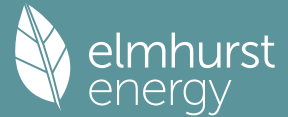


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Plot Reference	Plot 23			Issued on Date	22/12/2025
Assessment Reference	Plot 23	Plot Type Ref			
Plot Address	Flat 6, 2 Cross Road Manchester, M21 9SU			SAP Version	10.2
SAP Rating	88 B	DER	3.05	TER	11.19
Environmental	98 A	% DER < TER			72.74
CO ₂ Emissions (t/year)	0.19	DFEE	21.46	TFEE	25.86
Compliance Check	See BREL	% DFEE < TFEE			17.03
% DPER < TPER	45.87	DPER	32.04	TPER	59.20
Assessor Details	Daniel Smith			Assessor ID	CJ06-0001
Client	J Greenwood (Builders) Limited, Steve Brown				

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

1. Overall dwelling characteristics

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

2. Ventilation rate

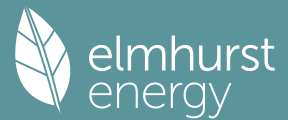
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.9800 (17)
Infiltration rate	0.1490 (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) = 0.1266 (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	0.1615	0.1583	0.1551	0.1393	0.1361	0.1203	0.1203	0.1172	0.1266	0.1361	0.1425	0.1488 (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	0.3015	0.2983	0.2951	0.2793	0.2761	0.2603	0.2603	0.2572	0.2666	0.2761	0.2825	0.2888 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window N/E			3.6800	1.3258	4.8788		(27)
Window S/W			7.5200	1.3258	9.9697		(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999 (29a)
Flat Roof	26.4200		26.4200	0.1500	3.9630	9.0000	237.7800 (30)
Total net area of external elements Aum(A, m ²)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.8345		(33)
Main dwelling							
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000 (32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000 (32)
Party Floor			73.4100			40.0000	2936.4000 (32d)
Party Ceiling			46.9900			30.0000	1409.7000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11569.1999 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.5970 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.0100	0.0370	0.2964
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	55.4100	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.7700	0.0250	0.1442
E3 Sill	2.5000	0.0220	0.0550
E4 Jamb	10.4800	0.0170	0.1782
E16 Corner (normal)	2.6800	0.0420	0.1126
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E15 Flat roof with parapet	12.9900	0.1320	1.7147
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.1500	0.9390
E24 Eaves (insulation at ceiling level - inverted)	8.8400	0.1500	1.3260
P4 Party wall - Roof (insulation at ceiling level)	3.5700	0.0400	0.1428
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.2411 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	28.0756 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.2585	18.0668	17.8750	16.9162	16.7245	15.7657	15.7657	15.5739	16.1492	16.7245	17.1080	17.4915	(38)
Heat transfer coeff	46.3342	46.1424	45.9506	44.9918	44.8001	43.8413	43.8413	43.6495	44.2248	44.8001	45.1836	45.5671	(39)
Average = Sum(39)m / 12 =												44.9439	
HLP	0.6312	0.6286	0.6259	0.6129	0.6103	0.5972	0.5972	0.5946	0.6024	0.6103	0.6155	0.6207	(40)
HLP (average)												0.6122	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766	(42a)
Hot water usage for baths	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171	(42b)
Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504	(42c)
Average daily hot water use (litres/day)												118.5607	(43)
Daily hot water use	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441	(44)
Energy conte	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255	(45)
Energy content (annual)										Total = Sum(45)m =		1969.2679	
Distribution loss (46)m = 0.15 x (45)m	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138	(46)
Water storage loss (or HIU loss):												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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2286.5989	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	67.9200	59.7644	62.7920	53.6065	50.8615	44.6367	43.2151	45.6188	46.8746	53.6932	58.8248	66.9740	(65)

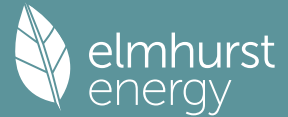
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9816	120.6582	108.9816	112.6143	108.9816	112.6143	108.9816	108.9816	112.6143	108.9816	112.6143	108.9816	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.1215	207.2500	201.8862	190.4673	176.0530	162.5056	153.4551	151.3266	156.6904	168.1093	182.5236	196.0710	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	(71)
Water heating gains (Table 5)	91.2903	88.9350	84.3979	74.4534	68.3623	61.9954	58.0848	61.3156	65.1036	72.1683	81.7012	90.0188	(72)
Total internal gains	463.2831	474.7330	453.1555	435.4248	411.2867	395.0051	378.4113	379.5136	392.2980	407.1489	434.7288	452.9612	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	3.6800	10.6334	0.4000	0.0000	0.7700	12.0523 (74)

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South	7.5200		46.7521		0.4000		0.0000		0.7700		108.2853 (78)	
Solar gains	120.3376	200.3759	265.0420	318.1862	350.7456	346.7050	334.8143	310.1047	283.0399	218.6987	143.2230	103.6158 (83)
Total gains	583.6207	675.1090	718.1974	753.6110	762.0322	741.7101	713.2256	689.6183	675.3380	625.8476	577.9519	556.5770 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.3585	69.6467	69.9374	71.4278	71.7335	73.3023	73.3023	73.6243	72.6666	71.7335	71.1246	70.5260
alpha	5.6239	5.6431	5.6625	5.7619	5.7822	5.8868	5.8868	5.9083	5.8444	5.7822	5.7416	5.7017
util living area												
	0.9405	0.8870	0.8163	0.6878	0.5391	0.3775	0.2704	0.2910	0.4495	0.7045	0.8846	0.9497 (86)
MIT	20.4646	20.6566	20.8091	20.9375	20.9860	20.9986	20.9998	20.9998	20.9961	20.9401	20.7207	20.4341 (87)
Th 2	20.4020	20.4044	20.4067	20.4184	20.4208	20.4325	20.4325	20.4349	20.4278	20.4208	20.4161	20.4114 (88)
util rest of house												
	0.9319	0.8730	0.7961	0.6607	0.5074	0.3443	0.2355	0.2553	0.4130	0.6730	0.8682	0.9423 (89)
MIT 2	19.7843	20.0189	20.2010	20.3560	20.4083	20.4315	20.4324	20.4347	20.4249	20.3631	20.1095	19.7547 (90)
Living area fraction												
	0.9319	0.8730	0.7961	0.6607	0.5074	0.3443	0.2355	0.2553	0.4130	0.6730	0.8682	0.9423 (89)
MIT	20.0513	20.2693	20.4397	20.5843	20.6351	20.6542	20.6552	20.6566	20.6491	20.5896	20.3495	20.0214 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0513	20.2693	20.4397	20.5843	20.6351	20.6542	20.6552	20.6566	20.6491	20.5896	20.3495	20.0214 (93)

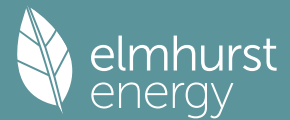
8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9262	0.8696	0.7973	0.6685	0.5192	0.3573	0.2492	0.2693	0.4271	0.6824	0.8662	0.9367 (94)
Useful gains	540.5744	587.0468	572.6234	503.8226	395.6416	265.0201	177.7474	185.7384	288.4564	427.0937	500.6406	521.3335 (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												
	729.8251	709.1748	640.5390	525.6972	400.2939	265.4225	177.7849	185.7969	289.6343	447.5372	598.6583	720.9380 (97)
Space heating kWh												
	140.8025	82.0700	50.5292	15.7497	3.4613	0.0000	0.0000	0.0000	0.0000	15.2100	70.5727	148.5057 (98a)
Space heating requirement - total per year (kWh/year)												526.9012
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												
	140.8025	82.0700	50.5292	15.7497	3.4613	0.0000	0.0000	0.0000	0.0000	15.2100	70.5727	148.5057 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												526.9012
Space heating per m2										(98c) / (4) =		7.1775 (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	140.8025	82.0700	50.5292	15.7497	3.4613	0.0000	0.0000	0.0000	0.0000	15.2100	70.5727	148.5057 (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)												
	140.8025	82.0700	50.5292	15.7497	3.4613	0.0000	0.0000	0.0000	0.0000	15.2100	70.5727	148.5057 (211)
Space heating efficiency (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
Efficiency of water heater												
(217)m	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958 (216)
Fuel for water heating, kWh/month	67.2948	59.3970	62.8062	54.5130	52.3634	46.6617	45.6704	47.7744	48.6205	54.8420	59.0807	66.4667 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	14.2622	12.8819	14.2622	13.8021	14.2622	13.8021	14.2622	14.2622	13.8021	14.2622	13.8021	14.2622 (231)
Lighting	20.1610	16.1739	14.5628	10.6694	8.2413	6.7332	7.5180	9.7722	12.6931	16.6540	18.8107	20.7214 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												526.9012 (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	343.5958	
Water heating fuel used	665.4910	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)		
mechanical ventilation fans (SFP = 0.7500)	167.9254	(230a)
Total electricity for the above, kWh/year	167.9254	(231)
Electricity for lighting (calculated in Appendix L)	162.7112	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1523.0287	(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	526.9012	0.1584	83.4536	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	665.4910	0.1412	93.9543	(264)
Space and water heating			177.4078	(265)
Pumps, fans and electric keep-hot	167.9254	0.1387	23.2933	(267)
Energy for lighting	162.7112	0.1443	23.4843	(268)
Total CO2, kg/year			224.1854	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0500	(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	526.9012	1.5863	835.8083	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	665.4910	1.5220	1012.9091	(278)
Space and water heating			1848.7174	(279)
Pumps, fans and electric keep-hot	167.9254	1.5128	254.0375	(281)
Energy for lighting	162.7112	1.5338	249.5718	(282)
Total Primary energy kWh/year			2352.3268	(286)
Dwelling Primary energy Rate (DPER)			32.0400	(287)

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

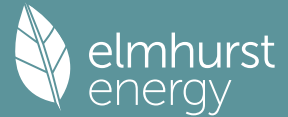
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	73.4100	x 2.5000	= 183.5250	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	183.5250	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1635 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4135	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3514 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
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
Adj infilt rate	0.4481	0.4393	0.4305	0.3866	0.3778	0.3339	0.3339	0.3251	0.3514	0.3778	0.3954	0.4129

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Effective ac 0.6004 0.5965 0.5927 0.5747 0.5714 0.5557 0.5557 0.5528 0.5618 0.5714 0.5782 0.5853 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			11.2000	1.1450	12.8244		(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230		(29a)
Flat Roof	26.4200		26.4200	0.1100	2.9062		(30)
Total net area of external elements Aum(A, m2)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		19.7536		(33)
Main dwelling							
Party Wall			55.4800	0.0000	0.0000		(32)
Corridor			23.5600	0.0000	0.0000		(32)

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

157.5970 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.0100	0.0700	0.5607
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	55.4100	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.7700	0.0500	0.2885
E3 Sill	2.5000	0.0500	0.1250
E4 Jamb	10.4800	0.0500	0.5240
E16 Corner (normal)	2.6800	0.0900	0.2412
E18 Party wall between dwellings	5.3600	0.0600	0.3216
E25 Staggered party wall between dwellings	5.3600	0.0600	0.3216
E15 Flat roof with parapet	12.9900	0.5600	7.2744
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.0200	0.1252
E24 Eaves (insulation at ceiling level - inverted)	8.8400	0.2400	2.1216
P4 Party wall - Roof (insulation at ceiling level)	3.5700	0.1200	0.4284

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

12.3322 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 32.0858 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.3618	36.1257	35.8943	34.8073	34.6039	33.6572	33.6572	33.4818	34.0218	34.6039	35.0153	35.4454 (38)
Heat transfer coeff	68.4476	68.2115	67.9801	66.8931	66.6897	65.7430	65.7430	65.5677	66.1077	66.6897	67.1012	67.5313 (39)
Average = Sum(39)m / 12 =												66.8921

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9324	0.9292	0.9260	0.9112	0.9085	0.8956	0.8956	0.8932	0.9005	0.9085	0.9141	0.9199 (40)
HLP (average)												0.9112
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

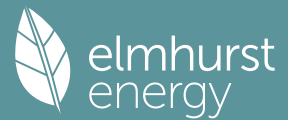
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766 (42a)	
Hot water usage for baths	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171 (42b)	
Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504 (42c)	
Average daily hot water use (litres/day)												118.5607 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441 (44)	
Energy content (annual)	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1969.2679	
	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138 (46)	
Water storage loss (or HIU loss):													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.7527 (55)	
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)	
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month													
	250.8655	221.8281	235.4431	206.3143	199.5619	179.3376	176.5651	183.7944	186.0680	208.0782	222.0086	248.0204 (62)	
WWHRS	-28.9010	-25.5603	-26.7653	-22.1627	-20.6548	-17.6745	-16.5670	-17.6174	-18.2867	-21.5580	-24.4226	-28.3658 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h													
	221.9645	196.2679	208.6778	184.1516	178.9071	161.6631	159.9981	166.1770	167.7813	186.5202	197.5860	219.6546 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2249.3493 (64)	
Electric shower(s)												2249 (64a)	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)	
Heat gains from water heating, kWh/month													
	105.1959	93.4329	100.0679	89.6799	88.1375	80.7102	80.4910	82.8948	82.9480	90.9691	94.8983	104.2499 (65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	108.9816	120.6582	108.9816	112.6143	108.9816	112.6143	108.9816	108.9816	112.6143	108.9816	112.6143	108.9816 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	205.1215	207.2500	201.8862	190.4673	176.0530	162.5056	153.4551	151.3266	156.6904	168.1093	182.5236	196.0710 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

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Pumps, fans	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299 (69)
Losses e.g. evaporation	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
(negative values) (Table 5)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395 (71)
Water heating gains (Table 5)	141.3923	139.0371	134.4999	124.5555	118.4643	112.0975	108.1869	111.4177	115.2056	122.2703	131.8032	140.1209 (72)
Total internal gains	516.3852	527.8351	506.2575	488.5269	464.3887	445.1072	428.5133	429.6156	442.4001	460.2509	487.8309	506.0632 (73)

6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	W
North					3.6800	10.6334	0.6300		0.7000		0.7700	11.9589 (74)
South					7.5200	46.7521	0.6300		0.7000		0.7700	107.4461 (78)
Solar gains	119.4050	198.8230	262.9879	315.7202	348.0273	344.0180	332.2195	307.7014	280.8464	217.0038	142.1131	102.8128 (83)
Total gains	635.7902	726.6581	769.2454	804.2471	812.4160	789.1252	760.7328	737.3170	723.2464	677.2548	629.9439	608.8760 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil _m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.9507	47.1132	47.2736	48.0418	48.1883	48.8823	48.8823	49.0130	48.6126	48.1883	47.8929	47.5878
alpha	4.1300	4.1409	4.1516	4.2028	4.2126	4.2588	4.2588	4.2675	4.2408	4.2126	4.1929	4.1725
util living area	0.9586	0.9305	0.8912	0.8104	0.6867	0.5154	0.3764	0.4037	0.5945	0.8177	0.9280	0.9640 (86)
MIT	19.8338	20.0768	20.3429	20.6534	20.8629	20.9691	20.9935	20.9912	20.9423	20.6924	20.2354	19.7993 (87)
Th 2	20.1400	20.1428	20.1454	20.1580	20.1603	20.1713	20.1713	20.1733	20.1671	20.1603	20.1556	20.1506 (88)
util rest of house	0.9512	0.9188	0.8732	0.7804	0.6408	0.4545	0.3072	0.3334	0.5333	0.7830	0.9140	0.9576 (89)
MIT 2	18.7955	19.0985	19.4265	19.8040	20.0372	20.1497	20.1682	20.1689	20.1236	19.8575	19.3093	18.7602 (90)
Living area fraction	19.2032	19.4826	19.7863	20.1375	20.3613	20.4714	20.4922	20.4917	20.4450	20.1853	19.6729	19.1681 (92)
MIT	19.2032	19.4826	19.7863	20.1375	20.3613	20.4714	20.4922	20.4917	20.4450	20.1853	19.6729	19.1681 (92)
Temperature adjustment	19.2032	19.4826	19.7863	20.1375	20.3613	20.4714	20.4922	20.4917	20.4450	20.1853	19.6729	19.1681 (93)
adjusted MIT	19.2032	19.4826	19.7863	20.1375	20.3613	20.4714	20.4922	20.4917	20.4450	20.1853	19.6729	19.1681 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9414	0.9083	0.8646	0.7796	0.6522	0.4770	0.3342	0.3608	0.5543	0.7841	0.9047	0.9483 (94)
Useful gains	598.5024	660.0417	665.1188	626.9692	529.8785	376.3985	254.2403	265.9915	400.9041	531.0488	569.8799	577.3821 (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	1020.0865	994.6991	903.2009	751.7110	577.6222	386.0039	255.8853	268.2854	419.4530	639.2397	843.6532	1010.8160 (97)
Space heating kWh	313.6586	224.8898	177.1331	89.8142	35.5214	0.0000	0.0000	0.0000	0.0000	80.4941	197.1168	322.4749 (98a)
Space heating requirement - total per year (kWh/year)												1441.1027
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	313.6586	224.8898	177.1331	89.8142	35.5214	0.0000	0.0000	0.0000	0.0000	80.4941	197.1168	322.4749 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1441.1027
Space heating per m ²										(98c) / (4) =		19.6309 (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	313.6586	224.8898	177.1331	89.8142	35.5214	0.0000	0.0000	0.0000	0.0000	80.4941	197.1168	322.4749 (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)	339.8251	243.6509	191.9101	97.3068	38.4847	0.0000	0.0000	0.0000	0.0000	87.2092	213.5610	349.3769 (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 requirement	221.9645	196.2679	208.6778	184.1516	178.9071	161.6631	159.9981	166.1770	167.7813	186.5202	197.5860	219.6546 (64)
Efficiency of water heater (217)m	84.8350	84.3658	83.6945	82.5426	81.1627	79.8000	79.8000	79.8000	79.8000	82.3150	84.0545	79.8000 (216)
Fuel for water heating, kWh/month	261.6425	232.6390	249.3328	223.0990	220.4302	202.5853	200.4989	208.2419	210.2522	226.5932	235.0691	84.9195 (217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	22.6442	18.1660	16.3565	11.9835	9.2564	7.5625	8.4440	10.9758	14.2565	18.7053	21.1276	23.2736 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-19.6500	-29.1001	-43.9107	-51.9077	-58.1978	-55.1357	-54.4663	-50.3182	-43.3845	-34.3877	-22.0950	-16.8297 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

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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	-7.2217	-15.5157	-31.4518	-48.1507	-64.5684	-65.2077	-64.4375	-54.1402	-39.1391	-22.4808	-9.7348	-5.6866 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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												1561.3247 (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												2729.0462 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												182.7518 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-907.1183 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												3652.0045 (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	1561.3247	0.2100	327.8782 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2729.0462	0.2100	573.0997 (264)
Space and water heating			900.9779 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	182.7518	0.1443	26.3767 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.3835	0.1336	-64.0291
PV Unit electricity exported	-427.7349	0.1253	-53.6123
Total			-117.6414 (269)
Total CO2, kg/year			821.6425 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1900 (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	1561.3247	1.1300	1764.2969 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2729.0462	1.1300	3083.8222 (278)
Space and water heating			4848.1192 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	182.7518	1.5338	280.3109 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.3835	1.4936	-715.9965
PV Unit electricity exported	-427.7349	0.4601	-196.7824
Total			-912.7790 (283)
Total Primary energy kWh/year			4345.7519 (286)
Target Primary Energy Rate (TPER)			59.2000 (287)

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Plot Reference	Plot 23			Issued on Date	22/12/2025
Assessment Reference	Plot 23	Plot Type Ref			
Plot Address	Flat 6, 2 Cross Road Manchester, M21 9SU			SAP Version	10.2
SAP Rating	88 B	DER	3.05	TER	11.19
Environmental	98 A	% DER < TER			72.74
CO ₂ Emissions (t/year)	0.19	DFEE	21.46	TFEE	25.86
Compliance Check	See BREL	% DFEE < TFEE			17.03
% DPER < TPER	45.87	DPER	32.04	TPER	59.20
Assessor Details	Daniel Smith			Assessor ID	CJ06-0001
Client	J Greenwood (Builders) Limited, Steve Brown				

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

1. Overall dwelling characteristics

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

2. Ventilation rate

		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1635 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.9800	(17)
Infiltration rate	0.3125	(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) =	0.2656 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.3386	0.3320	0.3254	0.2922	0.2855	0.2523	0.2523	0.2457	0.2656	0.2855	0.2988	0.3121 (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	0.5573	0.5551	0.5529	0.5427	0.5408	0.5318	0.5318	0.5302	0.5353	0.5408	0.5446	0.5487 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window N/E			3.6800	1.3258	4.8788		(27)
Window S/W			7.5200	1.3258	9.9697		(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999 (29a)
Flat Roof	26.4200		26.4200	0.1500	3.9630	9.0000	237.7800 (30)
Total net area of external elements Aum(A, m ²)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.8345			(33)
Main dwelling							
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000 (32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000 (32)
Party Floor			73.4100			40.0000	2936.4000 (32d)
Party Ceiling			46.9900			30.0000	1409.7000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11569.1999 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.5970 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				8.0100	0.0370	0.2964	

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P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	55.4100	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.7700	0.0250	0.1442
E3 Sill	2.5000	0.0220	0.0550
E4 Jamb	10.4800	0.0170	0.1782
E16 Corner (normal)	2.6800	0.0420	0.1126
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E15 Flat roof with parapet	12.9900	0.1320	1.7147
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.1500	0.9390
E24 Eaves (insulation at ceiling level - inverted)	8.8400	0.1500	1.3260
P4 Party wall - Roof (insulation at ceiling level)	3.5700	0.0400	0.1428
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.2411 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	28.0756 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	33.7541	33.6193	33.4871	32.8663	32.7502	32.2095	32.2095	32.1093	32.4177	32.7502	32.9851	33.2308 (38)
Average = Sum(39)m / 12 =	61.8297	61.6949	61.5627	60.9419	60.8258	60.2851	60.2851	60.1849	60.4933	60.8258	61.0607	61.3064 (39)
												60.9414
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8423	0.8404	0.8386	0.8302	0.8286	0.8212	0.8212	0.8198	0.8240	0.8286	0.8318	0.8351 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.3260 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171 (42b)
Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504 (42c)
Average daily hot water use (litres/day)												60.2750 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	65.7598	63.9560	61.9867	59.5354	57.3487	55.0761	54.6038	56.5692	58.5849	60.9187	63.3917	65.6675 (44)
Energy content (annual)	104.1475	91.0725	95.2712	81.5010	77.2023	67.7225	66.0386	70.0444	72.2410	82.6661	90.3130	102.8194 (45)
Distribution loss (46)m = 0.15 x (45)m												1001.0396
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 (46)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	88.5253	77.4117	80.9805	69.2758	65.6220	57.5641	56.1328	59.5378	61.4049	70.2662	76.7661	87.3965 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	88.5253	77.4117	80.9805	69.2758	65.6220	57.5641	56.1328	59.5378	61.4049	70.2662	76.7661	87.3965 (64)
12Total per year (kWh/year)												850.8836 (64)
Electric shower(s)												851 (64)
Heat gains from water heating, kWh/month	50.6277	45.1097	49.2581	47.0064	47.8885	45.6809	47.2036	47.8885	47.0064	49.2581	48.3319	50.6277 (64a)
	34.7883	30.6303	32.5597	29.0706	28.3776	25.8113	25.8341	26.8566	27.1028	29.8811	31.2745	34.5061 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(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	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	108.9816	120.6582	108.9816	112.6143	108.9816	112.6143	108.9816	108.9816	112.6143	108.9816	112.6143	108.9816 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	205.1215	207.2500	201.8862	190.4673	176.0530	162.5056	153.4551	151.3266	156.6904	168.1093	182.5236	196.0710 (68)
Pumps, fans	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299 (69)
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)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395 (71)
Total internal gains	46.7584	45.5809	43.7630	40.3758	38.1419	35.8490	34.7233	36.0975	37.6428	40.1627	43.4368	46.3791 (72)
	418.7513	431.3788	412.5206	401.3472	381.0663	368.8587	355.0497	354.2955	364.8373	375.1434	396.4644	409.3215 (73)

6. Solar gains												
[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W
North				3.6800	10.6334		0.4000		0.0000		0.7700	12.0523 (74)
South				7.5200	46.7521		0.4000		0.0000		0.7700	108.2853 (78)
Solar gains	120.3376	200.3759	265.0420	318.1862	350.7456	346.7050	334.8143	310.1047	283.0399	218.6987	143.2230	103.6158 (83)
Total gains	539.0889	631.7548	677.5625	719.5334	731.8119	715.5637	689.8640	664.4002	647.8772	593.8421	539.6875	512.9373 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												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	51.9761	52.0897	52.2015	52.7333	52.8340	53.3078	53.3078	53.3965	53.1243	52.8340	52.6306	52.4198
alpha	4.4651	4.4726	4.4801	4.5156	4.5223	4.5539	4.5539	4.5598	4.5416	4.5223	4.5087	4.4947
util living area	0.9730	0.9475	0.9101	0.8286	0.7008	0.5238	0.3814	0.4122	0.6102	0.8438	0.9485	0.9776 (86)
MIT	19.8618	20.1152	20.3810	20.6826	20.8812	20.9751	20.9952	20.9932	20.9502	20.7042	20.2430	19.8136 (87)
Th 2	20.2169	20.2184	20.2200	20.2273	20.2286	20.2350	20.2350	20.2362	20.2325	20.2286	20.2259	20.2230 (88)
util rest of house	0.9680	0.9385	0.8949	0.8013	0.6577	0.4662	0.3165	0.3457	0.5522	0.8132	0.9381	0.9735 (89)
MIT 2	19.1811	19.4290	19.6856	19.9716	20.1444	20.2212	20.2332	20.2334	20.2028	19.9975	19.5625	19.1387 (90)
Living area fraction									fLA = Living area / (4) =			0.3926 (91)
MIT	19.4483	19.6984	19.9586	20.2507	20.4336	20.5172	20.5323	20.5317	20.4962	20.2750	19.8297	19.4037 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4483	19.6984	19.9586	20.2507	20.4336	20.5172	20.5323	20.5317	20.4962	20.2750	19.8297	19.4037 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9621	0.9315	0.8892	0.8022	0.6696	0.4878	0.3419	0.3716	0.5727	0.8152	0.9319	0.9681 (94)
Useful gains	518.6695	588.4998	602.5020	577.2121	489.9977	349.0455	235.8580	246.8979	371.0187	484.0920	502.9124	496.5792 (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	936.6176	912.9855	828.5463	691.7345	531.2307	356.7200	237.0620	248.6667	386.9302	588.4875	777.2838	932.0828 (97)
Space heating kWh	310.9534	218.0544	168.1770	82.4561	30.6773	0.0000	0.0000	0.0000	0.0000	77.6702	197.5474	324.0147 (98a)
Space heating requirement - total per year (kWh/year)												1409.5505
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	310.9534	218.0544	168.1770	82.4561	30.6773	0.0000	0.0000	0.0000	0.0000	77.6702	197.5474	324.0147 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1409.5505
Space heating per m2										(98c) / (4) =		19.2011 (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	566.6797	446.1096	457.4056	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9263	0.9621	0.9533	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	524.9335	429.1812	436.0643	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	790.9713	763.2071	735.6125	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	191.5472	248.5153	222.8639	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	47.8868	62.1288	55.7160	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												165.7316 (107)
Energy for space heating												19.2011 (99)
Energy for space cooling												2.2576 (108)
Total												21.4587 (109)
Fabric Energy Efficiency (DFEE)												21.5 (109)

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

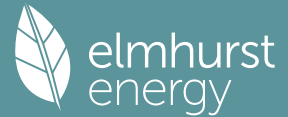
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	73.4100 (1b)	x 2.5000 (2b)	= 183.5250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	183.5250 (5)

2. Ventilation rate

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

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour	
Pressure test												30.0000 / (5) =	0.1635 (8)
Pressure Test Method												Yes	
Measured/design AP50												Blower Door	
Infiltration rate												5.0000	(17)
Number of sides sheltered												0.4135	(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) =	0.3514 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.4481	0.4393	0.4305	0.3866	0.3778	0.3339	0.3339	0.3251	0.3514	0.3778	0.3954	0.4129	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.6004	0.5965	0.5927	0.5747	0.5714	0.5557	0.5557	0.5528	0.5618	0.5714	0.5782	0.5853	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opening Type			11.2000	1.1450	12.8244			(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230			(29a)
Flat Roof	26.4200		26.4200	0.1100	2.9062			(30)
Total net area of external elements Aum(A, m2)			59.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		19.7536			(33)
Main dwelling								
Party Wall			55.4800	0.0000	0.0000			(32)
Corridor			23.5600	0.0000	0.0000			(32)

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

157.5970 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	8.0100	0.0700	0.5607	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	55.4100	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	5.7700	0.0500	0.2885	
E3 Sill	2.5000	0.0500	0.1250	
E4 Jamb	10.4800	0.0500	0.5240	
E16 Corner (normal)	2.6800	0.0900	0.2412	
E18 Party wall between dwellings	5.3600	0.0600	0.3216	
E25 Staggered party wall between dwellings	5.3600	0.0600	0.3216	
E15 Flat roof with parapet	12.9900	0.5600	7.2744	
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.0200	0.1252	
E24 Eaves (insulation at ceiling level - inverted)	8.8400	0.2400	2.1216	
P4 Party wall - Roof (insulation at ceiling level)	3.5700	0.1200	0.4284	

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

12.3322 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 32.0858 (37)

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

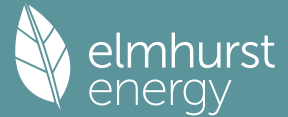
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	36.3618	36.1257	35.8943	34.8073	34.6039	33.6572	33.6572	33.4818	34.0218	34.6039	35.0153	35.4454	(38)
Average = Sum(39)m / 12 =	68.4476	68.2115	67.9801	66.8931	66.6897	65.7430	65.7430	65.5677	66.1077	66.6897	67.1012	67.5313	(39)
													66.8921

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9324	0.9292	0.9260	0.9112	0.9085	0.8956	0.8956	0.8932	0.9005	0.9085	0.9141	0.9199	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths													27.3094 (42b)
Hot water usage for other uses													38.4504 (42c)
Average daily hot water use (litres/day)													60.2750 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	65.7598	63.9560	61.9867	59.5354	57.3487	55.0761	54.6038	56.5692	58.5849	60.9187	63.3917	65.6675	(44)
Energy content (annual)	104.1475	91.0725	95.2712	81.5010	77.2023	67.7225	66.0386	70.0444	72.2410	82.6661	90.3130	102.8194	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1001.0396
Water storage loss (or HIU loss):													0.0000 (46)
Total storage loss													0.0000 (56)
If cylinder contains dedicated solar storage													0.0000 (57)
Primary loss													0.0000 (59)
Combi loss													0.0000 (61)
Total heat required for water heating calculated for each month													88.5253 (62)
WWHRS													0.0000 (63a)
PV diverter													0.0000 (63b)
Solar input													0.0000 (63c)
FGHRS													0.0000 (64a)
Output from w/h													88.5253 (64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 850.8836 (64)
Electric shower(s)													851 (64)
Heat gains from water heating, kWh/month	50.6277	45.1097	49.2581	47.0064	47.8885	45.6809	47.2036	47.8885	47.0064	49.2581	48.3319	50.6277	(64a)
													Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 575.8875 (64a)

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34.7883 30.6303 32.5597 29.0706 28.3776 25.8113 25.8341 26.8566 27.1028 29.8811 31.2745 34.5061 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9816	120.6582	108.9816	112.6143	108.9816	112.6143	108.9816	108.9816	112.6143	108.9816	112.6143	108.9816	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.1215	207.2500	201.8862	190.4673	176.0530	162.5056	153.4551	151.3266	156.6904	168.1093	182.5236	196.0710	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	(71)
Water heating gains (Table 5)	46.7584	45.5809	43.7630	40.3758	38.1419	35.8490	34.7233	36.0975	37.6428	40.1627	43.4368	46.3791	(72)
Total internal gains	418.7513	431.3788	412.5206	401.3472	381.0663	368.8587	355.0497	354.2955	364.8373	375.1434	396.4644	409.3215	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d			Gains W
North					3.6800	10.6334	0.6300	0.7000				0.7700			11.9589 (74)
South					7.5200	46.7521	0.6300	0.7000				0.7700			107.4461 (78)
Solar gains	119.4050	198.8230	262.9879	315.7202	348.0273	344.0180	332.2195	307.7014	280.8464	217.0038	142.1131			102.8128 (83)	
Total gains	538.1562	630.2019	675.5085	717.0674	729.0936	712.8767	687.2692	661.9968	645.6836	592.1472	538.5775			512.1343 (84)	

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
tau	46.9507	47.1132	47.2736	48.0418	48.1883	48.8823	48.8823	49.0130	48.6126	48.1883	47.8929	47.5878	
alpha	4.1300	4.1409	4.1516	4.2028	4.2126	4.2588	4.2588	4.2675	4.2408	4.2126	4.1929	4.1725	
util living area	0.9759	0.9547	0.9235	0.8533	0.7378	0.5629	0.4147	0.4468	0.6498	0.8662	0.9552	0.9798	(86)
MIT	19.6497	19.9138	20.2078	20.5659	20.8190	20.9570	20.9906	20.9871	20.9193	20.6026	20.0813	19.6125	(87)
Th 2	20.1400	20.1428	20.1454	20.1580	20.1603	20.1713	20.1713	20.1733	20.1671	20.1603	20.1556	20.1506	(88)
util rest of house	0.9713	0.9464	0.9095	0.8271	0.6932	0.4987	0.3393	0.3702	0.5871	0.8368	0.9455	0.9759	(89)
MIT 2	18.9129	19.1730	19.4597	19.8062	20.0310	20.1475	20.1677	20.1681	20.1186	19.8478	19.3499	18.8845	(90)
Living area fraction	19.2022	19.4639	19.7534	20.1044	20.3404	20.4653	20.4908	20.4897	20.4329	20.1441	19.6371	19.1703	(91)
MIT	19.2022	19.4639	19.7534	20.1044	20.3404	20.4653	20.4908	20.4897	20.4329	20.1441	19.6371	19.1703	(92)
Temperature adjustment	19.2022	19.4639	19.7534	20.1044	20.3404	20.4653	20.4908	20.4897	20.4329	20.1441	19.6371	19.1703	(93)
adjusted MIT	19.2022	19.4639	19.7534	20.1044	20.3404	20.4653	20.4908	20.4897	20.4329	20.1441	19.6371	19.1703	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9650	0.9385	0.9021	0.8252	0.7033	0.5220	0.3687	0.3999	0.6079	0.8362	0.9385	0.9702	(94)
Useful gains	519.3213	591.4712	609.3738	591.7446	512.7779	372.1452	253.3934	264.7487	392.5181	495.1297	505.4369	496.8825	(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	1020.0176	993.4233	900.9659	749.4997	576.2246	385.6028	255.7927	268.1503	418.6564	636.4935	841.2505	1010.9632	(97)
Space heating kWh	372.5180	270.1118	216.9445	113.5837	47.2044	0.0000	0.0000	0.0000	0.0000	105.1747	241.7858	382.4760	(98a)
Space heating requirement - total per year (kWh/year)												1749.7989	
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	372.5180	270.1118	216.9445	113.5837	47.2044	0.0000	0.0000	0.0000	0.0000	105.1747	241.7858	382.4760	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1749.7989	
Space heating per m ²										(98c) / (4) =		23.8360	(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	617.9841	486.4981	498.3143	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8937	0.9405	0.9290	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	552.2968	457.5532	462.9186	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	787.8307	760.1742	732.8034	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	169.5844	225.1500	200.7943	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	42.3961	56.2875	50.1986	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												148.8822	(107)
Energy for space heating												23.8360	(99)
Energy for space cooling												2.0281	(108)
Total												25.8641	(109)
Fabric Energy Efficiency (TFEE)												25.9	(109)

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Plot Reference	Plot 23			Issued on Date	22/12/2025
Assessment Reference	Plot 23	Plot Type Ref			
Plot Address	Flat 6, 2 Cross Road Manchester, M21 9SU			SAP Version	10.2
SAP Rating	88 B	DER	3.05	TER	11.19
Environmental	98 A	% DER < TER			72.74
CO ₂ Emissions (t/year)	0.19	DFEE	21.46	TFEE	25.86
Compliance Check	See BREL	% DFEE < TFEE			17.03
% DPER < TPER	45.87	DPER	32.04	TPER	59.20
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	73.4100	2.5000	183.5250
Ground floor	(1b)	(2b)	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	(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	2.9800	(17)
Infiltration rate	0.1490	(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) =	0.1266 (21)

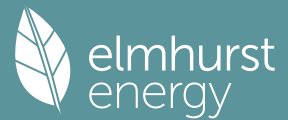
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1615	0.1583	0.1551	0.1393	0.1361	0.1203	0.1203	0.1172	0.1266	0.1361	0.1425	0.1488 (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	0.3015	0.2983	0.2951	0.2793	0.2761	0.2603	0.2603	0.2572	0.2666	0.2761	0.2825	0.2888 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window N/E			3.6800	1.3258	4.8788		(27)
Window S/W			7.5200	1.3258	9.9697		(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999 (29a)
Flat Roof	26.4200		26.4200	0.1500	3.9630	9.0000	237.7800 (30)
Total net area of external elements Aum(A, m ²)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	22.8345	(33)
Main dwelling							
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000 (32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000 (32)
Party Floor			73.4100			40.0000	2936.4000 (32d)
Party Ceiling			46.9900			30.0000	1409.7000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11569.1999 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		157.5970 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.0100	0.0370	0.2964
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	55.4100	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.7700	0.0250	0.1442
E3 Sill	2.5000	0.0220	0.0550
E4 Jamb	10.4800	0.0170	0.1782
E16 Corner (normal)	2.6800	0.0420	0.1126
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E15 Flat roof with parapet	12.9900	0.1320	1.7147
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.1500	0.9390
E24 Eaves (insulation at ceiling level - inverted)	8.8400	0.1500	1.3260
P4 Party wall - Roof (insulation at ceiling level)	3.5700	0.0400	0.1428
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.2411 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	28.0756 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.2585	18.0668	17.8750	16.9162	16.7245	15.7657	15.7657	15.5739	16.1492	16.7245	17.1080	17.4915	(38)
Heat transfer coeff	46.3342	46.1424	45.9506	44.9918	44.8001	43.8413	43.8413	43.6495	44.2248	44.8001	45.1836	45.5671	(39)
Average = Sum(39)m / 12 =												44.9439	
HLP	0.6312	0.6286	0.6259	0.6129	0.6103	0.5972	0.5972	0.5946	0.6024	0.6103	0.6155	0.6207	(40)
HLP (average)												0.6122	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766	(42a)
Hot water usage for baths	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171	(42b)
Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504	(42c)
Average daily hot water use (litres/day)												118.5607	(43)
Daily hot water use	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441	(44)
Energy conte	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255	(45)
Energy content (annual)										Total = Sum(45)m =		1969.2679	
Distribution loss (46)m = 0.15 x (45)m	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138	(46)
Water storage loss (or HIU loss):												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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2286.5989	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	67.9200	59.7644	62.7920	53.6065	50.8615	44.6367	43.2151	45.6188	46.8746	53.6932	58.8248	66.9740	(65)

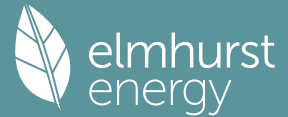
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.9816	120.6582	108.9816	112.6143	108.9816	112.6143	108.9816	108.9816	112.6143	108.9816	112.6143	108.9816	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.1215	207.2500	201.8862	190.4673	176.0530	162.5056	153.4551	151.3266	156.6904	168.1093	182.5236	196.0710	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	(71)
Water heating gains (Table 5)	91.2903	88.9350	84.3979	74.4534	68.3623	61.9954	58.0848	61.3156	65.1036	72.1683	81.7012	90.0188	(72)
Total internal gains	463.2831	474.7330	453.1555	435.4248	411.2867	395.0051	378.4113	379.5136	392.2980	407.1489	434.7288	452.9612	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	3.6800	10.6334	0.4000	0.0000	0.7700	12.0523 (74)

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South	7.5200		46.7521		0.4000		0.0000		0.7700		108.2853 (78)	
Solar gains	120.3376	200.3759	265.0420	318.1862	350.7456	346.7050	334.8143	310.1047	283.0399	218.6987	143.2230	103.6158 (83)
Total gains	583.6207	675.1090	718.1974	753.6110	762.0322	741.7101	713.2256	689.6183	675.3380	625.8476	577.9519	556.5770 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.3585	69.6467	69.9374	71.4278	71.7335	73.3023	73.3023	73.6243	72.6666	71.7335	71.1246	70.5260
alpha	5.6239	5.6431	5.6625	5.7619	5.7822	5.8868	5.8868	5.9083	5.8444	5.7822	5.7416	5.7017
util living area	0.9405	0.8870	0.8163	0.6878	0.5391	0.3775	0.2704	0.2910	0.4495	0.7045	0.8846	0.9497 (86)
MIT	20.4646	20.6566	20.8091	20.9375	20.9860	20.9986	20.9998	20.9998	20.9961	20.9401	20.7207	20.4341 (87)
Th 2	20.4020	20.4044	20.4067	20.4184	20.4208	20.4325	20.4325	20.4349	20.4278	20.4208	20.4161	20.4114 (88)
util rest of house	0.9319	0.8730	0.7961	0.6607	0.5074	0.3443	0.2355	0.2553	0.4130	0.6730	0.8682	0.9423 (89)
MIT 2	19.7843	20.0189	20.2010	20.3560	20.4083	20.4315	20.4324	20.4347	20.4249	20.3631	20.1095	19.7547 (90)
Living area fraction	20.0513	20.2693	20.4397	20.5843	20.6351	20.6542	20.6552	20.6566	20.6491	20.5896	20.3495	20.0214 (92)
MIT	20.0513	20.2693	20.4397	20.5843	20.6351	20.6542	20.6552	20.6566	20.6491	20.5896	20.3495	20.0214 (93)
Temperature adjustment												0.0000
adjusted MIT	20.0513	20.2693	20.4397	20.5843	20.6351	20.6542	20.6552	20.6566	20.6491	20.5896	20.3495	20.0214 (93)

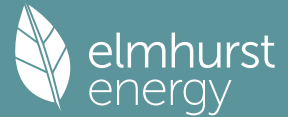
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9262	0.8696	0.7973	0.6685	0.5192	0.3573	0.2492	0.2693	0.4271	0.6824	0.8662	0.9367 (94)
Useful gains	540.5744	587.0468	572.6234	503.8226	395.6416	265.0201	177.7474	185.7384	288.4564	427.0937	500.6406	521.3335 (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	729.8251	709.1748	640.5390	525.6972	400.2939	265.4225	177.7849	185.7969	289.6343	447.5372	598.6583	720.9380 (97)
Space heating kWh	140.8025	82.0700	50.5292	15.7497	3.4613	0.0000	0.0000	0.0000	0.0000	15.2100	70.5727	148.5057 (98a)
Space heating requirement - total per year (kWh/year)												526.9012
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	140.8025	82.0700	50.5292	15.7497	3.4613	0.0000	0.0000	0.0000	0.0000	15.2100	70.5727	148.5057 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												526.9012
Space heating per m2										(98c) / (4) =		7.1775 (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	140.8025	82.0700	50.5292	15.7497	3.4613	0.0000	0.0000	0.0000	0.0000	15.2100	70.5727	148.5057 (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)	140.8025	82.0700	50.5292	15.7497	3.4613	0.0000	0.0000	0.0000	0.0000	15.2100	70.5727	148.5057 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
Efficiency of water heater												343.5958 (216)
(217)m	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958 (217)
Fuel for water heating, kWh/month	67.2948	59.3970	62.8062	54.5130	52.3634	46.6617	45.6704	47.7744	48.6205	54.8420	59.0807	66.4667 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	14.2622	12.8819	14.2622	13.8021	14.2622	13.8021	14.2622	14.2622	13.8021	14.2622	13.8021	14.2622 (231)
Lighting	20.1610	16.1739	14.5628	10.6694	8.2413	6.7332	7.5180	9.7722	12.6931	16.6540	18.8107	20.7214 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												526.9012 (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	343.5958	
Water heating fuel used	665.4910 (219)	
Space cooling fuel	0.0000 (221)	
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)		
mechanical ventilation fans (SFP = 0.7500)	167.9254 (230a)	
Total electricity for the above, kWh/year	167.9254 (231)	
Electricity for lighting (calculated in Appendix L)	162.7112 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000 (233)	
Wind generation	0.0000 (234)	
Hydro-electric generation (Appendix N)	0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)	
Appendix Q - special features		
Energy saved or generated	-0.0000 (236)	
Energy used	0.0000 (237)	
Total delivered energy for all uses	1523.0287 (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	526.9012	0.1584	83.4536	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	665.4910	0.1412	93.9543	(264)
Space and water heating			177.4078	(265)
Pumps, fans and electric keep-hot	167.9254	0.1387	23.2933	(267)
Energy for lighting	162.7112	0.1443	23.4843	(268)
Total CO2, kg/year			224.1854	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0500	(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	526.9012	1.5863	835.8083	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	665.4910	1.5220	1012.9091	(278)
Space and water heating			1848.7174	(279)
Pumps, fans and electric keep-hot	167.9254	1.5128	254.0375	(281)
Energy for lighting	162.7112	1.5338	249.5718	(282)
Total Primary energy kWh/year			2352.3268	(286)
Dwelling Primary energy Rate (DPER)			32.0400	(287)

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

1. Overall dwelling characteristics

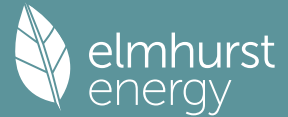
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	73.4100 (1b)	x 2.5000 (2b)	= 183.5250 (1b) - (3b)	
Ground floor				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	183.5250 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1635 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4135	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3514 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4481	0.4393	0.4305	0.3866	0.3778	0.3339	0.3339	0.3251	0.3514	0.3778	0.3954	0.4129 (22b)

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Effective ac 0.6004 0.5965 0.5927 0.5747 0.5714 0.5557 0.5557 0.5528 0.5618 0.5714 0.5782 0.5853 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opening Type			11.2000	1.1450	12.8244		(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230		(29a)
Flat Roof	26.4200		26.4200	0.1100	2.9062		(30)
Total net area of external elements Aum(A, m2)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		19.7536		(33)
Main dwelling							
Party Wall			55.4800	0.0000	0.0000		(32)
Corridor			23.5600	0.0000	0.0000		(32)

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

157.5970 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.0100	0.0700	0.5607
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	55.4100	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.7700	0.0500	0.2885
E3 Sill	2.5000	0.0500	0.1250
E4 Jamb	10.4800	0.0500	0.5240
E16 Corner (normal)	2.6800	0.0900	0.2412
E18 Party wall between dwellings	5.3600	0.0600	0.3216
E25 Staggered party wall between dwellings	5.3600	0.0600	0.3216
E15 Flat roof with parapet	12.9900	0.5600	7.2744
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.0200	0.1252
E24 Eaves (insulation at ceiling level - inverted)	8.8400	0.2400	2.1216
P4 Party wall - Roof (insulation at ceiling level)	3.5700	0.1200	0.4284

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

12.3322 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 32.0858 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.3618	36.1257	35.8943	34.8073	34.6039	33.6572	33.6572	33.4818	34.0218	34.6039	35.0153	35.4454 (38)
Heat transfer coeff	68.4476	68.2115	67.9801	66.8931	66.6897	65.7430	65.7430	65.5677	66.1077	66.6897	67.1012	67.5313 (39)
Average = Sum(39)m / 12 =												66.8921

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9324	0.9292	0.9260	0.9112	0.9085	0.8956	0.8956	0.8932	0.9005	0.9085	0.9141	0.9199 (40)
HLP (average)												0.9112
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

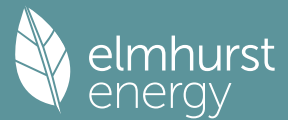
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766 (42a)	
Hot water usage for baths	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171 (42b)	
Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504 (42c)	
Average daily hot water use (litres/day)												118.5607 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441 (44)	
Energy content (annual)	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1969.2679	
	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138 (46)	
Water storage loss (or HIU loss):													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.7527 (55)	
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)	
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month													
	250.8655	221.8281	235.4431	206.3143	199.5619	179.3376	176.5651	183.7944	186.0680	208.0782	222.0086	248.0204 (62)	
WWHRS	-28.9010	-25.5603	-26.7653	-22.1627	-20.6548	-17.6745	-16.5670	-17.6174	-18.2867	-21.5580	-24.4226	-28.3658 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h													
	221.9645	196.2679	208.6778	184.1516	178.9071	161.6631	159.9981	166.1770	167.7813	186.5202	197.5860	219.6546 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2249.3493 (64)	
Electric shower(s)												2249 (64a)	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)	
Heat gains from water heating, kWh/month													
	105.1959	93.4329	100.0679	89.6799	88.1375	80.7102	80.4910	82.8948	82.9480	90.9691	94.8983	104.2499 (65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993	116.2993 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	108.9816	120.6582	108.9816	112.6143	108.9816	112.6143	108.9816	108.9816	112.6143	108.9816	112.6143	108.9816 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	205.1215	207.2500	201.8862	190.4673	176.0530	162.5056	153.4551	151.3266	156.6904	168.1093	182.5236	196.0710 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												

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Pumps, fans	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299	34.6299 (69)
Losses e.g. evaporation	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
(negative values) (Table 5)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395 (71)
Water heating gains (Table 5)	141.3923	139.0371	134.4999	124.5555	118.4643	112.0975	108.1869	111.4177	115.2056	122.2703	131.8032	140.1209 (72)
Total internal gains	516.3852	527.8351	506.2575	488.5269	464.3887	445.1072	428.5133	429.6156	442.4001	460.2509	487.8309	506.0632 (73)

6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	W
North					3.6800	10.6334	0.6300		0.7000		0.7700	11.9589 (74)
South					7.5200	46.7521	0.6300		0.7000		0.7700	107.4461 (78)
Solar gains	119.4050	198.8230	262.9879	315.7202	348.0273	344.0180	332.2195	307.7014	280.8464	217.0038	142.1131	102.8128 (83)
Total gains	635.7902	726.6581	769.2454	804.2471	812.4160	789.1252	760.7328	737.3170	723.2464	677.2548	629.9439	608.8760 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil _m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.9507	47.1132	47.2736	48.0418	48.1883	48.8823	48.8823	49.0130	48.6126	48.1883	47.8929	47.5878
alpha	4.1300	4.1409	4.1516	4.2028	4.2126	4.2588	4.2588	4.2675	4.2408	4.2126	4.1929	4.1725
util living area	0.9586	0.9305	0.8912	0.8104	0.6867	0.5154	0.3764	0.4037	0.5945	0.8177	0.9280	0.9640 (86)
MIT	19.8338	20.0768	20.3429	20.6534	20.8629	20.9691	20.9935	20.9912	20.9423	20.6924	20.2354	19.7993 (87)
Th 2	20.1400	20.1428	20.1454	20.1580	20.1603	20.1713	20.1713	20.1733	20.1671	20.1603	20.1556	20.1506 (88)
util rest of house	0.9512	0.9188	0.8732	0.7804	0.6408	0.4545	0.3072	0.3334	0.5333	0.7830	0.9140	0.9576 (89)
MIT 2	18.7955	19.0985	19.4265	19.8040	20.0372	20.1497	20.1682	20.1689	20.1236	19.8575	19.3093	18.7602 (90)
Living area fraction	19.2032	19.4826	19.7863	20.1375	20.3613	20.4714	20.4922	20.4917	20.4450	20.1853	19.6729	19.1681 (92)
MIT	19.2032	19.4826	19.7863	20.1375	20.3613	20.4714	20.4922	20.4917	20.4450	20.1853	19.6729	19.1681 (92)
Temperature adjustment	19.2032	19.4826	19.7863	20.1375	20.3613	20.4714	20.4922	20.4917	20.4450	20.1853	19.6729	19.1681 (93)
adjusted MIT	19.2032	19.4826	19.7863	20.1375	20.3613	20.4714	20.4922	20.4917	20.4450	20.1853	19.6729	19.1681 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9414	0.9083	0.8646	0.7796	0.6522	0.4770	0.3342	0.3608	0.5543	0.7841	0.9047	0.9483 (94)
Ext temp.	598.5024	660.0417	665.1188	626.9692	529.8785	376.3985	254.2403	265.9915	400.9041	531.0488	569.8799	577.3821 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1020.0865	994.6991	903.2009	751.7110	577.6222	386.0039	255.8853	268.2854	419.4530	639.2397	843.6532	1010.8160 (97)
Space heating requirement - total per year (kWh/year)	313.6586	224.8898	177.1331	89.8142	35.5214	0.0000	0.0000	0.0000	0.0000	80.4941	197.1168	322.4749 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	313.6586	224.8898	177.1331	89.8142	35.5214	0.0000	0.0000	0.0000	0.0000	80.4941	197.1168	322.4749 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	313.6586	224.8898	177.1331	89.8142	35.5214	0.0000	0.0000	0.0000	0.0000	80.4941	197.1168	322.4749 (98c)
Space heating per m ²	(98c) / (4) =											19.6309 (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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	313.6586	224.8898	177.1331	89.8142	35.5214	0.0000	0.0000	0.0000	0.0000	80.4941	197.1168	322.4749 (98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	339.8251	243.6509	191.9101	97.3068	38.4847	0.0000	0.0000	0.0000	0.0000	87.2092	213.5610	349.3769 (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 (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	221.9645	196.2679	208.6778	184.1516	178.9071	161.6631	159.9981	166.1770	167.7813	186.5202	197.5860	219.6546 (64)
Efficiency of water heater (217)m	84.8350	84.3658	83.6945	82.5426	81.1627	79.8000	79.8000	79.8000	79.8000	82.3150	84.0545	79.8000 (216)
Fuel for water heating, kWh/month	261.6425	232.6390	249.3328	223.0990	220.4302	202.5853	200.4989	208.2419	210.2522	226.5932	235.0691	258.6621 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	22.6442	18.1660	16.3565	11.9835	9.2564	7.5625	10.9758	14.2565	18.7053	21.1276	23.2736	23.2736 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-19.6500	-29.1001	-43.9107	-51.9077	-58.1978	-55.1357	-54.4663	-50.3182	-43.3845	-34.3877	-22.0950	-16.8297 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

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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	-7.2217	-15.5157	-31.4518	-48.1507	-64.5684	-65.2077	-64.4375	-54.1402	-39.1391	-22.4808	-9.7348	-5.6866 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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												1561.3247 (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												2729.0462 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												182.7518 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-907.1183 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												3652.0045 (238)

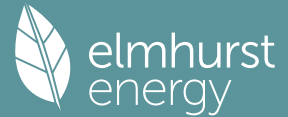
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1561.3247	0.2100	327.8782 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2729.0462	0.2100	573.0997 (264)
Space and water heating			900.9779 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	182.7518	0.1443	26.3767 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.3835	0.1336	-64.0291
PV Unit electricity exported	-427.7349	0.1253	-53.6123
Total			-117.6414 (269)
Total CO2, kg/year			821.6425 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1900 (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	1561.3247	1.1300	1764.2969 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2729.0462	1.1300	3083.8222 (278)
Space and water heating			4848.1192 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	182.7518	1.5338	280.3109 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-479.3835	1.4936	-715.9965
PV Unit electricity exported	-427.7349	0.4601	-196.7824
Total			-912.7790 (283)
Total Primary energy kWh/year			4345.7519 (286)
Target Primary Energy Rate (TPER)			59.2000 (287)

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Plot Reference	Plot 23			Issued on Date	22/12/2025
Assessment Reference	Plot 23	Plot Type Ref			
Plot Address	Flat 6, 2 Cross Road Manchester, M21 9SU			SAP Version	10.2
SAP Rating	88 B	DER	3.05	TER	11.19
Environmental	98 A	% DER < TER			72.74
CO ₂ Emissions (t/year)	0.19	DFEE	21.46	TFEE	25.86
Compliance Check	See BREL	% DFEE < TFEE			17.03
% DPER < TPER	45.87	DPER	32.04	TPER	59.20
Assessor Details	Daniel Smith			Assessor ID	CJ06-0001
Client	J Greenwood (Builders) Limited, Steve Brown				

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

1. Overall dwelling characteristics

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

2. Ventilation rate

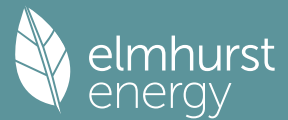
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	2.9800 (17)
Infiltration rate	0.1490 (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) = 0.1266 (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	0.1615	0.1583	0.1551	0.1393	0.1361	0.1203	0.1203	0.1172	0.1266	0.1361	0.1425	0.1488 (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	0.3015	0.2983	0.2951	0.2793	0.2761	0.2603	0.2603	0.2572	0.2666	0.2761	0.2825	0.2888 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window N/E			3.6800	1.3258	4.8788		(27)
Window S/W			7.5200	1.3258	9.9697		(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999 (29a)
Flat Roof	26.4200		26.4200	0.1500	3.9630	9.0000	237.7800 (30)
Total net area of external elements Aum(A, m ²)			59.9700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.8345		(33)
Main dwelling							
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000 (32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000 (32)
Party Floor			73.4100			40.0000	2936.4000 (32d)
Party Ceiling			46.9900			30.0000	1409.7000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11569.1999 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							157.5970 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.0100	0.0370	0.2964
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	55.4100	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.7700	0.0250	0.1442
E3 Sill	2.5000	0.0220	0.0550
E4 Jamb	10.4800	0.0170	0.1782
E16 Corner (normal)	2.6800	0.0420	0.1126
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E15 Flat roof with parapet	12.9900	0.1320	1.7147
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.1500	0.9390
E24 Eaves (insulation at ceiling level - inverted)	8.8400	0.1500	1.3260
P4 Party wall - Roof (insulation at ceiling level)	3.5700	0.0400	0.1428
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.2411 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	28.0756 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.2585	18.0668	17.8750	16.9162	16.7245	15.7657	15.7657	15.5739	16.1492	16.7245	17.1080	17.4915 (38)
Heat transfer coeff	46.3342	46.1424	45.9506	44.9918	44.8001	43.8413	43.8413	43.6495	44.2248	44.8001	45.1836	45.5671 (39)
Average = Sum(39)m / 12 =												44.9439
HLP	0.6312	0.6286	0.6259	0.6129	0.6103	0.5972	0.5972	0.5946	0.6024	0.6103	0.6155	0.6207 (40)
HLP (average)												0.6122
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3260 (42)
Hot water usage for mixer showers	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766 (42a)
Hot water usage for baths	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171 (42b)
Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504 (42c)
Average daily hot water use (litres/day)												118.5607 (43)
Daily hot water use	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441 (44)
Energy conte	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255 (45)
Energy content (annual)										Total = Sum(45)m =		1969.2679
Distribution loss (46)m = 0.15 x (45)m	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138 (46)
Water storage loss (or HIU loss):												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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
								Total per year (kWh/year) = Sum(64)m =				2286.5989 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000 (64a)
Heat gains from water heating, kWh/month	67.9200	59.7644	62.7920	53.6065	50.8615	44.6367	43.2151	45.6188	46.8746	53.6932	58.8248	66.9740 (65)

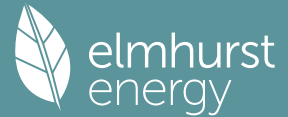
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0335	20.4581	16.6377	12.5958	9.4155	7.9490	8.5891	11.1645	14.9849	19.0268	22.2071	23.6736 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.1514	309.3283	301.3227	284.2795	262.7657	242.5456	229.0374	225.8605	233.8662	250.9093	272.4232	292.6432 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395 (71)
Water heating gains (Table 5)	91.2903	88.9350	84.3979	74.4534	68.3623	61.9954	58.0848	61.3156	65.1036	72.1683	81.7012	90.0188 (72)
Total internal gains	518.2768	516.5231	500.1598	469.1304	438.3450	410.2916	393.5130	396.1423	411.7563	439.9060	474.1331	504.1373 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	3.6800	10.6334	0.4000	0.0000	0.7700	12.0523 (74)
South	7.5200	46.7521	0.4000	0.0000	0.7700	108.2853 (78)

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Solar gains	120.3376	200.3759	265.0420	318.1862	350.7456	346.7050	334.8143	310.1047	283.0399	218.6987	143.2230	103.6158 (83)
Total gains	638.6144	716.8991	765.2018	787.3166	789.0906	756.9966	728.3273	706.2470	694.7963	658.6048	617.3561	607.7531 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.3585	69.6467	69.9374	71.4278	71.7335	73.3023	73.3023	73.6243	72.6666	71.7335	71.1246	70.5260
alpha	5.6239	5.6431	5.6625	5.7619	5.7822	5.8868	5.8868	5.9083	5.8444	5.7822	5.7416	5.7017
util living area	0.9175	0.8642	0.7854	0.6637	0.5217	0.3700	0.2648	0.2842	0.4372	0.6765	0.8589	0.9298 (86)
MIT	20.5528	20.7060	20.8443	20.9477	20.9881	20.9988	20.9999	20.9998	20.9966	20.9512	20.7660	20.5212 (87)
Th 2	20.4020	20.4044	20.4067	20.4184	20.4208	20.4325	20.4325	20.4349	20.4278	20.4208	20.4161	20.4114 (88)
util rest of house	0.9066	0.8486	0.7641	0.6367	0.4908	0.3374	0.2307	0.2493	0.4016	0.6450	0.8405	0.9201 (89)
MIT 2	19.8915	20.0770	20.2404	20.3665	20.4103	20.4316	20.4324	20.4348	20.4253	20.3742	20.1620	19.8613 (90)
Living area fraction									fLA = Living area / (4) =			0.3926 (91)
MIT	20.1511	20.3240	20.4775	20.5946	20.6371	20.6543	20.6552	20.6566	20.6496	20.6007	20.3991	20.1204 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1511	20.3240	20.4775	20.5946	20.6371	20.6543	20.6552	20.6566	20.6496	20.6007	20.3991	20.1204 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9016	0.8464	0.7667	0.6450	0.5024	0.3502	0.2441	0.2630	0.4154	0.6550	0.8399	0.9149 (94)
Useful gains	575.7624	606.7537	586.6912	507.8484	396.4427	265.0667	177.7521	185.7465	288.6356	431.3715	518.5315	556.0205 (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	734.4478	711.6988	642.2751	526.1638	400.3838	265.4276	177.7854	185.7978	289.6541	448.0324	600.9015	725.4456 (97)
Space heating kWh	118.0620	70.5231	41.3544	13.1871	2.9322	0.0000	0.0000	0.0000	0.0000	12.3958	59.3064	126.0523 (98a)
Space heating requirement - total per year (kWh/year)												443.8131
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	118.0620	70.5231	41.3544	13.1871	2.9322	0.0000	0.0000	0.0000	0.0000	12.3958	59.3064	126.0523 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												443.8131
Space heating per m2										(98c) / (4) =		6.0457 (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	118.0620	70.5231	41.3544	13.1871	2.9322	0.0000	0.0000	0.0000	0.0000	12.3958	59.3064	126.0523 (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)	118.0620	70.5231	41.3544	13.1871	2.9322	0.0000	0.0000	0.0000	0.0000	12.3958	59.3064	126.0523 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Water heating												
Water heating requirement	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
Efficiency of water heater (217)m	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958 (216)
Fuel for water heating, kWh/month	67.2948	59.3970	62.8062	54.5130	52.3634	46.6617	45.6704	47.7744	48.6205	54.8420	59.0807	66.4667 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	14.2622	12.8819	14.2622	13.8021	14.2622	13.8021	14.2622	14.2622	13.8021	14.2622	13.8021	14.2622 (231)
Lighting	20.1610	16.1739	14.5628	10.6694	8.2413	6.7322	7.5180	9.7722	12.6931	16.6540	18.8107	20.7214 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												443.8131 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												343.5958

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Water heating fuel used	665.4910 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500) mechanical ventilation fans (SFP = 0.7500)	167.9254 (230a)
Total electricity for the above, kWh/year	167.9254 (231)
Electricity for lighting (calculated in Appendix L)	162.7112 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1439.9407 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	443.8131	16.4900	73.1848 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	665.4910	16.4900	109.7395 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	167.9254	16.4900	27.6909 (249)
Energy for lighting	162.7112	16.4900	26.8311 (250)
Additional standing charges			0.0000 (251)
Total energy cost			237.4462 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.7219 (257)
SAP value	88.2979
SAP rating (Section 12)	88 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	443.8131	0.1584	70.3154 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	665.4910	0.1412	93.9543 (264)
Space and water heating			164.2697 (265)
Pumps, fans and electric keep-hot	167.9254	0.1387	23.2933 (267)
Energy for lighting	162.7112	0.1443	23.4843 (268)
Total CO2, kg/year			211.0473 (272)
CO2 emissions per m2			2.8700 (273)
EI value			97.6117
EI rating			98 (274)
EI band			A

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

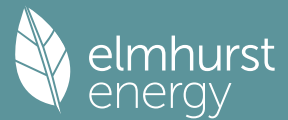
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	73.4100 (1b)	x 2.5000 (2b)	= 183.5250 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.5250 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 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
2.9800 (17)
0.1490 (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) = 0.1266 (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	0.1361	0.1330	0.1330	0.1235	0.1266	0.1077	0.1045	0.1045	0.1077	0.1203	0.1203	0.1235	(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	0.2761	0.2730	0.2730	0.2635	0.2666	0.2477	0.2445	0.2445	0.2477	0.2603	0.2603	0.2635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window N/E			3.6800	1.3258	4.8788			(27)
Window S/W			7.5200	1.3258	9.9697			(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999	(29a)
Flat Roof	26.4200		26.4200	0.1500	3.9630	9.0000	237.7800	(30)
Total net area of external elements Aum(A, m2)			59.9700					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 22.8345			(33)
Main dwelling								
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000	(32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000	(32)
Party Floor			73.4100			40.0000	2936.4000	(32d)
Party Ceiling			46.9900			30.0000	1409.7000	(32b)
Internal Wall			107.7800			9.0000	970.0200	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
(28)...(30) + (32) + (32a)...(32e) = 11569.1999 (34)
157.5970 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	8.0100	0.0370	0.2964
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	55.4100	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.7700	0.0250	0.1442
E3 Sill	2.5000	0.0220	0.0550
E4 Jamb	10.4800	0.0170	0.1782
E16 Corner (normal)	2.6800	0.0420	0.1126
E18 Party wall between dwellings	5.3600	0.0320	0.1715
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608
E15 Flat roof with parapet	12.9900	0.1320	1.7147
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.1500	0.9390
E24 Eaves (insulation at ceiling level - inverted)	8.8400	0.1500	1.3260
P4 Party wall - Roof (insulation at ceiling level)	3.5700	0.0400	0.1428

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
(36a) = 0.0000 (36)
Total fabric heat loss
(33) + (36) + (36a) = 28.0756 (37)

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

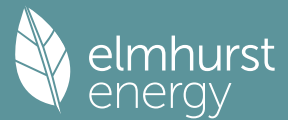
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.7245	16.5327	16.5327	15.9574	16.1492	14.9986	14.8069	14.8069	14.9986	15.7657	15.7657	15.9574	(38)
Heat transfer coeff	44.8001	44.6083	44.6083	44.0331	44.2248	43.0743	42.8825	42.8825	43.0743	43.8413	43.8413	44.0331	(39)
Average = Sum(39)m / 12 =												43.8253	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6103	0.6077	0.6077	0.5998	0.6024	0.5868	0.5842	0.5842	0.5868	0.5972	0.5972	0.5998	(40)
HLP (average)												0.5970	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.3260 (42)		
Hot water usage for mixer showers													
63.2188		62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766 (42a)	
Hot water usage for baths													
27.3094		26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171 (42b)	
Hot water usage for other uses													
38.4504		37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504 (42c)	
Average daily hot water use (litres/day)											118.5607 (43)		
Jan		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
128.9786		126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441 (44)	
Energy conte		204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255 (45)
Energy content (annual)		Total = Sum(45)m =										1969.2679	
Distribution loss (46)m = 0.15 x (45)m													
30.6406		26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138 (46)	
Water storage loss (or HIU loss):													
Store volume												201.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):				1.6100 (48)									
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.8694 (55)	
Total storage loss													
26.9514		24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	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 (59)	
Combi loss		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month													
231.2220		204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (62)	
WWHRS		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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 (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 (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	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
	Total per year (kWh/year) = Sum(64)m =											2286.5989 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	67.9200	59.7644	62.7920	53.6065	50.8615	44.6367	43.2151	45.6188	46.8746	53.6932	58.8248	66.9740 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0335	20.4581	16.6377	12.5958	9.4155	7.9490	8.5891	11.1645	14.9849	19.0268	22.2071	23.6736 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.1514	309.3283	301.3227	284.2795	262.7657	242.5456	229.0374	225.8605	233.8662	250.9093	272.4232	292.6432 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395 (71)
Water heating gains (Table 5)	91.2903	88.9350	84.3979	74.4534	68.3623	61.9954	58.0848	61.3156	65.1036	72.1683	81.7012	90.0188 (72)
Total internal gains	518.2768	516.5231	500.1598	469.1304	438.3450	410.2916	393.5130	396.1423	411.7563	439.9060	474.1331	504.1373 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d			Gains W
North					3.6800	9.3942	0.4000	0.0000				0.7700			10.6478 (74)
South					7.5200	41.2355	0.4000	0.0000				0.7700			95.5081 (78)
Solar gains	106.1559	181.3171	250.6009	306.9806	330.2024	334.2102	314.9500	287.8882	275.0128	208.1891	129.8386				93.4882 (83)
Total gains	624.4327	697.8402	750.7607	776.1110	768.5475	744.5018	708.4630	684.0304	686.7691	648.0951	603.9717				597.6255 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	71.7335	72.0418	72.0418	72.9830	72.6666	74.6076	74.9412	74.9412	74.6076	73.3023	73.3023	72.9830
alpha	5.7822	5.8028	5.8028	5.8655	5.8444	5.9738	5.9961	5.9961	5.9738	5.8868	5.8868	5.8655
util living area	0.9003	0.8405	0.7492	0.6136	0.4632	0.3065	0.2239	0.2445	0.3942	0.6362	0.8324	0.9146 (86)
MIT	20.6511	20.7805	20.8941	20.9699	20.9947	20.9997	21.0000	20.9999	20.9985	20.9688	20.8279	20.6204 (87)
Th 2	20.4208	20.4231	20.4231	20.4302	20.4278	20.4419	20.4443	20.4443	20.4419	20.4325	20.4325	20.4302 (88)
util rest of house	0.8873	0.8227	0.7259	0.5854	0.4313	0.2743	0.1903	0.2096	0.3596	0.6034	0.8114	0.9031 (89)
MIT 2	20.0278	20.1826	20.3125	20.4013	20.4234	20.4417	20.4443	20.4443	20.4408	20.4037	20.2493	19.9993 (90)
Living area fraction	FLA = Living area / (4) =											0.3926 (91)
MIT	20.2725	20.4173	20.5408	20.6245	20.6477	20.6608	20.6624	20.6624	20.6597	20.6256	20.4765	20.2432 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2725	20.4173	20.5408	20.6245	20.6477	20.6608	20.6624	20.6624	20.6597	20.6256	20.4765	20.2432 (93)

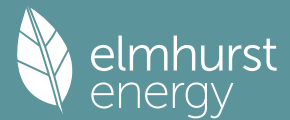
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8837	0.8226	0.7308	0.5951	0.4436	0.2869	0.2035	0.2233	0.3731	0.6147	0.8131	0.8990 (94)
Useful gains	551.8383	574.0142	548.6450	461.8590	340.9425	213.5935	144.1811	152.7502	256.2613	398.3863	491.1145	537.2756 (95)
Ext temp.	5.2000	5.8000	7.4000	9.9000	12.9000	15.7000	17.3000	17.1000	14.7000	11.3000	7.9000	5.0000 (96)
Heat loss rate W	675.2500	652.0550	586.1898	472.2322	342.6399	213.6815	144.1894	152.7650	256.7117	408.8462	551.3685	671.2027 (97)
Space heating kWh	91.8183	52.4434	27.9334	7.4687	1.2629	0.0000	0.0000	0.0000	0.0000	7.7822	43.3829	99.6418 (98a)
Space heating requirement - total per year (kWh/year)												331.7335
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	91.8183	52.4434	27.9334	7.4687	1.2629	0.0000	0.0000	0.0000	0.0000	7.7822	43.3829	99.6418 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												331.7335
Space heating per m2												(98c) / (4) = 4.5189 (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	91.8183	52.4434	27.9334	7.4687	1.2629	0.0000	0.0000	0.0000	0.0000	7.7822	43.3829	99.6418 (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)	91.8183	52.4434	27.9334	7.4687	1.2629	0.0000	0.0000	0.0000	0.0000	7.7822	43.3829	99.6418	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating requirement	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(64)
Efficiency of water heater (217)m	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	(216)
Fuel for water heating, kWh/month	67.2948	59.3970	62.8062	54.5130	52.3634	46.6617	45.6704	47.7744	48.6205	54.8420	59.0807	66.4667	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	14.2622	12.8819	14.2622	13.8021	14.2622	13.8021	14.2622	14.2622	13.8021	14.2622	13.8021	14.2622	(231)
Lighting	20.1610	16.1739	14.5628	10.6694	8.2413	6.7332	7.5180	9.7722	12.6931	16.6540	18.8107	20.7214	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	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												331.7335	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												343.5958	
Water heating fuel used												665.4910	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)												167.9254	(230a)
Total electricity for the above, kWh/year												167.9254	(231)
Electricity for lighting (calculated in Appendix L)												162.7112	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1327.8611	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	331.7335	28.4300	94.3118	(240)
Space heating - main system 2	0.0000	28.4300	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	665.4910	28.4300	189.1991	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	167.9254	28.4300	47.7412	(249)
Energy for lighting	162.7112	28.4300	46.2588	(250)
Additional standing charges			0.0000	(251)
Total energy cost			377.5109	(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	331.7335	0.1589	52.7167	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	665.4910	0.1412	93.9543	(264)
Space and water heating			146.6710	(265)
Pumps, fans and electric keep-hot	167.9254	0.1387	23.2933	(267)
Energy for lighting	162.7112	0.1443	23.4843	(268)
Total CO2, kg/year			193.4485	(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	331.7335	1.5882	526.8602	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	665.4910	1.5220	1012.9091	(278)
Space and water heating			1539.7693	(279)
Pumps, fans and electric keep-hot	167.9254	1.5128	254.0375	(281)
Energy for lighting	162.7112	1.5338	249.5718	(282)
Total Primary energy kWh/year			2043.3787	(286)

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SAP 10 EPC IMPROVEMENTS

Plot 23

Current energy efficiency rating: B 88
Current environmental impact rating: A 98

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

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

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

Potential energy efficiency rating: B 88
Potential environmental impact rating: A 98

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

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

	Current £378	Potential £378	£0
Electricity			
Space heating	£142	£142	£0
Water heating	£189	£189	£0
Lighting	£46	£46	£0
Total cost of fuels	£378	£378	£0
Total cost of uses	£377	£377	£0
Delivered energy	18 kWh/m ²	18 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m ²	3 kg/m ²	3 kg/m ²	0 kg/m ²
Primary energy	28 kWh/m ²	28 kWh/m ²	0 kWh/m ²

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

1. Overall dwelling characteristics

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

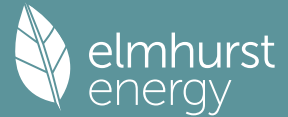
2. Ventilation rate

	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 2.9800 (17)
Infiltration rate 0.1490 (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) = 0.1266 (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	0.1615	0.1583	0.1551	0.1393	0.1361	0.1203	0.1203	0.1172	0.1266	0.1361	0.1425	0.1488 (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 0.3015 0.2983 0.2951 0.2793 0.2761 0.2603 0.2603 0.2572 0.2666 0.2761 0.2825 0.2888 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window N/E			3.6800	1.3258	4.8788			(27)
Window S/W			7.5200	1.3258	9.9697			(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999	(29a)
Flat Roof	26.4200		26.4200	0.1500	3.9630	9.0000	237.7800	(30)
Total net area of external elements Aum(A, m2)			59.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.8345			(33)
Main dwelling								
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000	(32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000	(32)
Party Floor			73.4100			40.0000	2936.4000	(32d)
Party Ceiling			46.9900			30.0000	1409.7000	(32b)
Internal Wall			107.7800			9.0000	970.0200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11569.1999 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 157.5970 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	8.0100	0.0370	0.2964	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	55.4100	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	5.7700	0.0250	0.1442	
E3 Sill	2.5000	0.0220	0.0550	
E4 Jamb	10.4800	0.0170	0.1782	
E16 Corner (normal)	2.6800	0.0420	0.1126	
E18 Party wall between dwellings	5.3600	0.0320	0.1715	
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608	
E15 Flat roof with parapet	12.9900	0.1320	1.7147	
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.1500	0.9390	
E24 Eaves (insulation at ceiling level - inverted)	8.8400	0.1500	1.3260	
P4 Party wall - Roof (insulation at ceiling level)	3.5700	0.0400	0.1428	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.2411 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 28.0756 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.2585	18.0668	17.8750	16.9162	16.7245	15.7657	15.7657	15.5739	16.1492	16.7245	17.1080	17.4915	(38)
Heat transfer coeff	46.3342	46.1424	45.9506	44.9918	44.8001	43.8413	43.8413	43.6495	44.2248	44.8001	45.1836	45.5671	(39)
Average = Sum(39)m / 12 =													44.9439

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6312	0.6286	0.6259	0.6129	0.6103	0.5972	0.5972	0.5946	0.6024	0.6103	0.6155	0.6207	(40)
HLP (average)													0.6122
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

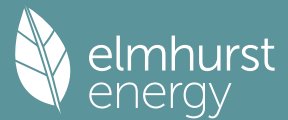
Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766	(42a)
Hot water usage for baths	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171	(42b)
Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504	(42c)
Average daily hot water use (litres/day)													118.5607 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441	(44)
Energy conte	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255	(45)
Energy content (annual)										Total = Sum(45)m =			1969.2679
Distribution loss (46)m = 0.15 x (45)m	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138	(46)
Water storage loss (or HIU loss):													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	67.9200	59.7644	62.7920	53.6065	50.8615	44.6367	43.2151	45.6188	46.8746	53.6932	58.8248	66.9740	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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(66)m	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0335	20.4581	16.6377	12.5958	9.4155	7.9490	8.5891	11.1645	14.9849	19.0268	22.2071	23.6736	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.1514	309.3283	301.3227	284.2795	262.7657	242.5456	229.0374	225.8605	233.8662	250.9093	272.4232	292.6432	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	(71)
Water heating gains (Table 5)	91.2903	88.9350	84.3979	74.4534	68.3623	61.9954	58.0848	61.3156	65.1036	72.1683	81.7012	90.0188	(72)
Total internal gains	518.2768	516.5231	500.1598	469.1304	438.3450	410.2916	393.5130	396.1423	411.7563	439.9060	474.1331	504.1373	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					3.6800	10.6334	0.4000	0.0000			0.7700			12.0523 (74)
South					7.5200	46.7521	0.4000	0.0000			0.7700			108.2853 (78)
Solar gains	120.3376	200.3759	265.0420	318.1862	350.7456	346.7050	334.8143	310.1047	283.0399	218.6987	143.2230	103.6158 (83)		
Total gains	638.6144	716.8991	765.2018	787.3166	789.0906	756.9966	728.3273	706.2470	694.7963	658.6048	617.3561	607.7531 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	69.3585	69.6467	69.9374	71.4278	71.7335	73.3023	73.3023	73.6243	72.6666	71.7335	71.1246	70.5260		
alpha	5.6239	5.6431	5.6625	5.7619	5.7822	5.8868	5.8868	5.9083	5.8444	5.7822	5.7416	5.7017		
util living area	0.9175	0.8642	0.7854	0.6637	0.5217	0.3700	0.2648	0.2842	0.4372	0.6765	0.8589	0.9298	(86)	
MIT	20.5528	20.7060	20.8443	20.9477	20.9881	20.9988	20.9999	20.9998	20.9966	20.9512	20.7660	20.5212	(87)	
Th 2	20.4020	20.4044	20.4067	20.4184	20.4208	20.4325	20.4325	20.4349	20.4278	20.4208	20.4161	20.4114	(88)	
util rest of house	0.9066	0.8486	0.7641	0.6367	0.4908	0.3374	0.2307	0.2493	0.4016	0.6450	0.8405	0.9201	(89)	
MIT 2	19.8915	20.0770	20.2404	20.3665	20.4103	20.4316	20.4324	20.4348	20.4253	20.3742	20.1620	19.8613	(90)	
Living area fraction									fLA = Living area / (4) =			0.3926	(91)	
MIT	20.1511	20.3240	20.4775	20.5946	20.6371	20.6543	20.6552	20.6566	20.6496	20.6007	20.3991	20.1204	(92)	
Temperature adjustment												0.0000		
adjusted MIT	20.1511	20.3240	20.4775	20.5946	20.6371	20.6543	20.6552	20.6566	20.6496	20.6007	20.3991	20.1204	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9016	0.8464	0.7667	0.6450	0.5024	0.3502	0.2441	0.2630	0.4154	0.6550	0.8399	0.9149	(94)	
Ext temp.	575.7624	606.7537	586.6912	507.8484	396.4427	265.0667	177.7521	185.7465	288.6356	431.3715	518.5315	556.0205	(95)	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Space heating kWh	734.4478	711.6988	642.2751	526.1638	400.3838	265.4276	177.7854	185.7978	289.6541	448.0324	600.9015	725.4456	(97)	
Space heating requirement - total per year (kWh/year)	118.0620	70.5231	41.3544	13.1871	2.9322	0.0000	0.0000	0.0000	0.0000	12.3958	59.3064	126.0523	(98a)	
Solar heating kWh												443.8131		
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	118.0620	70.5231	41.3544	13.1871	2.9322	0.0000	0.0000	0.0000	0.0000	12.3958	59.3064	126.0523	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												443.8131		
Space heating per m2										(98c) / (4) =		6.0457	(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)	118.0620	70.5231	41.3544	13.1871	2.9322	0.0000	0.0000	0.0000	0.0000	12.3958	59.3064	126.0523	(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)	118.0620	70.5231	41.3544	13.1871	2.9322	0.0000	0.0000	0.0000	0.0000	12.3958	59.3064	126.0523	(211)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769	(64)	
Efficiency of water heater	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	(216)	
(217)m													(217)	

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Fuel for water heating, kWh/month	67.2948	59.3970	62.8062	54.5130	52.3634	46.6617	45.6704	47.7744	48.6205	54.8420	59.0807	66.4667 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	14.2622	12.8819	14.2622	13.8021	14.2622	13.8021	14.2622	14.2622	13.8021	14.2622	13.8021	14.2622 (231)
Lighting	20.1610	16.1739	14.5628	10.6694	8.2413	6.7332	7.5180	9.7722	12.6931	16.6540	18.8107	20.7214 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												443.8131 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												343.5958
Water heating fuel used												665.4910 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												167.9254 (230a)
Total electricity for the above, kWh/year												167.9254 (231)
Electricity for lighting (calculated in Appendix L)												162.7112 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												1439.9407 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	443.8131	16.4900	73.1848 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	665.4910	16.4900	109.7395 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	167.9254	16.4900	27.6909 (249)
Energy for lighting	162.7112	16.4900	26.8311 (250)
Additional standing charges			0.0000 (251)
Total energy cost			237.4462 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.7219 (257)
SAP value		88.2979
SAP rating (Section 12)		88 (258)
SAP band		B

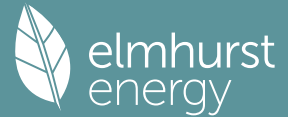
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	443.8131	0.1584	70.3154 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	665.4910	0.1412	93.9543 (264)
Space and water heating			164.2697 (265)
Pumps, fans and electric keep-hot	167.9254	0.1387	23.2933 (267)
Energy for lighting	162.7112	0.1443	23.4843 (268)
Total CO2, kg/year			211.0473 (272)
CO2 emissions per m2			2.8700 (273)
EI value			97.6117
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 (m2)	Storey height (m)	Volume (m3)	
Ground floor	73.4100 (1b)	x 2.5000 (2b)	= 183.5250 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4100		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.5250 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c)	Air changes per hour	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	2.9800	(17)
Infiltration rate	0.1490	(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) =	0.1266 (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	0.1361	0.1330	0.1330	0.1235	0.1266	0.1077	0.1045	0.1045	0.1077	0.1203	0.1203	0.1235	(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	0.2761	0.2730	0.2730	0.2635	0.2666	0.2477	0.2445	0.2445	0.2477	0.2603	0.2603	0.2635	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window N/E			3.6800	1.3258	4.8788			(27)
Window S/W			7.5200	1.3258	9.9697			(27)
EXT Wall	33.5500	11.2000	22.3500	0.1800	4.0230	110.0000	2458.4999	(29a)
Flat Roof	26.4200		26.4200	0.1500	3.9630	9.0000	237.7800	(30)
Total net area of external elements Aum(A, m2)			59.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.8345			(33)
Main dwelling								
Party Wall			55.4800	0.0000	0.0000	45.0000	2496.6000	(32)
Corridor			23.5600	0.0000	0.0000	45.0000	1060.2000	(32)
Party Floor			73.4100			40.0000	2936.4000	(32d)
Party Ceiling			46.9900			30.0000	1409.7000	(32b)
Internal Wall			107.7800			9.0000	970.0200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11569.1999 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		157.5970 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	8.0100	0.0370	0.2964	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	55.4100	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	5.7700	0.0250	0.1442	
E3 Sill	2.5000	0.0220	0.0550	
E4 Jamb	10.4800	0.0170	0.1782	
E16 Corner (normal)	2.6800	0.0420	0.1126	
E18 Party wall between dwellings	5.3600	0.0320	0.1715	
E25 Staggered party wall between dwellings	5.3600	0.0300	0.1608	
E15 Flat roof with parapet	12.9900	0.1320	1.7147	
E9 Balcony between dwellings, wall insulation continuous	6.2600	0.1500	0.9390	
E24 Eaves (insulation at ceiling level - inverted)	8.8400	0.1500	1.3260	
P4 Party wall - Roof (insulation at ceiling level)	3.5700	0.0400	0.1428	

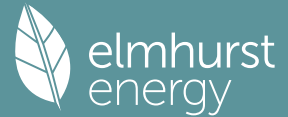
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.2411 (36)
Point Thermal Bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	28.0756 (37)

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	16.7245	16.5327	16.5327	15.9574	16.1492	14.9986	14.8069	14.8069	14.9986	15.7657	15.7657	15.9574	(38)
Average = Sum(39)m / 12 =	44.8001	44.6083	44.6083	44.0331	44.2248	43.0743	42.8825	42.8825	43.0743	43.8413	43.8413	44.0331	(39)
												43.8253	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.6103	0.6077	0.6077	0.5998	0.6024	0.5868	0.5842	0.5842	0.5868	0.5972	0.5972	0.5998	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3260 (42)
Hot water usage for mixer showers													
	63.2188	62.2688	60.8843	58.2355	56.2807	54.1008	52.8617	54.2356	55.7417	58.0823	60.7881	62.9766	(42a)
Hot water usage for baths													
	27.3094	26.9038	26.3327	25.2796	24.4910	23.6167	23.1444	23.7115	24.3290	25.2646	26.3394	27.2171	(42b)

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Hot water usage for other uses	38.4504	37.0522	35.6540	34.2558	32.8576	31.4594	31.4594	32.8576	34.2558	35.6540	37.0522	38.4504 (42c)
Average daily hot water use (litres/day)												118.5607 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	128.9786	126.2248	122.8710	117.7709	113.6294	109.1769	107.4655	110.8048	114.3266	119.0010	124.1797	128.6441 (44)
Energy content (annual)	204.2706	179.7424	188.8482	161.2225	152.9670	134.2457	129.9702	137.1995	140.9762	161.4833	176.9168	201.4255 (45)
Distribution loss (46)m = 0.15 x (45)m										Total =	Sum(45)m =	1969.2679
Water storage loss (or HIU loss):	30.6406	26.9614	28.3272	24.1834	22.9451	20.1369	19.4955	20.5799	21.1464	24.2225	26.5375	30.2138 (46)
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	67.9200	59.7644	62.7920	53.6065	50.8615	44.6367	43.2151	45.6188	46.8746	53.6932	58.8248	66.9740 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592	139.5592 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0335	20.4581	16.6377	12.5958	9.4155	7.9490	8.5891	11.1645	14.9849	19.0268	22.2071	23.6736 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	306.1514	309.3283	301.3227	284.2795	262.7657	242.5456	229.0374	225.8605	233.8662	250.9093	272.4232	292.6432 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819	51.2819 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395	-93.0395 (71)
Water heating gains (Table 5)	91.2903	88.9350	84.3979	74.4534	68.3623	61.9954	58.0848	61.3156	65.1036	72.1683	81.7012	90.0188 (72)
Total internal gains	518.2768	516.5231	500.1598	469.1304	438.3450	410.2916	393.5130	396.1423	411.7563	439.9060	474.1331	504.1373 (73)

6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d		Gains W
North						3.6800	9.3942	0.4000		0.0000	0.7700		10.6478 (74)
South						7.5200	41.2355	0.4000		0.0000	0.7700		95.5081 (78)
Solar gains	106.1559	181.3171	250.6009	306.9806	330.2024	334.2102	314.9500	287.8882	275.0128	208.1891	129.8386	93.4882 (83)	
Total gains	624.4327	697.8402	750.7607	776.1110	768.5475	744.5018	708.4630	684.0304	686.7691	648.0951	603.9717	597.6255 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	71.7335	72.0418	72.0418	72.9830	72.6666	74.6076	74.9412	74.9412	74.6076	73.3023	73.3023	72.9830
alpha	5.7822	5.8028	5.8028	5.8655	5.8444	5.9738	5.9961	5.9961	5.9738	5.8868	5.8868	5.8655
util living area	0.9003	0.8405	0.7492	0.6136	0.4632	0.3065	0.2239	0.2445	0.3942	0.6362	0.8324	0.9146 (86)
MIT	20.6511	20.7805	20.8941	20.9699	20.9947	20.9997	21.0000	20.9999	20.9985	20.9688	20.8279	20.6204 (87)
Th 2	20.4208	20.4231	20.4231	20.4302	20.4278	20.4419	20.4443	20.4443	20.4419	20.4325	20.4325	20.4302 (88)
util rest of house	0.8873	0.8227	0.7259	0.5854	0.4313	0.2743	0.1903	0.2096	0.3596	0.6034	0.8114	0.9031 (89)
MIT 2	20.0278	20.1826	20.3125	20.4013	20.4234	20.4417	20.4443	20.4443	20.4408	20.4037	20.2493	19.9993 (90)
Living area fraction	20.2725	20.4173	20.5408	20.6245	20.6477	20.6608	20.6624	20.6624	20.6597	20.6256	20.4765	20.2432 (92)
MIT	20.2725	20.4173	20.5408	20.6245	20.6477	20.6608	20.6624	20.6624	20.6597	20.6256	20.4765	20.2432 (93)
Temperature adjustment												0.0000
adjusted MIT	20.2725	20.4173	20.5408	20.6245	20.6477	20.6608	20.6624	20.6624	20.6597	20.6256	20.4765	20.2432 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8837	0.8226	0.7308	0.5951	0.4436	0.2869	0.2035	0.2233	0.3731	0.6147	0.8131	0.8990 (94)
Ext temp.	551.8383	574.0142	548.6450	461.8590	340.9425	213.5935	144.1811	152.7502	256.2613	398.3863	491.1145	537.2756 (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	675.2500	652.0550	586.1898	472.2322	342.6399	213.6815	144.1894	152.7650	256.7117	408.8462	551.3685	671.2027 (97)

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Space heating requirement - total per year (kWh/year)	91.8183	52.4434	27.9334	7.4687	1.2629	0.0000	0.0000	0.0000	0.0000	7.7822	43.3829	99.6418 (98a)
Solar heating kWh												331.7335
Space 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	91.8183	52.4434	27.9334	7.4687	1.2629	0.0000	0.0000	0.0000	0.0000	7.7822	43.3829	99.6418 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												331.7335
Space heating per m2										(98c) / (4) =		4.5189 (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)	91.8183	52.4434	27.9334	7.4687	1.2629	0.0000	0.0000	0.0000	0.0000	7.7822	43.3829	99.6418 (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)	91.8183	52.4434	27.9334	7.4687	1.2629	0.0000	0.0000	0.0000	0.0000	7.7822	43.3829	99.6418 (211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	231.2220	204.0856	215.7996	187.3045	179.9184	160.3277	156.9216	164.1509	167.0582	188.4347	202.9988	228.3769 (64)
Efficiency of water heater (217)m	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958	343.5958 (216)
Fuel for water heating, kWh/month	67.2948	59.3970	62.8062	54.5130	52.3634	46.6617	45.6704	47.7744	48.6205	54.8420	59.0807	66.4667 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	14.2622	12.8819	14.2622	13.8021	14.2622	13.8021	14.2622	14.2622	13.8021	14.2622	13.8021	14.2622 (231)
Lighting	20.1610	16.1739	14.5628	10.6694	8.2413	6.7332	7.5180	9.7722	12.6931	16.6540	18.8107	20.7214 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												331.7335 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												343.5958
Water heating fuel used												665.4910 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												167.9254 (230a)
mechanical ventilation fans (SFP = 0.7500)												167.9254 (231)
Total electricity for the above, kWh/year												162.7112 (232)
Electricity for lighting (calculated in Appendix L)												

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		1327.8611 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	331.7335	28.4300	94.3118 (240)
Space heating - main system 2	0.0000	28.4300	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	665.4910	28.4300	189.1991 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	167.9254	28.4300	47.7412 (249)
Energy for lighting	162.7112	28.4300	46.2588 (250)
Additional standing charges			0.0000 (251)
Total energy cost			377.5109 (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	331.7335	0.1589	52.7167 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	665.4910	0.1412	93.9543 (264)
Space and water heating			146.6710 (265)
Pumps, fans and electric keep-hot	167.9254	0.1387	23.2933 (267)
Energy for lighting	162.7112	0.1443	23.4843 (268)
Total CO2, kg/year			193.4485 (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	331.7335	1.5882	526.8602 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	665.4910	1.5220	1012.9091 (278)
Space and water heating			1539.7693 (279)
Pumps, fans and electric keep-hot	167.9254	1.5128	254.0375 (281)
Energy for lighting	162.7112	1.5338	249.5718 (282)
Total Primary energy kWh/year			2043.3787 (286)