	0.9833	0.9890	(40)
HLP (average)												0.9805	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6989 (42)
Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)
Hot water usage for baths 22.7881 22.4497 21.9731 21.0944 20.4364 19.7068 19.3127 19.7859 20.3012 21.0819 21.9788 22.7111 (42b)
Hot water usage for other uses 32.0288 30.8641 29.6994 28.5348 27.3701 26.2054 26.2054 27.3701 28.5348 29.6994 30.8641 32.0288 (42c)
Average daily hot water use (litres/day) 50.2453 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.8169	53.3138	51.6725	49.6291	47.8064	45.9121	45.5181	47.1560	48.8360	50.7814	52.8429	54.7399	(44)
Energy conte	86.8166	75.9182	79.4188	67.9398	64.3567	56.4543	55.0501	58.3890	60.2196	68.9098	75.2844	85.7095	(45)
Energy content (annual)										Total = Sum(45)m =		834.4667	
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	73.7941	64.5304	67.5060	57.7488	54.7032	47.9862	46.7926	49.6306	51.1867	58.5733	63.9917	72.8530	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	73.7941	64.5304	67.5060	57.7488	54.7032	47.9862	46.7926	49.6306	51.1867	58.5733	63.9917	72.8530	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		709.2967	(64)
Electric shower(s)	42.2080	37.6077	41.0661	39.1889	39.9243	38.0839	39.3533	39.9243	39.1889	41.0661	40.2939	42.2080	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												480.1132	(64a)

Heat gains from water heating, kWh/month

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29.0005 25.5345 27.1430 24.2344 23.6569 21.5175 21.5365 22.3887 22.5939 24.9099 26.0714 28.7653 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.8635	87.3132	78.8635	81.4923	78.8635	81.4923	78.8635	78.8635	81.4923	78.8635	81.4923	78.8635	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	(71)
Water heating gains (Table 5)	38.9792	37.9978	36.4826	33.6589	31.7968	29.8854	28.9469	30.0924	31.3804	33.4810	36.2103	38.6630	(72)
Total internal gains	314.3399	323.3441	309.5087	301.0741	286.1821	277.1238	267.0257	266.6353	274.4226	282.1341	297.8934	307.4929	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					1.8400	10.6334	0.6300	0.7000			0.7700	5.9795 (74)
South					5.7300	46.7521	0.6300	0.7000			0.7700	81.8705 (78)
Solar gains	87.8499	145.5098	190.2149	224.2276	243.1727	238.5651	231.1391	217.0032	201.7642	158.2232	104.4208	75.7284 (83)
Total gains	402.1898	468.8538	499.7236	525.3017	529.3547	515.6890	498.1649	483.6385	476.1868	440.3573	402.3142	383.2213 (84)

7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	52.2481	52.4128	52.5754	53.3524	53.5004	54.2001	54.2001	54.3316	53.9284	53.5004	53.2019	52.8935	21.0000 (85)
alpha	4.4832	4.4942	4.5050	4.5568	4.5667	4.6133	4.6133	4.6221	4.5952	4.5667	4.5468	4.5262	
util living area	0.9806	0.9618	0.9335	0.8681	0.7558	0.5780	0.4238	0.4536	0.6578	0.8759	0.9618	0.9839	(86)
MIT	19.7762	20.0202	20.2888	20.6125	20.8421	20.9650	20.9932	20.9906	20.9354	20.6534	20.1731	19.7397	(87)
Th 2	20.0823	20.0849	20.0875	20.0996	20.1019	20.1124	20.1124	20.1144	20.1084	20.1019	20.0973	20.0925	(88)
util rest of house	0.9761	0.9535	0.9190	0.8400	0.7068	0.5065	0.3407	0.3695	0.5884	0.8439	0.9520	0.9802	(89)
MIT 2	18.9803	19.2204	19.4816	19.7937	19.9941	20.0947	20.1102	20.1112	20.0725	19.8381	19.3824	18.9523	(90)
Living area fraction	19.4063	19.6485	19.9136	20.2319	20.4479	20.5605	20.5828	20.5819	20.5343	20.2745	19.8056	19.3737	(91)
MIT	19.4063	19.6485	19.9136	20.2319	20.4479	20.5605	20.5828	20.5819	20.5343	20.2745	19.8056	19.3737	(92)
Temperature adjustment	19.4063	19.6485	19.9136	20.2319	20.4479	20.5605	20.5828	20.5819	20.5343	20.2745	19.8056	19.3737	(93)
adjusted MIT	19.4063	19.6485	19.9136	20.2319	20.4479	20.5605	20.5828	20.5819	20.5343	20.2745	19.8056	19.3737	(93)

8. Space heating requirement

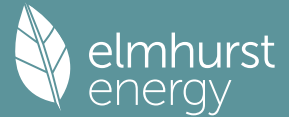
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9721	0.9488	0.9158	0.8445	0.7265	0.5433	0.3851	0.4144	0.6226	0.8506	0.9483	0.9766	(94)
Useful gains	390.9682	444.8452	457.6547	443.6110	384.5974	280.1823	191.8487	200.4102	296.4816	374.5711	381.5063	374.2372	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	760.7915	740.4371	671.3394	558.8926	430.2573	289.3756	193.3589	202.5327	313.9521	475.8275	628.4138	754.8632	(97)
Space heating kWh	275.1485	198.6377	158.9815	83.0028	33.9710	0.0000	0.0000	0.0000	0.0000	75.3347	177.7734	283.1857	(98a)
Space heating requirement - total per year (kWh/year)												1286.0353	
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	275.1485	198.6377	158.9815	83.0028	33.9710	0.0000	0.0000	0.0000	0.0000	75.3347	177.7734	283.1857	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1286.0353	
Space heating per m ²												25.5673	(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	456.3596	359.2618	368.0781	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9005	0.9473	0.9377	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	410.9556	340.3420	345.1649	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	571.5173	552.7073	537.2735	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	115.6044	157.9998	142.9288	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	28.9011	39.4999	35.7322	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												104.1332	(107)
Energy for space heating												25.5673	(99)
Energy for space cooling												2.0702	(108)
Total												27.6375	(109)
Fabric Energy Efficiency (TFEE)												27.6	(109)

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Plot Reference	Plot 22				Issued on Date	22/12/2025	
Assessment Reference	Plot 22			Plot Type Ref			
Plot Address	Flat 5, 4 Cross Road Manchester, M21 9SX				SAP Version	10.2	
SAP Rating	89 B	DER	3.26	TER	13.57		
Environmental	98 A	% DER < TER				75.98	
CO ₂ Emissions (t/year)	0.14	DFEE	21.21	TFEE	27.64		
Compliance Check	See BREL	% DFEE < TFEE				23.27	
% DPER < TPER	52.52	DPER	34.34	TPER	72.34		
Assessor Details	Daniel Smith				Assessor ID	CJ06-0001	
Client	J Greenwood (Builders) Limited, Steve Brown						

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

1. Overall dwelling characteristics

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

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.8800	(17)
Infiltration rate	0.1440	(18)
Number of sides sheltered	2	(19)

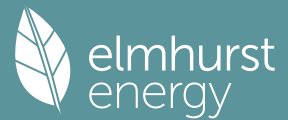
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1224 (21)

	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	0.1561	0.1530	0.1499	0.1346	0.1316	0.1163	0.1163	0.1132	0.1224	0.1316	0.1377	0.1438 (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	0.2961	0.2930	0.2899	0.2746	0.2716	0.2563	0.2563	0.2532	0.2624	0.2716	0.2777	0.2838 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window N/E			1.9400	1.3258	2.4394		(27)
Window S/W			5.7300	1.3258	7.5966		(27)
EXT Wall	29.2700	7.5700	21.7000	0.1800	3.9060	110.0000	2387.0001 (29a)
Flat Roof	14.5300		14.5300	0.1500	2.1795	9.0000	130.7700 (30)
Total net area of external elements Aum(A, m ²)			43.8000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.1215		(33)
Main dwelling							
Party Wall			53.5200	0.0000	0.0000	45.0000	2408.4000 (32)
Corridor			24.6800	0.0000	0.0000	45.0000	1110.6000 (32)
Party Floor			50.3000			40.0000	2012.0000 (32d)
Party Ceiling			35.7700			30.0000	1073.1000 (32b)
Internal Wall			39.0000			9.0000	351.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9472.8701 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.3274 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	10.8700	0.0370	0.4022
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	52.3000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0250	0.0935
E3 Sill	1.2500	0.0220	0.0275
E4 Jamb	7.5400	0.0170	0.1282
E16 Corner (normal)	8.0400	0.0420	0.3377
E18 Party wall between dwellings	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E9 Balcony between dwellings, wall insulation continuous	5.6200	0.1500	0.8430
E15 Flat roof with parapet	10.9700	0.1320	1.4480
E24 Eaves (insulation at ceiling level - inverted)	6.7800	0.1500	1.0170
P4 Party wall - Roof (insulation at ceiling level)	6.0600	0.0400	0.2424
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8665 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	20.9879 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	12.2857	12.1588	12.0318	11.3969	11.2699	10.6350	10.6350	10.5080	10.8889	11.2699	11.5239	11.7778 (38)
Heat transfer coeff	33.2737	33.1467	33.0197	32.3848	32.2578	31.6229	31.6229	31.4959	31.8769	32.2578	32.5118	32.7658 (39)
Average = Sum(39)m / 12 =												32.3531
HLP	0.6615	0.6590	0.6565	0.6438	0.6413	0.6287	0.6287	0.6262	0.6337	0.6413	0.6464	0.6514 (40)
HLP (average)												0.6432
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6989 (42)
Hot water usage for mixer showers	52.7051	51.9130	50.7588	48.5505	46.9208	45.1034	44.0704	45.2159	46.4715	48.4228	50.6786	52.5031 (42a)	
Hot water usage for baths	22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111 (42b)	
Hot water usage for other uses	32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288 (42c)	
Average daily hot water use (litres/day)												98.8376 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430 (44)	
Distribution loss (46)m = 0.15 x (45)m	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167 (45)	
Store volume										Total = Sum(45)m =		1641.6717	
a) If manufacturer declared loss factor is known (kWh/day):	25.5433	22.4762	23.6150	20.1605	19.1282	16.7871	16.2524	17.1563	17.6285	20.1929	22.1228	25.1875 (46)	
Temperature factor from Table 2b												201.0000 (47)	
Enter (49) or (54) in (55)												1.6100 (48)	
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)	
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1959.0027 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month	56.6210	49.8223	52.3465	44.6890	42.4008	37.2115	36.0262	38.0299	39.0766	44.7609	49.0389	55.8323 (65)	

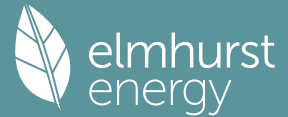
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.8635	87.3132	78.8635	81.4923	78.8635	81.4923	78.8635	78.8635	81.4923	78.8635	81.4923	78.8635 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)	76.1034	74.1404	70.3583	62.0681	56.9903	51.6826	48.4223	51.1155	54.2731	60.1624	68.1095	75.0434 (72)
Total internal gains	351.4641	359.4866	343.3844	329.4833	311.3755	298.9210	286.5012	287.6584	297.3152	308.8156	329.7926	343.8733 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.8400	10.6334	0.4000	0.0000	0.7700	6.0262 (74)

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South	5.7300		46.7521		0.4000		0.0000		0.7700		82.5099 (78)	
Solar gains	88.5361	146.6463	191.7006	225.9789	245.0720	240.4285	232.9445	218.6981	203.3401	159.4590	105.2364	76.3199 (83)
Total gains	440.0002	506.1329	535.0850	555.4622	556.4475	539.3495	519.4456	506.3566	500.6553	468.2746	435.0290	420.1932 (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	79.0821	79.3851	79.6903	81.2527	81.5725	83.2103	83.2103	83.5458	82.5474	81.5725	80.9353	80.3080
alpha	6.2721	6.2923	6.3127	6.4168	6.4382	6.5474	6.5474	6.5697	6.5032	6.4382	6.3957	6.3539
util living area	0.9410	0.8846	0.8109	0.6815	0.5344	0.3749	0.2678	0.2861	0.4382	0.6905	0.8807	0.9507 (86)
MIT	20.5785	20.7441	20.8663	20.9602	20.9922	20.9994	20.9999	20.9999	20.9982	20.9637	20.7944	20.5494 (87)
Th 2	20.3750	20.3772	20.3795	20.3907	20.3930	20.4043	20.4043	20.4065	20.3997	20.3930	20.3885	20.3840 (88)
util rest of house	0.9313	0.8686	0.7883	0.6521	0.5009	0.3401	0.2316	0.2492	0.4005	0.6562	0.8618	0.9422 (89)
MIT 2	19.8971	20.0968	20.2399	20.3527	20.3864	20.4038	20.4042	20.4065	20.3985	20.3599	20.1694	19.8695 (90)
Living area fraction	20.2618	20.4432	20.5751	20.6778	20.7106	20.7226	20.7230	20.7241	20.7195	fLA = Living area / (4) =	20.5039	0.5352 (91)
MIT	20.2618	20.4432	20.5751	20.6778	20.7106	20.7226	20.7230	20.7241	20.7195	20.6830	20.5039	20.2334 (92)
Temperature adjustment	20.2618	20.4432	20.5751	20.6778	20.7106	20.7226	20.7230	20.7241	20.7195	20.6830	20.5039	0.0000
adjusted MIT	20.2618	20.4432	20.5751	20.6778	20.7106	20.7226	20.7230	20.7241	20.7195	20.6830	20.5039	20.2334 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9293	0.8704	0.7956	0.6661	0.5185	0.3587	0.2510	0.2689	0.4206	0.6728	0.8655	0.9400 (94)
Useful gains	408.9013	440.5452	425.7354	370.0089	288.5242	193.4619	130.3713	136.1730	210.5647	315.0713	376.5333	394.9628 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	531.1072	515.2061	464.7567	381.4234	290.6631	193.6135	130.3828	136.1908	211.0084	325.2572	435.7854	525.3454 (97)
Space heating kWh	90.9212	50.1722	29.0318	8.2184	1.5913	0.0000	0.0000	0.0000	0.0000	7.5784	42.6615	97.0047 (98a)
Space heating requirement - total per year (kWh/year)												327.1795
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	90.9212	50.1722	29.0318	8.2184	1.5913	0.0000	0.0000	0.0000	0.0000	7.5784	42.6615	97.0047 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												327.1795
Space heating per m2										(98c) / (4) =		6.5046 (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	90.9212	50.1722	29.0318	8.2184	1.5913	0.0000	0.0000	0.0000	0.0000	7.5784	42.6615	97.0047 (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)	90.9212	50.1722	29.0318	8.2184	1.5913	0.0000	0.0000	0.0000	0.0000	7.5784	42.6615	97.0047 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100 (216)
Fuel for water heating, kWh/month	56.4494	49.8511	52.7703	45.9303	44.2095	39.4941	38.7227	40.4473	41.0995	46.2410	49.6744	55.7706 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	9.7723	8.8266	9.7723	9.4571	9.7723	9.4571	9.7723	9.7723	9.4571	9.7723	9.4571	9.7723 (231)
Lighting	14.6001	11.7127	10.5460	7.7264	5.9681	4.8760	5.4443	7.0767	9.1920	12.0604	13.6222	15.0058 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												327.1795 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	349.4100	
Water heating fuel used	560.6602 (219)	
Space cooling fuel	0.0000 (221)	
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)		
mechanical ventilation fans (SFP = 0.7500)	115.0612 (230a)	
Total electricity for the above, kWh/year	115.0612 (231)	
Electricity for lighting (calculated in Appendix L)	117.8308 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000 (233)	
Wind generation	0.0000 (234)	
Hydro-electric generation (Appendix N)	0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)	
Appendix Q - special features		
Energy saved or generated	-0.0000 (236)	
Energy used	0.0000 (237)	
Total delivered energy for all uses	1120.7317 (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	327.1795	0.1588	51.9592 (261)	
Space heating - main system 2	0.0000	0.0000	0.0000 (262)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	560.6602	0.1411	79.1169 (264)	
Space and water heating			131.0761 (265)	
Pumps, fans and electric keep-hot	115.0612	0.1387	15.9604 (267)	
Energy for lighting	117.8308	0.1443	17.0066 (268)	
Total CO2, kg/year			164.0431 (272)	
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2600 (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	327.1795	1.5878	519.5024 (275)	
Space heating - main system 2	0.0000	0.0000	0.0000 (276)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	560.6602	1.5218	853.2118 (278)	
Space and water heating			1372.7142 (279)	
Pumps, fans and electric keep-hot	115.0612	1.5128	174.0647 (281)	
Energy for lighting	117.8308	1.5338	180.7328 (282)	
Total Primary energy kWh/year			1727.5117 (286)	
Dwelling Primary energy Rate (DPER)			34.3400 (287)	

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

1. Overall dwelling characteristics

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

2. Ventilation rate

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4433	0.4346	0.4259	0.3825	0.3738	0.3303	0.3303	0.3216	0.3477	0.3738	0.3911	0.4085 (22b)

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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			7.5700	1.1450	8.6679		(27)
EXT Wall	29.2700	7.5700	21.7000	0.1800	3.9060		(29a)
Flat Roof	14.5300		14.5300	0.1100	1.5983		(30)
Total net area of external elements Aum(A, m2)			43.8000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		14.1722		(33)
Main dwelling							
Party Wall			53.5200	0.0000	0.0000		(32)
Corridor			24.6800	0.0000	0.0000		(32)

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

188.3274 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	10.8700	0.0700	0.7609
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	52.3000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0500	0.1870
E3 Sill	1.2500	0.0500	0.0625
E4 Jamb	7.5400	0.0500	0.3770
E16 Corner (normal)	8.0400	0.0900	0.7236
E18 Party wall between dwellings	2.6800	0.0600	0.1608
E25 Staggered party wall between dwellings	8.0400	0.0600	0.4824
E9 Balcony between dwellings, wall insulation continuous	5.6200	0.0200	0.1124
E15 Flat roof with parapet	10.9700	0.5600	6.1432
E24 Eaves (insulation at ceiling level - inverted)	6.7800	0.2400	1.6272
P4 Party wall - Roof (insulation at ceiling level)	6.0600	0.1200	0.7272

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

11.3642 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 25.5364 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.8262	24.6679	24.5127	23.7838	23.6474	23.0125	23.0125	22.8949	23.2570	23.6474	23.9233	24.2117
Heat transfer coeff	50.3627	50.2044	50.0492	49.3202	49.1838	48.5489	48.5489	48.4313	48.7935	49.1838	49.4597	49.7482
Average = Sum(39)m / 12 =												49.3195

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0012	0.9981	0.9950	0.9805	0.9778	0.9652	0.9652	0.9628	0.9700	0.9778	0.9833	0.9890
HLP (average)												0.9805
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

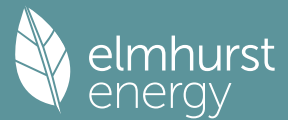
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6989
Hot water usage for mixer showers												(42)
Hot water usage for baths												(42a)
Hot water usage for other uses												(42b)
Average daily hot water use (litres/day)												(42c)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430
Energy conte	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167
Energy content (annual)										Total = Sum(45)m =		1641.6717
Distribution loss (46)m = 0.15 x (45)m												(46)
Water storage loss (or HIU loss):												
Store volume												150.0000
a) If manufacturer declared loss factor is known (kWh/day):												1.3938
Temperature factor from Table 2b												0.5400
Enter (49) or (54) in (55)												0.7527
Total storage loss												(56)
If cylinder contains dedicated solar storage												(57)
Primary loss												(59)
Combi loss												(61)
Total heat required for water heating calculated for each month												(62)
WWHRS												(63a)
PV diverter												(63b)
Solar input												(63c)
FGHRS												(63d)
Output from w/h												(64)
12Total per year (kWh/year)												(64)
Electric shower(s)												(64a)
Heat gains from water heating, kWh/month												(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												(69)

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Pumps, fans	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	31.4947 0.0000	31.4947 0.0000	31.4947 0.0000	31.4947 0.0000	31.4947 3.0000	31.4947 3.0000	31.4947 3.0000	(69) 3.0000 (70)
Losses e.g. evaporation	(negative values) (Table 5)												
Water heating gains	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	(71)
Total internal gains	126.2055	124.2424	120.4603	112.1701	107.0923	101.7847	98.5244	101.2175	104.3751	110.2645	118.2116	125.1455	(72)
	404.5661	412.5887	396.4864	382.5853	364.4776	349.0231	336.6032	337.7605	347.4173	361.9176	382.8947	396.9754	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					1.8400	10.6334	0.6300	0.7000			0.7700			5.9795 (74)
South					5.7300	46.7521	0.6300	0.7000			0.7700			81.8705 (78)
Solar gains	87.8499	145.5098	190.2149	224.2276	243.1727	238.5651	231.1391	217.0032	201.7642	158.2232	104.4208			75.7284 (83)
Total gains	492.4161	558.0984	586.7014	606.8129	607.6502	587.5882	567.7424	554.7637	549.1815	520.1408	487.3155			472.7038 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.2481	52.4128	52.5754	53.3524	53.5004	54.2001	54.2001	54.3316	53.9284	53.5004	53.2019	52.8935
alpha	4.4832	4.4942	4.5050	4.5568	4.5667	4.6133	4.6133	4.6221	4.5952	4.5667	4.5468	4.5262
util living area	0.9603	0.9326	0.8935	0.8131	0.6887	0.5152	0.3737	0.3980	0.5863	0.8134	0.9285	0.9656 (86)
MIT	19.9913	20.2109	20.4471	20.7155	20.8928	20.9780	20.9959	20.9945	20.9594	20.7564	20.3534	19.9578 (87)
Th 2	20.0823	20.0849	20.0875	20.0996	20.1019	20.1124	20.1124	20.1144	20.1084	20.1019	20.0973	20.0925 (88)
util rest of house	0.9521	0.9195	0.8731	0.7795	0.6377	0.4488	0.2995	0.3231	0.5195	0.7739	0.9125	0.9584 (89)
MIT 2	18.9361	19.2084	19.4968	19.8192	20.0109	20.0986	20.1108	20.1120	20.0805	19.8727	19.3977	18.9023 (90)
Living area fraction	19.5008	19.7449	20.0054	20.2989	20.4829	20.5692	20.5845	20.5843	20.5509	20.3457	19.9092	19.4672 (92)
MIT	19.5008	19.7449	20.0054	20.2989	20.4829	20.5692	20.5845	20.5843	20.5509	20.3457	19.9092	19.4672 (92)
Temperature adjustment	19.5008	19.7449	20.0054	20.2989	20.4829	20.5692	20.5845	20.5843	20.5509	20.3457	19.9092	19.4672 (93)
adjusted MIT	19.5008	19.7449	20.0054	20.2989	20.4829	20.5692	20.5845	20.5843	20.5509	20.3457	19.9092	19.4672 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9458	0.9140	0.8711	0.7874	0.6600	0.4834	0.3392	0.3631	0.5533	0.7853	0.9087	0.9524 (94)
Useful gains	465.7462	510.0922	511.0908	477.7954	401.0612	284.0571	192.5535	201.4247	303.8675	408.4714	442.8269	450.1980 (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	765.5546	745.2798	675.9341	562.1954	431.9749	289.7988	193.4436	202.6531	314.7608	479.3301	633.5388	759.5133 (97)
Space heating kWh	223.0574	158.0460	122.6434	60.7680	22.9997	0.0000	0.0000	0.0000	0.0000	52.7189	137.3125	230.1306 (98a)
Space heating requirement - total per year (kWh/year)												1007.6766
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	223.0574	158.0460	122.6434	60.7680	22.9997	0.0000	0.0000	0.0000	0.0000	52.7189	137.3125	230.1306 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1007.6766
Space heating per m ²										(98c) / (4) =		20.0333 (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	223.0574	158.0460	122.6434	60.7680	22.9997	0.0000	0.0000	0.0000	0.0000	52.7189	137.3125	230.1306 (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)	241.6657	171.2308	132.8747	65.8375	24.9185	0.0000	0.0000	0.0000	0.0000	57.1169	148.7676	249.3289 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	192.7889	170.6179	181.7141	161.0180	156.8963	142.2710	141.1326	146.2831	147.3700	163.2413	172.2162	190.8632 (64)
Efficiency of water heater (217)m	84.3877	83.8885	83.1978	82.0793	80.8476	79.8000	79.8000	79.8000	79.8000	81.8244	83.5568	79.8000 (216)
Fuel for water heating, kWh/month	228.4563	203.3865	218.4121	196.1737	194.0642	178.2845	176.8579	183.3121	184.6741	199.5019	206.1067	225.9260 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	16.3863	13.1457	11.8362	8.6717	6.6983	5.4726	6.1104	7.9425	10.3166	13.5359	15.2888	16.8417 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-13.6309	-20.2773	-30.7412	-36.5291	-41.1420	-39.0690	-38.6181	-35.5985	-30.5608	-24.0636	-15.3659	-11.6660 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

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Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.7814	-10.2931	-20.8967	-32.0302	-42.9765	-43.3895	-35.9756	-25.9837	-14.9022	-6.4436	-3.7620	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											1091.7406	(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											2395.1559	(219)
Space cooling fuel											0.0000	(221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year											86.0000	(231)
Electricity for lighting (calculated in Appendix L)											132.2467	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-621.5509	(233)
Wind generation											0.0000	(234)
Hydro-electric generation (Appendix N)											0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)											0.0000	(235)
Appendix Q - special features												
Energy saved or generated											-0.0000	(236)
Energy used											0.0000	(237)
Total delivered energy for all uses											3083.5924	(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	1091.7406	0.2100	229.2655 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2395.1559	0.2100	502.9827 (264)
Space and water heating			732.2483 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	132.2467	0.1443	19.0873 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-337.2625	0.1335	-45.0088
PV Unit electricity exported	-284.2884	0.1253	-35.6267
Total			-80.6355 (269)
Total CO2, kg/year			682.6293 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5700 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1091.7406	1.1300	1233.6669 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2395.1559	1.1300	2706.5262 (278)
Space and water heating			3940.1931 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	132.2467	1.5338	202.8444 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-337.2625	1.4932	-503.5857
PV Unit electricity exported	-284.2884	0.4600	-130.7670
Total			-634.3527 (283)
Total Primary energy kWh/year			3638.7856 (286)
Target Primary Energy Rate (TPER)			72.3400 (287)

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Plot Reference	Plot 22			Issued on Date	22/12/2025
Assessment Reference	Plot 22	Plot Type Ref			
Plot Address	Flat 5, 4 Cross Road Manchester, M21 9SX			SAP Version	10.2
SAP Rating	89 B	DER	3.26	TER	13.57
Environmental	98 A	% DER < TER			75.98
CO ₂ Emissions (t/year)	0.14	DFEE	21.21	TFEE	27.64
Compliance Check	See BREL	% DFEE < TFEE			23.27
% DPER < TPER	52.52	DPER	34.34	TPER	72.34
Assessor Details	Daniel Smith			Assessor ID	CJ06-0001
Client	J Greenwood (Builders) Limited, Steve Brown				

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

1. Overall dwelling characteristics

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

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.8800	(17)
Infiltration rate	0.1440	(18)
Number of sides sheltered	2	(19)

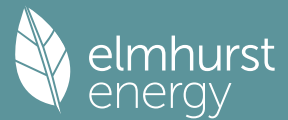
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1224 (21)

	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	0.1561	0.1530	0.1499	0.1346	0.1316	0.1163	0.1163	0.1132	0.1224	0.1316	0.1377	0.1438 (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	0.2961	0.2930	0.2899	0.2746	0.2716	0.2563	0.2563	0.2532	0.2624	0.2716	0.2777	0.2838 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window N/E			1.9400	1.3258	2.4394		(27)
Window S/W			5.7300	1.3258	7.5966		(27)
EXT Wall	29.2700	7.5700	21.7000	0.1800	3.9060	110.0000	2387.0001 (29a)
Flat Roof	14.5300		14.5300	0.1500	2.1795	9.0000	130.7700 (30)
Total net area of external elements Aum(A, m ²)			43.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	16.1215	(33)
Main dwelling							
Party Wall			53.5200	0.0000	0.0000	45.0000	2408.4000 (32)
Corridor			24.6800	0.0000	0.0000	45.0000	1110.6000 (32)
Party Floor			50.3000			40.0000	2012.0000 (32d)
Party Ceiling			35.7700			30.0000	1073.1000 (32b)
Internal Wall			39.0000			9.0000	351.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							9472.8701 (34)
							188.3274 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	10.8700	0.0370	0.4022
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	52.3000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0250	0.0935
E3 Sill	1.2500	0.0220	0.0275
E4 Jamb	7.5400	0.0170	0.1282
E16 Corner (normal)	8.0400	0.0420	0.3377
E18 Party wall between dwellings	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E9 Balcony between dwellings, wall insulation continuous	5.6200	0.1500	0.8430
E15 Flat roof with parapet	10.9700	0.1320	1.4480
E24 Eaves (insulation at ceiling level - inverted)	6.7800	0.1500	1.0170
P4 Party wall - Roof (insulation at ceiling level)	6.0600	0.0400	0.2424
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8665 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	20.9879 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	12.2857	12.1588	12.0318	11.3969	11.2699	10.6350	10.6350	10.5080	10.8889	11.2699	11.5239	11.7778	(38)
Heat transfer coeff	33.2737	33.1467	33.0197	32.3848	32.2578	31.6229	31.6229	31.4959	31.8769	32.2578	32.5118	32.7658	(39)
Average = Sum(39)m / 12 =												32.3531	
HLP	0.6615	0.6590	0.6565	0.6438	0.6413	0.6287	0.6287	0.6262	0.6337	0.6413	0.6464	0.6514	(40)
HLP (average)												0.6432	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6989 (42)
Hot water usage for mixer showers	52.7051	51.9130	50.7588	48.5505	46.9208	45.1034	44.0704	45.2159	46.4715	48.4228	50.6786	52.5031	(42a)
Hot water usage for baths	22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111	(42b)
Hot water usage for other uses	32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288	(42c)
Average daily hot water use (litres/day)												98.8376	(43)
Daily hot water use	107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430	(44)
Energy conte	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167	(45)
Energy content (annual)										Total = Sum(45)m =		1641.6717	
Distribution loss (46)m = 0.15 x (45)m	25.5433	22.4762	23.6150	20.1605	19.1282	16.7871	16.2524	17.1563	17.6285	20.1929	22.1228	25.1875	(46)
Water storage loss (or HIU loss):												201.0000	(47)
Store volume												1.6100	(48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400	(49)
Temperature factor from Table 2b												0.8694	(55)
Enter (49) or (54) in (55)													
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681	(64)
										Total per year (kWh/year) = Sum(64)m =		1959.0027	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	56.6210	49.8223	52.3465	44.6890	42.4008	37.2115	36.0262	38.0299	39.0766	44.7609	49.0389	55.8323	(65)

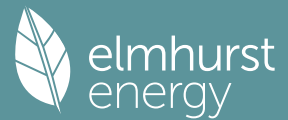
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6802	14.8152	12.0485	9.1215	6.8184	5.7564	6.2200	8.0850	10.8517	13.7787	16.0817	17.1438	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	220.9150	223.2075	217.4307	205.1326	189.6084	175.0179	165.2705	162.9781	168.7549	181.0530	196.5772	211.1677	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	(71)
Water heating gains (Table 5)	76.1034	74.1404	70.3583	62.0681	56.9903	51.6826	48.4223	51.1155	54.2731	60.1624	68.1095	75.0434	(72)
Total internal gains	394.5699	393.0343	380.7087	357.1934	334.2884	313.3282	300.7841	303.0499	314.7509	335.8654	361.6397	384.2261	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.8400	10.6334	0.4000	0.0000	0.7700	6.0262 (74)
South	5.7300	46.7521	0.4000	0.0000	0.7700	82.5099 (78)

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Solar gains	88.5361	146.6463	191.7006	225.9789	245.0720	240.4285	232.9445	218.6981	203.3401	159.4590	105.2364	76.3199 (83)
Total gains	483.1060	539.6806	572.4093	583.1723	579.3604	553.7567	533.7286	521.7480	518.0910	495.3244	466.8762	460.5460 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.0821	79.3851	79.6903	81.2527	81.5725	83.2103	83.2103	83.5458	82.5474	81.5725	80.9353	80.3080
alpha	6.2721	6.2923	6.3127	6.4168	6.4382	6.5474	6.5474	6.5697	6.5032	6.4382	6.3957	6.3539
util living area	0.9150	0.8580	0.7757	0.6538	0.5142	0.3652	0.2607	0.2776	0.4236	0.6585	0.8503	0.9280 (86)
MIT	20.6618	20.7897	20.8963	20.9684	20.9937	20.9995	21.0000	20.9999	20.9986	20.9721	20.8359	20.6327 (87)
Th 2	20.3750	20.3772	20.3795	20.3907	20.3930	20.4043	20.4043	20.4065	20.3997	20.3930	20.3885	20.3840 (88)
util rest of house	0.9023	0.8401	0.7518	0.6247	0.4817	0.3313	0.2254	0.2418	0.3871	0.6245	0.8290	0.9168 (89)
MIT 2	19.9969	20.1492	20.2726	20.3607	20.3877	20.4039	20.4042	20.4065	20.3987	20.3678	20.2160	19.9702 (90)
Living area fraction	20.3527	20.4920	20.6064	20.6859	20.7120	20.7226	20.7231	20.7241	20.7198	20.6912	20.5478	20.3248 (91)
MIT	20.3527	20.4920	20.6064	20.6859	20.7120	20.7226	20.7231	20.7241	20.7198	20.6912	20.5478	20.3248 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3527	20.4920	20.6064	20.6859	20.7120	20.7226	20.7231	20.7241	20.7198	20.6912	20.5478	20.3248 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9018	0.8435	0.7607	0.6389	0.4988	0.3494	0.2443	0.2610	0.4066	0.6414	0.8348	0.9157 (94)
Useful gains	435.6599	455.2235	435.4524	372.6066	288.9899	193.4865	130.3733	136.1764	210.6532	317.6964	389.7472	421.7023 (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	534.1338	516.8227	465.7895	381.6849	290.7090	193.6159	130.3830	136.1912	211.0170	325.5208	437.2106	528.3412 (97)
Space heating kWh	73.2646	41.3947	22.5708	6.5364	1.2790	0.0000	0.0000	0.0000	0.0000	5.8214	34.1736	79.3393 (98a)
Space heating requirement - total per year (kWh/year)												264.3797
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	73.2646	41.3947	22.5708	6.5364	1.2790	0.0000	0.0000	0.0000	0.0000	5.8214	34.1736	79.3393 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												264.3797
Space heating per m2										(98c) / (4) =		5.2561 (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	73.2646	41.3947	22.5708	6.5364	1.2790	0.0000	0.0000	0.0000	0.0000	5.8214	34.1736	79.3393 (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)	73.2646	41.3947	22.5708	6.5364	1.2790	0.0000	0.0000	0.0000	0.0000	5.8214	34.1736	79.3393 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Water heating												
Water heating requirement	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100 (216)
Fuel for water heating, kWh/month	56.4494	49.8511	52.7703	45.9303	44.2095	39.4941	38.7227	40.4473	41.0995	46.2410	49.6744	55.7706 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	9.7723	8.8266	9.7723	9.4571	9.7723	9.4571	9.7723	9.7723	9.4571	9.7723	9.4571	9.7723 (231)
Lighting	14.6001	11.7127	10.5460	7.7264	5.9681	4.8760	5.4443	7.0767	9.1920	12.0604	13.6222	15.0058 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												264.3797 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												349.4100

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Water heating fuel used	560.6602 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500) mechanical ventilation fans (SFP = 0.7500)	115.0612 (230a)
Total electricity for the above, kWh/year	115.0612 (231)
Electricity for lighting (calculated in Appendix L)	117.8308 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1057.9319 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	264.3797	16.4900	43.5962 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	560.6602	16.4900	92.4529 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	115.0612	16.4900	18.9736 (249)
Energy for lighting	117.8308	16.4900	19.4303 (250)
Additional standing charges			0.0000 (251)
Total energy cost			174.4530 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.6590 (257)
SAP value	89.3175
SAP rating (Section 12)	89 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	264.3797	0.1589	42.0064 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	560.6602	0.1411	79.1169 (264)
Space and water heating			121.1233 (265)
Pumps, fans and electric keep-hot	115.0612	0.1387	15.9604 (267)
Energy for lighting	117.8308	0.1443	17.0066 (268)
Total CO2, kg/year			154.0903 (272)
CO2 emissions per m2			3.0600 (273)
EI value			97.8334
EI rating			98 (274)
EI band			A

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

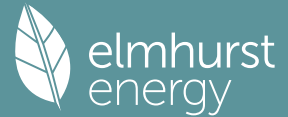
1. Overall dwelling characteristics

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

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes

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

Blower Door
2.8800 (17)
0.1440 (18)
2 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor
(20) = 1 - [0.075 x (19)] = 0.8500 (20)
(21) = (18) x (20) = 0.1224 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.2000	4.2000	3.9000	4.0000	3.4000	3.3000	3.3000	3.4000	3.8000	3.8000	3.9000	(22)
Wind factor	1.0750	1.0500	1.0500	0.9750	1.0000	0.8500	0.8250	0.8250	0.8500	0.9500	0.9500	0.9750	(22a)
Adj infilt rate	0.1316	0.1285	0.1285	0.1193	0.1224	0.1040	0.1010	0.1010	0.1040	0.1163	0.1163	0.1193	(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	0.2716	0.2685	0.2685	0.2593	0.2624	0.2440	0.2410	0.2410	0.2440	0.2563	0.2563	0.2593	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window N/E			1.8400	1.3258	2.4394			(27)
Window S/W			5.7300	1.3258	7.5966			(27)
EXT Wall	29.2700	7.5700	21.7000	0.1800	3.9060	110.0000	2387.0001	(29a)
Flat Roof	14.5300		14.5300	0.1500	2.1795	9.0000	130.7700	(30)
Total net area of external elements Aum(A, m2)			43.8000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 16.1215			(33)
Main dwelling								
Party Wall			53.5200	0.0000	0.0000	45.0000	2408.4000	(32)
Corridor			24.6800	0.0000	0.0000	45.0000	1110.6000	(32)
Party Floor			50.3000			40.0000	2012.0000	(32d)
Party Ceiling			35.7700			30.0000	1073.1000	(32b)
Internal Wall			39.0000			9.0000	351.0000	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 9472.8701 (34)
188.3274 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	10.8700	0.0370	0.4022
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	52.3000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0250	0.0935
E3 Sill	1.2500	0.0220	0.0275
E4 Jamb	7.5400	0.0170	0.1282
E16 Corner (normal)	8.0400	0.0420	0.3377
E18 Party wall between dwellings	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E9 Balcony between dwellings, wall insulation continuous	5.6200	0.1500	0.8430
E15 Flat roof with parapet	10.9700	0.1320	1.4480
E24 Eaves (insulation at ceiling level - inverted)	6.7800	0.1500	1.0170
P4 Party wall - Roof (insulation at ceiling level)	6.0600	0.0400	0.2424
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8665 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 20.9879 (37)

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

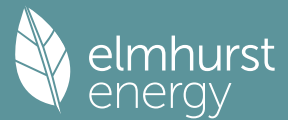
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	11.2699	11.1429	11.1429	10.7620	10.8889	10.1270	10.0001	10.0001	10.1270	10.6350	10.6350	10.7620	(38)
Heat transfer coeff	32.2578	32.1308	32.1308	31.7499	31.8769	31.1150	30.9880	30.9880	31.1150	31.6229	31.6229	31.7499	(39)
Average = Sum(39)m / 12 =													31.6123

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6413	0.6388	0.6388	0.6312	0.6337	0.6186	0.6161	0.6161	0.6186	0.6287	0.6287	0.6312	(40)
HLP (average)													0.6285
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6989 (42)	
Hot water usage for mixer showers													
52.7051	51.9130	50.7588	48.5505	46.9208	45.1034	44.0704	45.2159	46.4715	48.4228	50.6786	52.5031	(42a)	
Hot water usage for baths													
22.7881	22.4497	21.9731	21.0944	20.4364	19.7068	19.3127	19.7859	20.3012	21.0819	21.9788	22.7111	(42b)	
Hot water usage for other uses													
32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288	(42c)	
Average daily hot water use (litres/day)												98.8376 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430	(44)	
Energy content (annual)	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =	1641.6717		
25.5433	22.4762	23.6150	20.1605	19.1282	16.7871	16.2524	17.1563	17.6285	20.1929	22.1228	25.1875	(46)	
Water storage loss (or HIU loss):													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b													
Enter (49) or (54) in (55)												0.5400	(49)
												0.8694	(55)
Total storage loss													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)	
If cylinder contains dedicated solar storage													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)

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FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (64)
	Total per year (kWh/year) = Sum(64)m =											1959.0027 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	56.6210	49.8223	52.3465	44.6890	42.4008	37.2115	36.0262	38.0299	39.0766	44.7609	49.0389	55.8323 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6802	14.8152	12.0485	9.1215	6.8184	5.7564	6.2200	8.0850	10.8517	13.7787	16.0817	17.1438 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	220.9150	223.2075	217.4307	205.1326	189.6084	175.0179	165.2705	162.9781	168.7549	181.0530	196.5772	211.1677 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)	76.1034	74.1404	70.3583	62.0681	56.9903	51.6826	48.4223	51.1155	54.2731	60.1624	68.1095	75.0434 (72)
Total internal gains	394.5699	393.0343	380.7087	357.1934	334.2884	313.3282	300.7841	303.0499	314.7509	335.8654	361.6397	384.2261 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North				1.8400	9.3942	0.4000	0.0000			0.7700			5.3239 (74)
South				5.7300	41.2355	0.4000	0.0000			0.7700			72.7741 (78)
Solar gains	78.0980	132.6870	181.2315	217.9821	230.6766	231.7245	219.0857	202.9931	197.5428	151.7809	95.3961	68.8570 (83)	
Total gains	472.6679	525.7213	561.9402	575.1755	564.9650	545.0527	519.8699	506.0430	512.2937	487.6463	457.0358	453.0832 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	81.5725	81.8949	81.8949	82.8775	82.5474	84.5687	84.9152	84.9152	84.5687	83.2103	83.2103	82.8775
alpha	6.4382	6.4597	6.4597	6.5252	6.5032	6.6379	6.6610	6.6610	6.6379	6.5474	6.5474	6.5252
util living area	0.8959	0.8320	0.7374	0.6028	0.4555	0.3025	0.2205	0.2388	0.3822	0.6175	0.8213	0.9112 (86)
MIT	20.7420	20.8474	20.9323	20.9828	20.9974	20.9999	21.0000	21.0000	20.9994	20.9831	20.8832	20.7146 (87)
Th 2	20.3930	20.3952	20.3952	20.4020	20.3997	20.4133	20.4156	20.4156	20.4133	20.4043	20.4043	20.4043 (88)
util rest of house	0.8807	0.8118	0.7116	0.5727	0.4222	0.2690	0.1857	0.2030	0.3468	0.5826	0.7972	0.8978 (89)
MIT 2	20.1096	20.2331	20.3273	20.3864	20.3978	20.4132	20.4156	20.4156	20.4129	20.3896	20.2846	20.0855 (90)
Living area fraction									FLA = Living area / (4) =			0.5352 (91)
MIT	20.4481	20.5619	20.6511	20.7056	20.7187	20.7272	20.7283	20.7283	20.7268	20.7072	20.6050	20.4222 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4481	20.5619	20.6511	20.7056	20.7187	20.7272	20.7283	20.7283	20.7268	20.7072	20.6050	20.4222 (93)

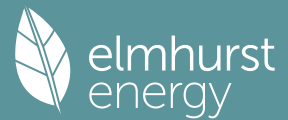
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8822	0.8175	0.7227	0.5880	0.4399	0.2869	0.2043	0.2222	0.3658	0.6005	0.8056	0.8983 (94)
Ext temp.	416.9670	429.7890	406.1059	338.2238	248.5536	156.3931	106.2352	112.4309	187.3724	292.8091	368.1751	406.9905 (95)
Heat loss rate W	5.2000	5.8000	7.4000	9.9000	12.9000	15.7000	17.3000	17.1000	14.7000	11.3000	7.9000	5.0000 (96)
Space heating kWh	491.8694	474.3111	425.7691	343.0760	249.2352	156.4212	106.2374	112.4348	187.5231	297.4831	401.7680	489.6526 (97)
Space heating requirement - total per year (kWh/year)	55.7274	29.9189	14.6295	3.4936	0.5071	0.0000	0.0000	0.0000	0.0000	3.4774	24.1869	61.5006 (98a)
Solar heating kWh												193.4414
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh	55.7274	29.9189	14.6295	3.4936	0.5071	0.0000	0.0000	0.0000	0.0000	3.4774	24.1869	61.5006 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												193.4414
Space heating per m2										(98c) / (4) =		3.8458 (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
	55.7274	29.9189	14.6295	3.4936	0.5071	0.0000	0.0000	0.0000	0.0000	3.4774	24.1869	61.5006 (98)

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Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	55.7274	29.9189	14.6295	3.4936	0.5071	0.0000	0.0000	0.0000	0.0000	3.4774	24.1869	61.5006	(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	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681	(64)
Efficiency of water heater (217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)
Fuel for water heating, kWh/month	56.4494	49.8511	52.7703	45.9303	44.2095	39.4941	38.7227	40.4473	41.0995	46.2410	49.6744	55.7706	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	9.7723	8.8266	9.7723	9.4571	9.7723	9.4571	9.7723	9.7723	9.4571	9.7723	9.4571	9.7723	(231)
Lighting	14.6001	11.7127	10.5460	7.7264	5.9681	4.8760	5.4443	7.0767	9.1920	12.0604	13.6222	15.0058	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												193.4414	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												349.4100	
Water heating fuel used												560.6602	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)												115.0612	(230a)
Total electricity for the above, kWh/year												115.0612	(231)
Electricity for lighting (calculated in Appendix L)												117.8308	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												986.9936	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	193.4414	28.4300	54.9954	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	560.6602	28.4300	159.3957	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	115.0612	28.4300	32.7119	(249)
Energy for lighting	117.8308	28.4300	33.4993	(250)
Additional standing charges			0.0000	(251)
Total energy cost			280.6023	(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	193.4414	0.1594	30.8252	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	560.6602	0.1411	79.1169	(264)
Space and water heating			109.9421	(265)
Pumps, fans and electric keep-hot	115.0612	0.1387	15.9604	(267)
Energy for lighting	117.8308	0.1443	17.0066	(268)
Total CO2, kg/year			142.9091	(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	193.4414	1.5898	307.5346	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	560.6602	1.5218	853.2118	(278)
Space and water heating			1160.7464	(279)
Pumps, fans and electric keep-hot	115.0612	1.5128	174.0647	(281)
Energy for lighting	117.8308	1.5338	180.7328	(282)
Total Primary energy kWh/year			1515.5439	(286)

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SAP 10 EPC IMPROVEMENTS

Plot 22

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

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

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

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

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

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

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

	Current £281	Potential £281	Saving £0
Electricity			
Space heating	£88	£88	£0
Water heating	£159	£159	£0
Lighting	£33	£33	£0
Total cost of fuels	£281	£281	£0
Total cost of uses	£280	£280	£0
Delivered energy	20 kWh/m²	20 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	30 kWh/m²	30 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

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

2. Ventilation rate

	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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 2.8800 (17)

Infiltration rate 0.1440 (18)

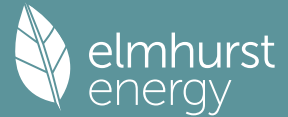
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1224 (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	0.1561	0.1530	0.1499	0.1346	0.1316	0.1163	0.1163	0.1132	0.1224	0.1316	0.1377	0.1438 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)

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

Effective ac 0.2961 0.2930 0.2899 0.2746 0.2716 0.2563 0.2563 0.2532 0.2624 0.2716 0.2777 0.2838 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window N/E			1.8400	1.3258	2.4394			(27)
Window S/W			5.7300	1.3258	7.5966			(27)
EXT Wall	29.2700	7.5700	21.7000	0.1800	3.9060	110.0000	2387.0001	(29a)
Flat Roof	14.5300		14.5300	0.1500	2.1795	9.0000	130.7700	(30)
Total net area of external elements Aum(A, m2)			43.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.1215			(33)
Main dwelling								
Party Wall			53.5200	0.0000	0.0000	45.0000	2408.4000	(32)
Corridor			24.6800	0.0000	0.0000	45.0000	1110.6000	(32)
Party Floor			50.3000			40.0000	2012.0000	(32d)
Party Ceiling			35.7700			30.0000	1073.1000	(32b)
Internal Wall			39.0000			9.0000	351.0000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 9472.8701 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 188.3274 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	10.8700	0.0370	0.4022
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	52.3000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	3.7400	0.0250	0.0935
E3 Sill	1.2500	0.0220	0.0275
E4 Jamb	7.5400	0.0170	0.1282
E16 Corner (normal)	8.0400	0.0420	0.3377
E18 Party wall between dwellings	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E9 Balcony between dwellings, wall insulation continuous	5.6200	0.1500	0.8430
E15 Flat roof with parapet	10.9700	0.1320	1.4480
E24 Eaves (insulation at ceiling level - inverted)	6.7800	0.1500	1.0170
P4 Party wall - Roof (insulation at ceiling level)	6.0600	0.0400	0.2424

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.8665 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 20.9879 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	12.2857	12.1588	12.0318	11.3969	11.2699	10.6350	10.6350	10.5080	10.8889	11.2699	11.5239	11.7778
Heat transfer coeff	33.2737	33.1467	33.0197	32.3848	32.2578	31.6229	31.6229	31.4959	31.8769	32.2578	32.5118	32.7658
Average = Sum(39)m / 12 =												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6615	0.6590	0.6565	0.6438	0.6413	0.6287	0.6287	0.6262	0.6337	0.6413	0.6464	0.6514
HLP (average)												0.6432
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6989 (42)

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

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

Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1641.6717

Water storage loss (or HIU loss): 25.5433 22.4762 23.6150 20.1605 19.1282 16.7871 16.2524 17.1563 17.6285 20.1929 22.1228 25.1875 (46)

Store volume 201.0000 (47)

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

Temperature factor from Table 2b 0.5400 (49)

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

Total storage loss 26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)

If cylinder contains dedicated solar storage 26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (57)

Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)

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

Total heat required for water heating calculated for each month 197.2400 174.1848 184.3846 160.4850 154.4725 137.9963 135.3009 141.3271 143.6056 161.5705 173.5673 194.8681 (62)

WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)

PV diverter 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63b)

Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)

FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)

Output from w/h 197.2400 174.1848 184.3846 160.4850 154.4725 137.9963 135.3009 141.3271 143.6056 161.5705 173.5673 194.8681 (64)

Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

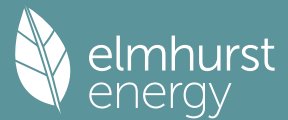
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 56.6210 49.8223 52.3465 44.6890 42.4008 37.2115 36.0262 38.0299 39.0766 44.7609 49.0389 55.8323 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
----------------------------------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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(66)m	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6802	14.8152	12.0485	9.1215	6.8184	5.7564	6.2200	8.0850	10.8517	13.7787	16.0817	17.1438	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	220.9150	223.2075	217.4307	205.1326	189.6084	175.0179	165.2705	162.9781	168.7549	181.0530	196.5772	211.1677	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	(71)
Water heating gains (Table 5)	76.1034	74.1404	70.3583	62.0681	56.9903	51.6826	48.4223	51.1155	54.2731	60.1624	68.1095	75.0434	(72)
Total internal gains	394.5699	393.0343	380.7087	357.1934	334.2884	313.3282	300.7841	303.0499	314.7509	335.8654	361.6397	384.2261	(73)

6. Solar gains

[Jan]													
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W	
North					1.8400	10.6334	0.4000		0.0000		0.7700	6.0262 (74)	
South					5.7300	46.7521	0.4000		0.0000		0.7700	82.5099 (78)	
Solar gains	88.5361	146.6463	191.7006	225.9789	245.0720	240.4285	232.9445	218.6981	203.3401	159.4590	105.2364	76.3199 (83)	
Total gains	483.1060	539.6806	572.4093	583.1723	579.3604	553.7567	533.7286	521.7480	518.0910	495.3244	466.8762	460.5460 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	79.0821	79.3851	79.6903	81.2527	81.5725	83.2103	83.2103	83.5458	82.5474	81.5725	80.9353	80.3080		
alpha	6.2721	6.2923	6.3127	6.4168	6.4382	6.5474	6.5474	6.5697	6.5032	6.4382	6.3957	6.3539		
util living area	0.9150	0.8580	0.7757	0.6538	0.5142	0.3652	0.2607	0.2776	0.4236	0.6585	0.8503	0.9280	(86)	
MIT	20.6618	20.7897	20.8963	20.9684	20.9937	20.9995	21.0000	20.9999	20.9986	20.9721	20.8359	20.6327	(87)	
Th 2	20.3750	20.3772	20.3795	20.3907	20.3930	20.4043	20.4043	20.4065	20.3997	20.3930	20.3885	20.3840	(88)	
util rest of house	0.9023	0.8401	0.7518	0.6247	0.4817	0.3313	0.2254	0.2418	0.3871	0.6245	0.8290	0.9168	(89)	
MIT 2	19.9969	20.1492	20.2726	20.3607	20.3877	20.4039	20.4042	20.4065	20.3987	20.3678	20.2160	19.9702	(90)	
Living area fraction									fLA = Living area / (4) =			0.5352	(91)	
MIT	20.3527	20.4920	20.6064	20.6859	20.7120	20.7226	20.7231	20.7241	20.7198	20.6912	20.5478	20.3248	(92)	
Temperature adjustment												0.0000		
adjusted MIT	20.3527	20.4920	20.6064	20.6859	20.7120	20.7226	20.7231	20.7241	20.7198	20.6912	20.5478	20.3248	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	435.6599	455.2235	435.4524	372.6066	288.9899	193.4865	130.3733	136.1764	210.6532	317.6964	389.7472	421.7023	(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	534.1338	516.8227	465.7895	381.6849	290.7090	193.6159	130.3830	136.1912	211.0170	325.5208	437.2106	528.3412	(97)	
Space heating kWh	73.2646	41.3947	22.5708	6.5364	1.2790	0.0000	0.0000	0.0000	0.0000	5.8214	34.1736	79.3393	(98a)	
Space heating requirement - total per year (kWh/year)												264.3797		
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	73.2646	41.3947	22.5708	6.5364	1.2790	0.0000	0.0000	0.0000	0.0000	5.8214	34.1736	79.3393	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												264.3797		
Space heating per m2										(98c) / (4) =		5.2561	(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)	73.2646	41.3947	22.5708	6.5364	1.2790	0.0000	0.0000	0.0000	0.0000	5.8214	34.1736	79.3393	(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)	73.2646	41.3947	22.5708	6.5364	1.2790	0.0000	0.0000	0.0000	0.0000	5.8214	34.1736	79.3393	(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	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681	(64)	
Efficiency of water heater	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(216)	
(217)m													(217)	

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Fuel for water heating, kWh/month	56.4494	49.8511	52.7703	45.9303	44.2095	39.4941	38.7227	40.4473	41.0995	46.2410	49.6744	55.7706 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	9.7723	8.8266	9.7723	9.4571	9.7723	9.4571	9.7723	9.7723	9.4571	9.7723	9.4571	9.7723 (231)
Lighting	14.6001	11.7127	10.5460	7.7264	5.9681	4.8760	5.4443	7.0767	9.1920	12.0604	13.6222	15.0058 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												264.3797 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												349.4100
Water heating fuel used												560.6602 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												115.0612 (230a)
Total electricity for the above, kWh/year												115.0612 (231)
Electricity for lighting (calculated in Appendix L)												117.8308 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												1057.9319 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	264.3797	16.4900	43.5962 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	560.6602	16.4900	92.4529 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	115.0612	16.4900	18.9736 (249)
Energy for lighting	117.8308	16.4900	19.4303 (250)
Additional standing charges			0.0000 (251)
Total energy cost			174.4530 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.6590 (257)
SAP value		89.3175
SAP rating (Section 12)		89 (258)
SAP band		B

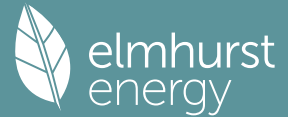
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	264.3797	0.1589	42.0064 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	560.6602	0.1411	79.1169 (264)
Space and water heating			121.1233 (265)
Pumps, fans and electric keep-hot	115.0612	0.1387	15.9604 (267)
Energy for lighting	117.8308	0.1443	17.0066 (268)
Total CO2, kg/year			154.0903 (272)
CO2 emissions per m2			3.0600 (273)
EI value			97.8334
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

Full SAP Calculation Printout



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

2. Ventilation rate

													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													Air changes per hour
Pressure test													0.0000 / (5) = 0.0000 (8)
Pressure Test Method													Yes
Measured/design AP50													Blower Door
Infiltration rate													2.8800 (17)
Number of sides sheltered													0.1440 (18)
													2 (19)
Shelter factor													(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) = 0.1224 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	4.3000	4.2000	4.2000	3.9000	4.0000	3.4000	3.3000	3.3000	3.4000	3.8000	3.8000	3.9000	(22)
Wind factor	1.0750	1.0500	1.0500	0.9750	1.0000	0.8500	0.8250	0.8250	0.8500	0.9500	0.9500	0.9750	(22a)
Adj infilt rate	0.1316	0.1285	0.1285	0.1193	0.1224	0.1040	0.1010	0.1010	0.1040	0.1163	0.1163	0.1193	(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	0.2716	0.2685	0.2685	0.2593	0.2624	0.2440	0.2410	0.2410	0.2440	0.2563	0.2563	0.2593	(25)

3. Heat losses and heat loss parameter

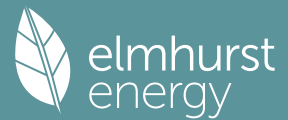
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Main dwelling								
Window N/E			1.8400	1.3258	2.4394			(27)
Window S/W			5.7300	1.3258	7.5966			(27)
EXT Wall	29.2700	7.5700	21.7000	0.1800	3.9060	110.0000	2387.0001	(29a)
Flat Roof	14.5300		14.5300	0.1500	2.1795	9.0000	130.7700	(30)
Total net area of external elements Aum(A, m ²)			43.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.1215			(33)
Main dwelling								
Party Wall			53.5200	0.0000	0.0000	45.0000	2408.4000	(32)
Corridor			24.6800	0.0000	0.0000	45.0000	1110.6000	(32)
Party Floor			50.3000			40.0000	2012.0000	(32d)
Party Ceiling			35.7700			30.0000	1073.1000	(32b)
Internal Wall			39.0000			9.0000	351.0000	(32c)
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) = 9472.8701 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K								188.3274 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E7 Party floor between dwellings (in blocks of flats)				10.8700	0.0370	0.4022		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				52.3000	0.0000	0.0000		
E2 Other lintels (including other steel lintels)				3.7400	0.0250	0.0935		
E3 Sill				1.2500	0.0220	0.0275		
E4 Jamb				7.5400	0.0170	0.1282		
E16 Corner (normal)				8.0400	0.0420	0.3377		
E18 Party wall between dwellings				2.6800	0.0320	0.0858		
E25 Staggered party wall between dwellings				8.0400	0.0300	0.2412		
E9 Balcony between dwellings, wall insulation continuous				5.6200	0.1500	0.8430		
E15 Flat roof with parapet				10.9700	0.1320	1.4480		
E24 Eaves (insulation at ceiling level - inverted)				6.7800	0.1500	1.0170		
P4 Party wall - Roof (insulation at ceiling level)				6.0600	0.0400	0.2424		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.8665	(36)
Point Thermal Bridges							0.0000	
Total fabric heat loss							(33) + (36) + (36a) = 20.9879	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	11.2699	11.1429	11.1429	10.7620	10.8889	10.1270	10.0001	10.0001	10.1270	10.6350	10.6350	10.7620	(38)
Average = Sum(39)m / 12 =	32.2578	32.1308	32.1308	31.7499	31.8769	31.1150	30.9880	30.9880	31.1150	31.6229	31.6229	31.7499	(39)
													31.6123
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.6413	0.6388	0.6388	0.6312	0.6337	0.6186	0.6161	0.6161	0.6186	0.6287	0.6287	0.6312	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

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

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Hot water usage for other uses	32.0288	30.8641	29.6994	28.5348	27.3701	26.2054	26.2054	27.3701	28.5348	29.6994	30.8641	32.0288 (42c)
Average daily hot water use (litres/day)												98.8376 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	107.5220	105.2268	102.4314	98.1796	94.7273	91.0156	89.5885	92.3719	95.3074	99.2042	103.5214	107.2430 (44)
Energy content (annual)	170.2886	149.8416	157.4332	134.4030	127.5211	111.9143	108.3495	114.3757	117.5236	134.6191	147.4853	167.9167 (45)
Distribution loss (46)m = 0.15 x (45)m	25.5433	22.4762	23.6150	20.1605	19.1282	16.7871	16.2524	17.1563	17.6285	20.1929	22.1228	25.1875 (46)
Water storage loss (or HIU loss):												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	56.6210	49.8223	52.3465	44.6890	42.4008	37.2115	36.0262	38.0299	39.0766	44.7609	49.0389	55.8323 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6802	14.8152	12.0485	9.1215	6.8184	5.7564	6.2200	8.0850	10.8517	13.7787	16.0817	17.1438 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	220.9150	223.2075	217.4307	205.1326	189.6084	175.0179	165.2705	162.9781	168.7549	181.0530	196.5772	211.1677 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)	76.1034	74.1404	70.3583	62.0681	56.9903	51.6826	48.4223	51.1155	54.2731	60.1624	68.1095	75.0434 (72)
Total internal gains	394.5699	393.0343	380.7087	357.1934	334.2884	313.3282	300.7841	303.0499	314.7509	335.8654	361.6397	384.2261 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
North					1.8400	9.3942		0.4000	0.0000	0.7700		5.3239 (74)
South					5.7300	41.2355		0.4000	0.0000	0.7700		72.7741 (78)
Solar gains	78.0980	132.6870	181.2315	217.9821	230.6766	231.7245	219.0857	202.9931	197.5428	151.7809	95.3961	68.8570 (83)
Total gains	472.6679	525.7213	561.9402	575.1755	564.9650	545.0527	519.8699	506.0430	512.2937	487.6463	457.0358	453.0832 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	81.5725	81.8949	81.8949	82.8775	82.5474	84.5687	84.9152	84.9152	84.5687	83.2103	83.2103	82.8775
alpha	6.4382	6.4597	6.4597	6.5252	6.5032	6.6379	6.6610	6.6610	6.6379	6.5474	6.5474	6.5252
util living area	0.8959	0.8320	0.7374	0.6028	0.4555	0.3025	0.2205	0.2388	0.3822	0.6175	0.8213	0.9112 (86)
MIT	20.7420	20.8474	20.9323	20.9828	20.9974	20.9999	21.0000	21.0000	20.9994	20.9831	20.8832	20.7146 (87)
Th 2	20.3930	20.3952	20.3952	20.4020	20.3997	20.4133	20.4156	20.4156	20.4133	20.4043	20.4043	20.4020 (88)
util rest of house	0.8807	0.8118	0.7116	0.5727	0.4222	0.2690	0.1857	0.2030	0.3468	0.5826	0.7972	0.8978 (89)
MIT 2	20.1096	20.2331	20.3273	20.3864	20.3978	20.4132	20.4156	20.4156	20.4129	20.3896	20.2846	20.0855 (90)
Living area fraction	20.4481	20.5619	20.6511	20.7056	20.7187	20.7272	20.7283	20.7283	20.7268	20.7072	20.6050	20.4222 (91)
MIT	20.4481	20.5619	20.6511	20.7056	20.7187	20.7272	20.7283	20.7283	20.7268	20.7072	20.6050	20.4222 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4481	20.5619	20.6511	20.7056	20.7187	20.7272	20.7283	20.7283	20.7268	20.7072	20.6050	20.4222 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8822	0.8175	0.7227	0.5880	0.4399	0.2869	0.2043	0.2222	0.3658	0.6005	0.8056	0.8983 (94)
Ext temp.	416.9670	429.7890	406.1059	338.2238	248.5536	156.3931	106.2352	112.4309	187.3724	292.8091	368.1751	406.9905 (95)
Heat loss rate W	5.2000	5.8000	7.4000	9.9000	12.9000	15.7000	17.3000	17.1000	14.7000	11.3000	7.9000	5.0000 (96)
Space heating kWh	491.8694	474.3111	425.7691	343.0760	249.2352	156.4212	106.2374	112.4348	187.5231	297.4831	401.7680	489.6526 (97)

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Space heating requirement - total per year (kWh/year)	55.7274	29.9189	14.6295	3.4936	0.5071	0.0000	0.0000	0.0000	0.0000	3.4774	24.1869	61.5006 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	193.4414 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98c)
Space heating kWh	55.7274	29.9189	14.6295	3.4936	0.5071	0.0000	0.0000	0.0000	0.0000	3.4774	24.1869	61.5006 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												193.4414 (98c) / (4) =
Space heating per m2												3.8458 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	55.7274	29.9189	14.6295	3.4936	0.5071	0.0000	0.0000	0.0000	0.0000	3.4774	24.1869	61.5006 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	55.7274	29.9189	14.6295	3.4936	0.5071	0.0000	0.0000	0.0000	0.0000	3.4774	24.1869	61.5006 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	197.2400	174.1848	184.3846	160.4850	154.4725	137.9963	135.3009	141.3271	143.6056	161.5705	173.5673	194.8681 (64)
Efficiency of water heater												349.4100 (216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100 (217)
Fuel for water heating, kWh/month	56.4494	49.8511	52.7703	45.9303	44.2095	39.4941	38.7227	40.4473	41.0995	46.2410	49.6744	55.7706 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	9.7723	8.8266	9.7723	9.4571	9.7723	9.4571	9.7723	9.4571	9.7723	9.4571	9.7723	9.7723 (231)
Lighting	14.6001	11.7127	10.5460	7.7264	5.9681	4.8760	5.4443	7.0767	9.1920	12.0604	13.6222	15.0058 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												193.4414 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												349.4100
Water heating fuel used												560.6602 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												115.0612 (230a)
Total electricity for the above, kWh/year												115.0612 (231)
Electricity for lighting (calculated in Appendix L)												117.8308 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												986.9936 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	193.4414	28.4300	54.9954 (240)
Space heating - main system 2	0.0000	28.4300	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	560.6602	28.4300	159.3957 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	115.0612	28.4300	32.7119 (249)
Energy for lighting	117.8308	28.4300	33.4993 (250)
Additional standing charges			0.0000 (251)
Total energy cost			280.6023 (255)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	193.4414	0.1594	30.8252 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	560.6602	0.1411	79.1169 (264)
Space and water heating			109.9421 (265)
Pumps, fans and electric keep-hot	115.0612	0.1387	15.9604 (267)
Energy for lighting	117.8308	0.1443	17.0066 (268)
Total CO2, kg/year			142.9091 (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	193.4414	1.5898	307.5346 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	560.6602	1.5218	853.2118 (278)
Space and water heating			1160.7464 (279)
Pumps, fans and electric keep-hot	115.0612	1.5128	174.0647 (281)
Energy for lighting	117.8308	1.5338	180.7328 (282)
Total Primary energy kWh/year			1515.5439 (286)