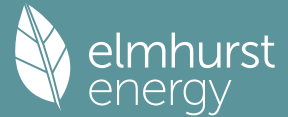


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Plot Reference	Plot 11				Issued on Date	22/12/2025	
Assessment Reference	Plot 11			Plot Type Ref			
Plot Address	Flat 4, 6 Cross Road Manchester, M21 9SA				SAP Version	10.2	
SAP Rating	90 B	DER	2.56	TER	9.88		
Environmental	98 A	% DER < TER				74.09	
CO ₂ Emissions (t/year)	0.16	DFEE	17.69	TFEE	18.79		
Compliance Check	See BREL	% DFEE < TFEE				5.88	
% DPER < TPER	47.99	DPER	27.12	TPER	52.14		
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	70.4200 (1b)	2.5000 (2b)	176.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	176.0500 (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	2.7100 (17)
Infiltration rate	0.1355 (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) = 0.1152 (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	0.1468	0.1440	0.1411	0.1267	0.1238	0.1094	0.1094	0.1065	0.1152	0.1238	0.1296	0.1353 (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	0.2868	0.2840	0.2811	0.2667	0.2638	0.2494	0.2494	0.2465	0.2552	0.2638	0.2696	0.2753 (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	32.9900	11.2000	21.7900	0.1800	3.9222	110.0000	2396.9002 (29a)
External Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100 (30)
Total net area of external elements Aum(A, m ²)			34.4800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 18.9942		(33)
Main dwelling							
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000 (32)
Corridor			24.7600	0.0000	0.0000	45.0000	1114.2000 (32)
Party Floor 1			70.4200			40.0000	2816.8000 (32d)
Party Ceiling			68.9300			30.0000	2067.9000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11802.0302 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.5949 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	21.4000	0.0370	0.7918
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	58.6600	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	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E14 Flat roof	3.2300	0.1600	0.5168
E9 Balcony between dwellings, wall insulation continuous	4.8800	0.1500	0.7320
E24 Eaves (insulation at ceiling level - inverted)	3.2300	0.1500	0.4845
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.3420 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	22.3362 (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	16.6649	16.4976	16.3303	15.4939	15.3266	14.4902	14.4902	14.3229	14.8248	15.3266	15.6612	15.9957	(38)
Heat transfer coeff	39.0011	38.8338	38.6665	37.8301	37.6628	36.8264	36.8264	36.6591	37.1610	37.6628	37.9974	38.3320	(39)
Average = Sum(39)m / 12 =												37.7883	
HLP	0.5538	0.5515	0.5491	0.5372	0.5348	0.5230	0.5230	0.5206	0.5277	0.5348	0.5396	0.5443	(40)
HLP (average)												0.5366	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2563 (42)
Hot water usage for mixer showers	62.0500	61.1175	59.7587	57.1588	55.2402	53.1006	51.8844	53.2329	54.7112	57.0085	59.6642	61.8123	(42a)
Hot water usage for baths	26.8068	26.4086	25.8480	24.8143	24.0403	23.1820	22.7184	23.2751	23.8813	24.7997	25.8547	26.7161	(42b)
Hot water usage for other uses	37.7365	36.3643	34.9921	33.6198	32.2476	30.8754	30.8754	32.2476	33.6198	34.9921	36.3643	37.7365	(42c)
Average daily hot water use (litres/day)												116.3681	(43)
Daily hot water use	126.5933	123.8905	120.5988	115.5930	111.5281	107.1579	105.4782	108.7556	112.2123	116.8002	121.8832	126.2650	(44)
Energy conte	200.4929	176.4184	185.3558	158.2410	150.1382	131.7632	127.5667	134.6622	138.3690	158.4968	173.6449	197.7004	(45)
Energy content (annual)										Total = Sum(45)m =		1932.8495	
Distribution loss (46)m = 0.15 x (45)m	30.0739	26.4628	27.8034	23.7362	22.5207	19.7645	19.1350	20.1993	20.7553	23.7745	26.0467	29.6551	(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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518	(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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2250.1805	(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	66.6639	58.6591	61.6308	52.6151	49.9210	43.8113	42.4159	44.7752	46.0077	52.7002	57.7369	65.7354	(65)

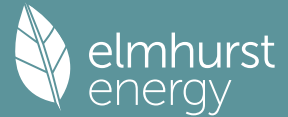
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.4591	115.6511	104.4591	107.9410	104.4591	107.9410	104.4591	104.4591	107.9410	104.4591	107.9410	104.4591	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2753	200.3328	195.1480	184.1102	170.1770	157.0818	148.3334	146.2759	151.4607	162.4984	176.4316	189.5269	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	(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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	(71)
Water heating gains (Table 5)	89.6020	87.2903	82.8371	73.0766	67.0981	60.8490	57.0106	60.1817	63.8996	70.8336	80.1902	88.3540	(72)
Total internal gains	449.1806	460.1184	439.2884	421.9720	398.5783	382.7160	366.6472	367.7608	380.1454	394.6353	421.4070	439.1841	(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	569.5181	660.4944	704.3304	740.1582	749.3239	729.4210	701.4615	677.8655	663.1853	613.3340	564.6301	542.8000 (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	84.0577	84.4198	84.7850	86.6596	87.0445	89.0214	89.0214	89.4277	88.2200	87.0445	86.2781	85.5250
alpha	6.6038	6.6280	6.6523	6.7773	6.8030	6.9348	6.9348	6.9618	6.8813	6.8030	6.7519	6.7017
util living area	0.9191	0.8439	0.7529	0.6091	0.4660	0.3230	0.2310	0.2488	0.3863	0.6274	0.8401	0.9317 (86)
MIT	20.6914	20.8362	20.9266	20.9833	20.9974	20.9998	21.0000	21.0000	20.9994	20.9832	20.8697	20.6655 (87)
Th 2	20.4717	20.4739	20.4760	20.4868	20.4890	20.4998	20.4998	20.5020	20.4955	20.4890	20.4847	20.4804 (88)
util rest of house	0.9084	0.8277	0.7320	0.5852	0.4408	0.2978	0.2047	0.2218	0.3582	0.5991	0.8212	0.9224 (89)
MIT 2	20.1207	20.2938	20.3990	20.4706	20.4868	20.4997	20.4998	20.5020	20.4951	20.4734	20.3451	20.0972 (90)
Living area fraction									fLA = Living area / (4) =			0.3989 (91)
MIT	20.3483	20.5101	20.6094	20.6751	20.6905	20.6992	20.6993	20.7006	20.6963	20.6768	20.5544	20.3239 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3483	20.5101	20.6094	20.6751	20.6905	20.6992	20.6993	20.7006	20.6963	20.6768	20.5544	20.3239 (93)

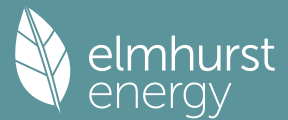
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9057	0.8288	0.7374	0.5940	0.4508	0.3079	0.2152	0.2326	0.3694	0.6096	0.8239	0.9193 (94)
Useful gains	515.8180	547.4294	519.3691	439.6625	337.7700	224.5685	150.9612	157.6530	244.9602	373.8619	465.2002	499.0020 (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	625.9022	606.2006	545.5626	445.4538	338.6068	224.6125	150.9640	157.6577	245.1241	379.5194	511.2308	618.0606 (97)
Space heating kWh	81.9027	39.4942	19.4880	4.1697	0.6226	0.0000	0.0000	0.0000	0.0000	4.2092	33.1421	88.5796 (98a)
Space heating requirement - total per year (kWh/year)												271.6080
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	81.9027	39.4942	19.4880	4.1697	0.6226	0.0000	0.0000	0.0000	0.0000	4.2092	33.1421	88.5796 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												271.6080
Space heating per m2										(98c) / (4) =		3.8570 (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	81.9027	39.4942	19.4880	4.1697	0.6226	0.0000	0.0000	0.0000	0.0000	4.2092	33.1421	88.5796 (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)	81.9027	39.4942	19.4880	4.1697	0.6226	0.0000	0.0000	0.0000	0.0000	4.2092	33.1421	88.5796 (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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518 (64)
Efficiency of water heater (217)m	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901 (216)
Fuel for water heating, kWh/month	66.0618	58.3118	61.6652	53.5371	51.4362	45.8466	44.8802	46.9411	47.7652	53.8639	58.0112	65.2507 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	13.6813	12.3573	13.6813	13.2399	13.6813	13.2399	13.6813	13.6813	13.2399	13.6813	13.2399	13.6813 (231)
Lighting	19.3244	15.5028	13.9585	10.2266	7.8993	6.4538	7.2060	9.3667	12.1664	15.9629	18.0301	19.8615 (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												271.6080 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												344.2901

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Water heating fuel used	653.5711 (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)	161.0857 (230a)
Total electricity for the above, kWh/year	161.0857 (231)
Electricity for lighting (calculated in Appendix L)	155.9590 (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	1242.2238 (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	271.6080	0.1596	43.3447 (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)	653.5711	0.1412	92.2672 (264)
Space and water heating			135.6119 (265)
Pumps, fans and electric keep-hot	161.0857	0.1387	22.3446 (267)
Energy for lighting	155.9590	0.1443	22.5097 (268)
Total CO2, kg/year			180.4662 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5600 (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	271.6080	1.5906	432.0326 (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)	653.5711	1.5220	994.7507 (278)
Space and water heating			1426.7833 (279)
Pumps, fans and electric keep-hot	161.0857	1.5128	243.6905 (281)
Energy for lighting	155.9590	1.5338	239.2151 (282)
Total Primary energy kWh/year			1909.6889 (286)
Dwelling Primary energy Rate (DPER)			27.1200 (287)

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

1. Overall dwelling characteristics

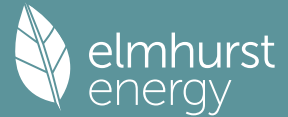
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	70.4200 (1b)	x 2.5000 (2b)	= 176.0500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	176.0500 (5)

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) = 0.1704 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4204 (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) = 0.3573 (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	0.4556	0.4467	0.4377	0.3931	0.3841	0.3395	0.3395	0.3305	0.3573	0.3841	0.4020	0.4199 (22b)
Effective ac	0.6038	0.5998	0.5958	0.5773	0.5738	0.5576	0.5576	0.5546	0.5638	0.5738	0.5808	0.5881 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
TER Opening Type			11.2000	1.1450	12.8244			(27)					
EXT Wall	32.9900	11.2000	21.7900	0.1800	3.9222			(29a)					
External Roof	1.4900		1.4900	0.1100	0.1639			(30)					
Total net area of external elements Aum(A, m2)			34.4800					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.9105			(33)					
Main dwelling													
Party Wall			53.8400	0.0000	0.0000			(32)					
Corridor			24.7600	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							167.5949	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E7 Party floor between dwellings (in blocks of flats)				21.4000	0.0700		1.4980						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				58.6600	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				2.6800	0.0600		0.1608						
E25 Staggered party wall between dwellings				8.0400	0.0600		0.4824						
E14 Flat roof				3.2300	0.0800		0.2584						
E9 Balcony between dwellings, wall insulation continuous				4.8800	0.0200		0.0976						
E24 Eaves (insulation at ceiling level - inverted)				3.2300	0.2400		0.7752						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.4511	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	21.3616	(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	35.0782	34.8441	34.6146	33.5365	33.3348	32.3959	32.3959	32.2220	32.7576	33.3348	33.7429	34.1694	(38)
Average = Sum(39)m / 12 =	56.4399	56.2057	55.9762	54.8982	54.6965	53.7576	53.7576	53.5837	54.1192	54.6965	55.1045	55.5311	(39)
												54.8972	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8015	0.7981	0.7949	0.7796	0.7767	0.7634	0.7634	0.7609	0.7685	0.7767	0.7825	0.7886	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

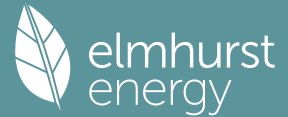
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2563	(42)
Hot water usage for mixer showers														
	62.0500	61.1175	59.7587	57.1588	55.2402	53.1006	51.8844	53.2329	54.7112	57.0085	59.6642	61.8123	(42a)	
Hot water usage for baths														
	26.8068	26.4086	25.8480	24.8143	24.0403	23.1820	22.7184	23.2751	23.8813	24.7997	25.8547	26.7161	(42b)	
Hot water usage for other uses														
	37.7365	36.3643	34.9921	33.6198	32.2476	30.8754	30.8754	32.2476	33.6198	34.9921	36.3643	37.7365	(42c)	
Average daily hot water use (litres/day)													116.3681	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	126.5933	123.8905	120.5988	115.5930	111.5281	107.1579	105.4782	108.7556	112.2123	116.8002	121.8832	126.2650	(44)	
Energy conte	200.4929	176.4184	185.3558	158.2410	150.1382	131.7632	127.5667	134.6622	138.3690	158.4968	173.6449	197.7004	(45)	
Energy content (annual)										Total = Sum(45)m =		1932.8495		
Distribution loss (46)m = 0.15 x (45)m														
	30.0739	26.4628	27.8034	23.7362	22.5207	19.7645	19.1350	20.1993	20.7553	23.7745	26.0467	29.6551	(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														
WWHRS	247.0878	218.5041	231.9507	203.3328	196.7331	176.8550	174.1616	181.2571	183.4608	205.0917	218.7368	244.2953	(62)	
PV diverter	-28.3667	-25.0877	-26.2704	-21.7529	-20.2730	-17.3477	-16.2607	-17.2916	-17.9486	-21.1594	-23.9711	-27.8414	(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														
	218.7211	193.4164	205.6803	181.5799	176.4602	159.5073	157.9009	163.9655	165.5122	183.9323	194.7657	216.4539	(64)	
12Total per year (kWh/year)													2217.8956	(64)
Electric shower(s)													2218	(64)
	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														
	103.9398	92.3277	98.9067	88.6886	87.1969	79.8847	79.6918	82.0511	82.0812	89.9761	93.8104	103.0113	(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	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	(66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	104.4591	115.6511	104.4591	107.9410	104.4591	107.9410	104.4591	104.4591	107.9410	104.4591	107.9410	104.4591	(67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	198.2753	200.3328	195.1480	184.1102	170.1770	157.0818	148.3334	146.2759	151.4607	162.4984	176.4316	189.5269	(68)	
Pumps, fans	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	(69)	
	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	

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Losses e.g. evaporation (negative values) (Table 5)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511 (71)
Water heating gains (Table 5)	139.7040	137.3924	132.9392	123.1786	117.2001	110.9510	107.1127	110.2837	114.0016	120.9356	130.2922	138.4561 (72)
Total internal gains	502.2826	513.2205	492.3904	475.0741	451.6804	432.8180	416.7493	417.8629	430.2475	447.7373	474.5091	492.2862 (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	621.6876	712.0435	755.3783	790.7943	799.7077	776.8360	748.9688	725.5642	711.0938	664.7411	616.6221	595.0990 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil, m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.0856	58.3276	58.5667	59.7168	59.9370	60.9838	60.9838	61.1817	60.5763	59.9370	59.4932	59.0362
alpha	4.8724	4.8885	4.9044	4.9811	4.9958	5.0656	5.0656	5.0788	5.0384	4.9958	4.9662	4.9357
util living area	0.9509	0.9127	0.8590	0.7529	0.6102	0.4389	0.3152	0.3388	0.5152	0.7624	0.9085	0.9577 (86)
MIT	20.2087	20.4251	20.6328	20.8440	20.9531	20.9929	20.9989	20.9985	20.9840	20.8593	20.5343	20.1797 (87)
Th 2	20.2521	20.2549	20.2578	20.2711	20.2736	20.2852	20.2852	20.2873	20.2807	20.2736	20.2685	20.2633 (88)
util rest of house	0.9425	0.8992	0.8386	0.7218	0.5688	0.3913	0.2643	0.2867	0.4648	0.7263	0.8923	0.9504 (89)
MIT 2	19.3436	19.6106	19.8621	20.1156	20.2327	20.2804	20.2847	20.2866	20.2690	20.1388	19.7589	19.3166 (90)
Living area fraction	19.6887	19.9355	20.1695	20.4061	20.5201	20.5646	20.5696	20.5705	20.5542	20.4262	20.0682	19.6609 (92)
MIT	19.6887	19.9355	20.1695	20.4061	20.5201	20.5646	20.5696	20.5705	20.5542	20.4262	20.0682	19.6609 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6887	19.9355	20.1695	20.4061	20.5201	20.5646	20.5696	20.5705	20.5542	20.4262	20.0682	19.6609 (93)

8. Space heating requirement

Utilisation	0.9352	0.8927	0.8359	0.7278	0.5831	0.4100	0.2846	0.3075	0.4842	0.7342	0.8873	0.9433 (94)
Useful gains	581.3829	635.6697	631.4498	575.5099	466.3244	318.5032	213.1311	223.0816	344.2827	488.0571	547.1586	561.3548 (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	868.5347	845.0801	765.1673	631.6666	482.4258	320.6418	213.3951	223.4726	349.2967	537.4586	714.6062	858.5581 (97)
Space heating kWh	213.6410	140.7238	99.4858	40.4328	11.9794	0.0000	0.0000	0.0000	0.0000	36.7547	120.5623	221.1192 (98a)
Space heating requirement - total per year (kWh/year)												884.6989
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	213.6410	140.7238	99.4858	40.4328	11.9794	0.0000	0.0000	0.0000	0.0000	36.7547	120.5623	221.1192 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												884.6989
Space heating per m ²										(98c) / (4) =		12.5632 (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	213.6410	140.7238	99.4858	40.4328	11.9794	0.0000	0.0000	0.0000	0.0000	36.7547	120.5623	221.1192 (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)	231.4637	152.4635	107.7853	43.8058	12.9787	0.0000	0.0000	0.0000	0.0000	39.8209	130.6200	239.5658 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	218.7211	193.4164	205.6803	181.5799	176.4602	159.5073	157.9009	163.9655	165.5122	183.9323	194.7657	216.4539 (64)
Efficiency of water heater (217)m	84.0071	83.3581	82.5268	81.3006	80.3175	79.8000	79.8000	79.8000	79.8000	81.1701	83.0170	79.8000 (216)
Fuel for water heating, kWh/month	260.3603	232.0307	249.2286	223.3437	219.7033	199.8838	197.8708	205.4705	207.4088	226.6009	234.6095	257.3534 (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	7.3041	7.3041	7.0685	7.3041 (231)
Lighting	21.7045	17.4122	15.6777	11.4862	8.8723	7.2487	8.0936	10.5203	13.6649	17.9290	20.2508	22.3078 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.8780	-27.9725	-42.2345	-49.9593	-56.0454	-53.1114	-52.4689	-48.4578	-41.7571	-33.0708	-21.2330	-16.1669 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.8992	-14.8260	-30.0585	-46.0237	-61.7205	-62.3304	-61.5919	-51.7460	-37.4053	-21.4814	-9.3003	-5.4323	(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												958.5037	(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												2713.8644	(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)												175.1680	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-870.1712	(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												3063.3649	(238)

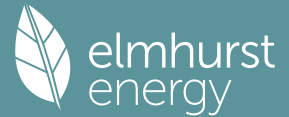
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	958.5037	0.2100	201.2858 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2713.8644	0.2100	569.9115 (264)
Space and water heating			771.1973 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	175.1680	0.1443	25.2822 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-461.3558	0.1336	-61.6149
PV Unit electricity exported	-408.8154	0.1253	-51.2398
Total			-112.8546 (269)
Total CO2, kg/year			695.5541 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8800 (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	958.5037	1.1300	1083.1091 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2713.8644	1.1300	3066.6668 (278)
Space and water heating			4149.7759 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	175.1680	1.5338	268.6785 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-461.3558	1.4935	-689.0468
PV Unit electricity exported	-408.8154	0.4600	-188.0743
Total			-877.1210 (283)
Total Primary energy kWh/year			3671.4342 (286)
Target Primary Energy Rate (TPER)			52.1400 (287)

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Plot Reference	Plot 11				Issued on Date	22/12/2025	
Assessment Reference	Plot 11			Plot Type Ref			
Plot Address	Flat 4, 6 Cross Road Manchester, M21 9SA				SAP Version	10.2	
SAP Rating	90 B	DER	2.56	TER	9.88		
Environmental	98 A	% DER < TER				74.09	
CO ₂ Emissions (t/year)	0.16	DFEE	17.69	TFEE	18.79		
Compliance Check	See BREL	% DFEE < TFEE				5.88	
% DPER < TPER	47.99	DPER	27.12	TPER	52.14		
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	70.4200 (1b)	2.5000 (2b)	176.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	176.0500 (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) = 0.1704 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	2.7100 (17)
Infiltration rate	0.3059 (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) = 0.2600 (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	0.3315	0.3250	0.3185	0.2860	0.2795	0.2470	0.2470	0.2405	0.2600	0.2795	0.2925	0.3055 (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	0.5550	0.5528	0.5507	0.5409	0.5391	0.5305	0.5305	0.5289	0.5338	0.5391	0.5428	0.5467 (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	32.9900	11.2000	21.7900	0.1800	3.9222	110.0000	2396.9002 (29a)
External Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100 (30)
Total net area of external elements Aum(A, m ²)			34.4800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.9942		(33)
Main dwelling							
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000 (32)
Corridor			24.7600	0.0000	0.0000	45.0000	1114.2000 (32)
Party Floor 1			70.4200			40.0000	2816.8000 (32d)
Party Ceiling			68.9300			30.0000	2067.9000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11802.0302 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.5949 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				21.4000	0.0370	0.7918	

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P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	58.6600	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	2.6800	0.0320	0.0858									
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412									
E14 Flat roof	3.2300	0.1600	0.5168									
E9 Balcony between dwellings, wall insulation continuous	4.8800	0.1500	0.7320									
E24 Eaves (insulation at ceiling level - inverted)	3.2300	0.1500	0.4845									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												3.3420 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 22.3362 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 32.2409	Feb 32.1169	Mar 31.9954	Apr 31.4246	May 31.3179	Jun 30.8207	Jul 30.8207	Aug 30.7287	Sep 31.0122	Oct 31.3179	Nov 31.5339	Dec 31.7598 (38)
Heat transfer coeff	54.5771	54.4532	54.3316	53.7609	53.6541	53.1569	53.1569	53.0649	53.3484	53.6541	53.8701	54.0960 (39)
Average = Sum(39)m / 12 =												53.7604
HLP	Jan 0.7750	Feb 0.7733	Mar 0.7715	Apr 0.7634	May 0.7619	Jun 0.7549	Jul 0.7549	Aug 0.7535	Sep 0.7576	Oct 0.7619	Nov 0.7650	Dec 0.7682 (40)
HLP (average)												0.7634
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.2563 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	26.8068	26.4086	25.8480	24.8143	24.0403	23.1820	22.7184	23.2751	23.8813	24.7997	25.8547	26.7161 (42b)
Hot water usage for other uses	37.7365	36.3643	34.9921	33.6198	32.2476	30.8754	30.8754	32.2476	33.6198	34.9921	36.3643	37.7365 (42c)
Average daily hot water use (litres/day)												59.1600 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	64.5433	62.7730	60.8401	58.4341	56.2879	54.0574	53.5938	55.5227	57.5011	59.7917	62.2190	64.4527 (44)
Energy conte	102.2208	89.3878	93.5089	79.9934	75.7743	66.4698	64.8170	68.7487	70.9046	81.1368	88.6423	100.9173 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss (or HIU loss):												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	86.8877	75.9797	79.4826	67.9944	64.4081	56.4994	55.0945	58.4364	60.2689	68.9663	75.3460	85.7797 (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	86.8877	75.9797	79.4826	67.9944	64.4081	56.4994	55.0945	58.4364	60.2689	68.9663	75.3460	85.7797 (64)
12Total per year (kWh/year)												835.1436 (64)
Electric shower(s)	49.6917	44.2757	48.3474	46.1373	47.0031	44.8364	46.3309	47.0031	46.1373	48.3474	47.4383	49.6917 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												565.2404 (64a)
Heat gains from water heating, kWh/month	34.1449	30.0639	31.9575	28.5329	27.8528	25.3339	25.3563	26.3599	26.6016	29.3284	30.6961	33.8679 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.4591	115.6511	104.4591	107.9410	104.4591	107.9410	104.4591	104.4591	107.9410	104.4591	107.9410	104.4591 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2753	200.3328	195.1480	184.1102	170.1770	157.0818	148.3334	146.2759	151.4607	162.4984	176.4316	189.5269 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814 (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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511 (71)
Water heating gains (Table 5)	45.8936	44.7379	42.9536	39.6291	37.4366	35.1860	34.0811	35.4299	36.9466	39.4199	42.6334	45.5213 (72)
Total internal gains	405.4722	417.5660	399.4049	388.5245	368.9168	357.0530	343.7177	343.0091	353.1925	363.2216	383.8503	396.3515 (73)

6. Solar gains												

[Jan]												
			Area	Solar flux	g	Specific data	FF		Access		Gains	
			m2	Table 6a	W/m2	or Table 6b	or Table 6c		factor		W	
									Table 6d			
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	525.8098	617.9419	664.4469	706.7107	719.6624	703.7580	678.5320	653.1137	636.2324	581.9203	527.0733	499.9673 (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	60.0680	60.2048	60.3395	60.9801	61.1015	61.6729	61.6729	61.7799	61.4515	61.1015	60.8564	60.6023
alpha	5.0045	5.0137	5.0226	5.0653	5.0734	5.1115	5.1115	5.1187	5.0968	5.0734	5.0571	5.0402
util living area	0.9720	0.9418	0.8962	0.7987	0.6562	0.4773	0.3437	0.3722	0.5630	0.8173	0.9431	0.9773 (86)
MIT	20.0919	20.3312	20.5634	20.8042	20.9391	20.9901	20.9985	20.9977	20.9775	20.8125	20.4275	20.0451 (87)
Th 2	20.2750	20.2766	20.2781	20.2851	20.2865	20.2926	20.2926	20.2938	20.2903	20.2865	20.2838	20.2810 (88)
util rest of house	0.9668	0.9319	0.8795	0.7699	0.6145	0.4267	0.2889	0.3158	0.5101	0.7848	0.9317	0.9730 (89)
MIT 2	19.4505	19.6833	19.9052	20.1304	20.2444	20.2873	20.2921	20.2929	20.2772	20.1430	19.7854	19.4096 (90)
Living area fraction									fLA = Living area /	(4) =		0.3989 (91)
MIT	19.7064	19.9417	20.1677	20.3992	20.5215	20.5677	20.5739	20.5740	20.5565	20.4100	20.0415	19.6631 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7064	19.9417	20.1677	20.3992	20.5215	20.5677	20.5739	20.5740	20.5565	20.4100	20.0415	19.6631 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9620	0.9268	0.8767	0.7747	0.6285	0.4465	0.3108	0.3383	0.5302	0.7908	0.9273	0.9685 (94)
Useful gains	505.8181	572.6827	582.4978	547.4796	452.3304	314.2338	210.8641	220.9165	337.3546	460.1663	488.7768	484.2360 (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	840.8352	819.0704	742.5906	618.2053	473.3094	317.2233	211.2378	221.4949	344.4461	526.3489	697.1603	836.4904 (97)
Space heating kWh	249.2527	165.5725	119.1090	50.9226	15.6084	0.0000	0.0000	0.0000	0.0000	49.2398	150.0361	262.0773 (98a)
Space heating requirement - total per year (kWh/year)												1061.8184
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	249.2527	165.5725	119.1090	50.9226	15.6084	0.0000	0.0000	0.0000	0.0000	49.2398	150.0361	262.0773 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1061.8184
Space heating per m2										(98c) / (4) =		15.0784 (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	499.6753	393.3614	403.2931	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9605	0.9823	0.9773	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	479.9361	386.4173	394.1482	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	779.9353	752.6109	724.9687	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	215.9995	272.4480	246.1304	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	53.9999	68.1120	61.5326	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												183.6445 (107)
Energy for space heating												15.0784 (99)
Energy for space cooling												2.6078 (108)
Total												17.6862 (109)
Fabric Energy Efficiency (DFEE)												17.7 (109)

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

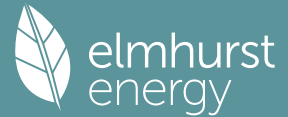
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	70.4200 (1b)	x 2.5000 (2b)	= 176.0500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	176.0500 (5)

2. Ventilation rate

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

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1704 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.4204 (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) = 0.3573 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4556	0.4467	0.4377	0.3931	0.3841	0.3395	0.3395	0.3305	0.3573	0.3841	0.4020	0.4199	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.6038	0.5998	0.5958	0.5773	0.5738	0.5576	0.5576	0.5546	0.5638	0.5738	0.5808	0.5881	(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	32.9900	11.2000	21.7900	0.1800	3.9222			(29a)
External Roof	1.4900		1.4900	0.1100	0.1639			(30)
Total net area of external elements Aum(A, m2)			34.4800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	16.9105		(33)
Main dwelling								
Party Wall			53.8400	0.0000	0.0000			(32)
Corridor			24.7600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 167.5949 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	21.4000	0.0700	1.4980	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	58.6600	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	2.6800	0.0600	0.1608	
E25 Staggered party wall between dwellings	8.0400	0.0600	0.4824	
E14 Flat roof	3.2300	0.0800	0.2584	
E9 Balcony between dwellings, wall insulation continuous	4.8800	0.0200	0.0976	
E24 Eaves (insulation at ceiling level - inverted)	3.2300	0.2400	0.7752	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.4511 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 21.3616 (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	
	35.0782	34.8441	34.6146	33.5365	33.3348	32.3959	32.3959	32.2220	32.7576	33.3348	33.7429	34.1694	(38)
Heat transfer coeff	56.4399	56.2057	55.9762	54.8982	54.6965	53.7576	53.7576	53.5837	54.1192	54.6965	55.1045	55.5311	(39)
Average = Sum(39)m / 12 =												54.8972	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.8015	0.7981	0.7949	0.7796	0.7767	0.7634	0.7634	0.7609	0.7685	0.7767	0.7825	0.7886	(40)
HLP (average)												0.7796	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2563 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

Hot water usage for baths 26.8068 26.4086 25.8480 24.8143 24.0403 23.1820 22.7184 23.2751 23.8813 24.7997 25.8547 26.7161 (42b)

Hot water usage for other uses 37.7365 36.3643 34.9921 33.6198 32.2476 30.8754 30.8754 32.2476 33.6198 34.9921 36.3643 37.7365 (42c)

Average daily hot water use (litres/day) 59.1600 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	64.5433	62.7730	60.8401	58.4341	56.2879	54.0574	53.5938	55.5227	57.5011	59.7917	62.2190	64.4527	(44)

Energy conte 102.2208 89.3878 93.5089 79.9934 75.7743 66.4698 64.8170 68.7487 70.9046 81.1368 88.6423 100.9173 (45)

Energy content (annual) Distribution loss (46)m = 0.15 x (45)m 982.5219

Water storage loss (or HIU loss): 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (46)

Total storage loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)

If cylinder contains dedicated solar storage 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)

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

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

Total heat required for water heating calculated for each month 86.8877 75.9797 79.4826 67.9944 64.4081 56.4994 55.0945 58.4364 60.2689 68.9663 75.3460 85.7797 (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 (64a)

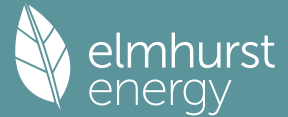
Output from w/h 86.8877 75.9797 79.4826 67.9944 64.4081 56.4994 55.0945 58.4364 60.2689 68.9663 75.3460 85.7797 (64)

Total per year (kWh/year) 835.1436 (64)

Electric shower(s) 49.6917 44.2757 48.3474 46.1373 47.0031 44.8364 46.3309 47.0031 46.1373 48.3474 47.4383 49.6917 (64a)

Heat gains from water heating, kWh/month 34.1449 30.0639 31.9575 28.5329 27.8528 25.3339 25.3563 26.3599 26.6016 29.3284 30.6961 33.8679 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.4591	115.6511	104.4591	107.9410	104.4591	107.9410	104.4591	104.4591	107.9410	104.4591	107.9410	104.4591 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2753	200.3328	195.1480	184.1102	170.1770	157.0818	148.3334	146.2759	151.4607	162.4984	176.4316	189.5269 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814 (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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511 (71)
Water heating gains (Table 5)	45.8936	44.7379	42.9536	39.6291	37.4366	35.1860	34.0811	35.4299	36.9466	39.4199	42.6334	45.5213 (72)
Total internal gains	405.4722	417.5660	399.4049	388.5245	368.9168	357.0530	343.7177	343.0091	353.1925	363.2216	383.8503	396.3515 (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	524.8771	616.3890	662.3928	704.2448	716.9442	701.0710	675.9372	650.7104	634.0388	580.2254	525.9633			499.1643 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.0856	58.3276	58.5667	59.7168	59.9370	60.9838	60.9838	61.1817	60.5763	59.9370	59.4932	59.0362
alpha	4.8724	4.8885	4.9044	4.9811	4.9958	5.0656	5.0656	5.0788	5.0384	4.9958	4.9662	4.9357
util living area	0.9736	0.9455	0.9029	0.8076	0.6670	0.4839	0.3488	0.3771	0.5714	0.8249	0.9458	0.9782 (86)
MIT	20.0282	20.2740	20.5181	20.7836	20.9308	20.9890	20.9983	20.9975	20.9747	20.7954	20.3922	19.9952 (87)
Th 2	20.2521	20.2549	20.2578	20.2711	20.2736	20.2852	20.2852	20.2873	20.2807	20.2736	20.2685	20.2633 (88)
util rest of house	0.9686	0.9360	0.8866	0.7789	0.6246	0.4322	0.2927	0.3194	0.5174	0.7926	0.9348	0.9741 (89)
MIT 2	19.3694	19.6101	19.8453	20.0996	20.2257	20.2793	20.2845	20.2863	20.2661	20.1166	19.7389	19.3462 (90)
Living area fraction	19.6322	19.8749	20.1137	20.3724	20.5070	20.5624	20.5692	20.5700	20.5488	20.3874	19.9995	19.6051 (92)
MIT	19.6322	19.8749	20.1137	20.3724	20.5070	20.5624	20.5692	20.5700	20.5488	20.3874	19.9995	19.6051 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6322	19.8749	20.1137	20.3724	20.5070	20.5624	20.5692	20.5700	20.5488	20.3874	19.9995	19.6051 (93)

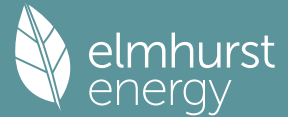
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9636	0.9305	0.8832	0.7831	0.6386	0.4524	0.3150	0.3424	0.5379	0.7980	0.9301	0.9696 (94)
Useful gains	505.7925	573.5684	584.9964	551.5096	457.8312	317.1936	212.9523	222.7995	341.0369	463.0027	489.2214	483.9860 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	865.3455	841.6761	762.0422	629.8147	481.7103	320.5239	213.3771	223.4443	349.0017	535.3348	710.8199	855.4618 (97)
Space heating kWh	267.5074	180.1684	131.7221	56.3797	17.7661	0.0000	0.0000	0.0000	0.0000	53.8151	159.5509	276.3779 (98a)
Space heating requirement - total per year (kWh/year)												1143.2876
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	267.5074	180.1684	131.7221	56.3797	17.7661	0.0000	0.0000	0.0000	0.0000	53.8151	159.5509	276.3779 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1143.2876
Space heating per m ²										(98c) / (4) =		16.2353 (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	505.3210	397.8059	407.2359	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9573	0.9806	0.9755	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	483.7295	390.1013	397.2488	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	776.7947	749.5780	722.1596	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	211.0070	267.4507	241.7336	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	52.7517	66.8627	60.4334	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												180.0478 (107)
Energy for space heating												16.2353 (99)
Energy for space cooling												2.5568 (108)
Total												18.7920 (109)
Fabric Energy Efficiency (TFEE)												18.8 (109)

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Plot Reference	Plot 11				Issued on Date	22/12/2025	
Assessment Reference	Plot 11			Plot Type Ref			
Plot Address	Flat 4, 6 Cross Road Manchester, M21 9SA				SAP Version	10.2	
SAP Rating	90 B	DER	2.56	TER	9.88		
Environmental	98 A	% DER < TER				74.09	
CO ₂ Emissions (t/year)	0.16	DFEE	17.69	TFEE	18.79		
Compliance Check	See BREL	% DFEE < TFEE				5.88	
% DPER < TPER	47.99	DPER	27.12	TPER	52.14		
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	70.4200 (1b)	2.5000 (2b)	176.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	176.0500 (5)

2. Ventilation rate

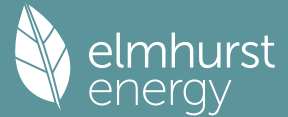
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	2.7100 (17)
Infiltration rate	0.1355 (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) = 0.1152 (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	0.1468	0.1440	0.1411	0.1267	0.1238	0.1094	0.1094	0.1065	0.1152	0.1238	0.1296	0.1353 (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	0.2868	0.2840	0.2811	0.2667	0.2638	0.2494	0.2494	0.2465	0.2552	0.2638	0.2696	0.2753 (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	32.9900	11.2000	21.7900	0.1800	3.9222	110.0000	2396.9002 (29a)
External Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100 (30)
Total net area of external elements Aum(A, m ²)			34.4800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 18.9942		(33)
Main dwelling							
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000 (32)
Corridor			24.7600	0.0000	0.0000	45.0000	1114.2000 (32)
Party Floor 1			70.4200			40.0000	2816.8000 (32d)
Party Ceiling			68.9300			30.0000	2067.9000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11802.0302 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.5949 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	21.4000	0.0370	0.7918
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	58.6600	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	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E14 Flat roof	3.2300	0.1600	0.5168
E9 Balcony between dwellings, wall insulation continuous	4.8800	0.1500	0.7320
E24 Eaves (insulation at ceiling level - inverted)	3.2300	0.1500	0.4845
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.3420 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	22.3362 (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	16.6649	16.4976	16.3303	15.4939	15.3266	14.4902	14.4902	14.3229	14.8248	15.3266	15.6612	15.9957	(38)
Heat transfer coeff	39.0011	38.8338	38.6665	37.8301	37.6628	36.8264	36.8264	36.6591	37.1610	37.6628	37.9974	38.3320	(39)
Average = Sum(39)m / 12 =												37.7883	
HLP	0.5538	0.5515	0.5491	0.5372	0.5348	0.5230	0.5230	0.5206	0.5277	0.5348	0.5396	0.5443	(40)
HLP (average)												0.5366	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2563 (42)
Hot water usage for mixer showers	62.0500	61.1175	59.7587	57.1588	55.2402	53.1006	51.8844	53.2329	54.7112	57.0085	59.6642	61.8123	(42a)
Hot water usage for baths	26.8068	26.4086	25.8480	24.8143	24.0403	23.1820	22.7184	23.2751	23.8813	24.7997	25.8547	26.7161	(42b)
Hot water usage for other uses	37.7365	36.3643	34.9921	33.6198	32.2476	30.8754	30.8754	32.2476	33.6198	34.9921	36.3643	37.7365	(42c)
Average daily hot water use (litres/day)												116.3681	(43)
Daily hot water use	126.5933	123.8905	120.5988	115.5930	111.5281	107.1579	105.4782	108.7556	112.2123	116.8002	121.8832	126.2650	(44)
Energy conte	200.4929	176.4184	185.3558	158.2410	150.1382	131.7632	127.5667	134.6622	138.3690	158.4968	173.6449	197.7004	(45)
Energy content (annual)										Total = Sum(45)m =		1932.8495	
Distribution loss (46)m = 0.15 x (45)m	30.0739	26.4628	27.8034	23.7362	22.5207	19.7645	19.1350	20.1993	20.7553	23.7745	26.0467	29.6551	(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	(58)
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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518	(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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2250.1805	(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	66.6639	58.6591	61.6308	52.6151	49.9210	43.8113	42.4159	44.7752	46.0077	52.7002	57.7369	65.7354	(65)

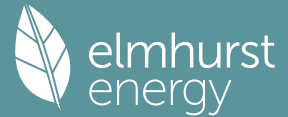
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.4591	115.6511	104.4591	107.9410	104.4591	107.9410	104.4591	104.4591	107.9410	104.4591	107.9410	104.4591	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2753	200.3328	195.1480	184.1102	170.1770	157.0818	148.3334	146.2759	151.4607	162.4984	176.4316	189.5269	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	(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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	(71)
Water heating gains (Table 5)	89.6020	87.2903	82.8371	73.0766	67.0981	60.8490	57.0106	60.1817	63.8996	70.8336	80.1902	88.3540	(72)
Total internal gains	449.1806	460.1184	439.2884	421.9720	398.5783	382.7160	366.6472	367.7608	380.1454	394.6353	421.4070	439.1841	(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	569.5181	660.4944	704.3304	740.1582	749.3239	729.4210	701.4615	677.8655	663.1853	613.3340	564.6301	542.8000 (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	84.0577	84.4198	84.7850	86.6596	87.0445	89.0214	89.0214	89.4277	88.2200	87.0445	86.2781	85.5250
alpha	6.6038	6.6280	6.6523	6.7773	6.8030	6.9348	6.9348	6.9618	6.8813	6.8030	6.7519	6.7017
util living area	0.9191	0.8439	0.7529	0.6091	0.4660	0.3230	0.2310	0.2488	0.3863	0.6274	0.8401	0.9317 (86)
MIT	20.6914	20.8362	20.9266	20.9833	20.9974	20.9998	21.0000	21.0000	20.9994	20.9832	20.8697	20.6655 (87)
Th 2	20.4717	20.4739	20.4760	20.4868	20.4890	20.4998	20.4998	20.5020	20.4955	20.4890	20.4847	20.4804 (88)
util rest of house	0.9084	0.8277	0.7320	0.5852	0.4408	0.2978	0.2047	0.2218	0.3582	0.5991	0.8212	0.9224 (89)
MIT 2	20.1207	20.2938	20.3990	20.4706	20.4868	20.4997	20.4998	20.5020	20.4951	20.4734	20.3451	20.0972 (90)
Living area fraction										fLA = Living area / (4) =		0.3989 (91)
MIT	20.3483	20.5101	20.6094	20.6751	20.6905	20.6992	20.6993	20.7006	20.6963	20.6768	20.5544	20.3239 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3483	20.5101	20.6094	20.6751	20.6905	20.6992	20.6993	20.7006	20.6963	20.6768	20.5544	20.3239 (93)

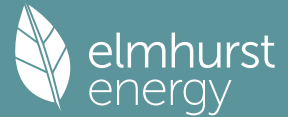
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9057	0.8288	0.7374	0.5940	0.4508	0.3079	0.2152	0.2326	0.3694	0.6096	0.8239	0.9193 (94)
Useful gains	515.8180	547.4294	519.3691	439.6625	337.7700	224.5685	150.9612	157.6530	244.9602	373.8619	465.2002	499.0020 (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	625.9022	606.2006	545.5626	445.4538	338.6068	224.6125	150.9640	157.6577	245.1241	379.5194	511.2308	618.0606 (97)
Space heating kWh	81.9027	39.4942	19.4880	4.1697	0.6226	0.0000	0.0000	0.0000	0.0000	4.2092	33.1421	88.5796 (98a)
Space heating requirement - total per year (kWh/year)												271.6080
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	81.9027	39.4942	19.4880	4.1697	0.6226	0.0000	0.0000	0.0000	0.0000	4.2092	33.1421	88.5796 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												271.6080
Space heating per m2										(98c) / (4) =		3.8570 (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	81.9027	39.4942	19.4880	4.1697	0.6226	0.0000	0.0000	0.0000	0.0000	4.2092	33.1421	88.5796 (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)	81.9027	39.4942	19.4880	4.1697	0.6226	0.0000	0.0000	0.0000	0.0000	4.2092	33.1421	88.5796 (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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518 (64)
Efficiency of water heater (217)m	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901 (216)
Fuel for water heating, kWh/month	66.0618	58.3118	61.6652	53.5371	51.4362	45.8466	44.8802	46.9411	47.7652	53.8639	58.0112	65.2507 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	13.6813	12.3573	13.6813	13.2399	13.6813	13.2399	13.6813	13.6813	13.2399	13.6813	13.2399	13.6813 (231)
Lighting	19.3244	15.5028	13.9585	10.2266	7.8993	6.4538	7.2060	9.3667	12.1664	15.9629	18.0301	19.8615 (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												271.6080 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												344.2901

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Water heating fuel used	653.5711 (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)	161.0857 (230a)
Total electricity for the above, kWh/year	161.0857 (231)
Electricity for lighting (calculated in Appendix L)	155.9590 (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	1242.2238 (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	271.6080	0.1596	43.3447 (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)	653.5711	0.1412	92.2672 (264)
Space and water heating			135.6119 (265)
Pumps, fans and electric keep-hot	161.0857	0.1387	22.3446 (267)
Energy for lighting	155.9590	0.1443	22.5097 (268)
Total CO2, kg/year			180.4662 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5600 (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	271.6080	1.5906	432.0326 (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)	653.5711	1.5220	994.7507 (278)
Space and water heating			1426.7833 (279)
Pumps, fans and electric keep-hot	161.0857	1.5128	243.6905 (281)
Energy for lighting	155.9590	1.5338	239.2151 (282)
Total Primary energy kWh/year			1909.6889 (286)
Dwelling Primary energy Rate (DPER)			27.1200 (287)

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

1. Overall dwelling characteristics

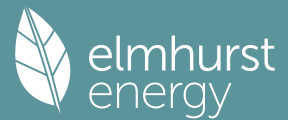
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	70.4200 (1b)	x 2.5000 (2b)	= 176.0500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	176.0500 (5)

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) = 0.1704 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4204 (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) = 0.3573 (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	0.4556	0.4467	0.4377	0.3931	0.3841	0.3395	0.3395	0.3305	0.3573	0.3841	0.4020	0.4199 (22b)
Effective ac	0.6038	0.5998	0.5958	0.5773	0.5738	0.5576	0.5576	0.5546	0.5638	0.5738	0.5808	0.5881 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Main dwelling													
TER Opening Type			11.2000	1.1450	12.8244			(27)					
EXT Wall	32.9900	11.2000	21.7900	0.1800	3.9222			(29a)					
External Roof	1.4900		1.4900	0.1100	0.1639			(30)					
Total net area of external elements Aum(A, m2)			34.4800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.9105			(33)					
Main dwelling													
Party Wall			53.8400	0.0000	0.0000			(32)					
Corridor			24.7600	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							167.5949	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E7 Party floor between dwellings (in blocks of flats)				21.4000	0.0700		1.4980						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				58.6600	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				2.6800	0.0600		0.1608						
E25 Staggered party wall between dwellings				8.0400	0.0600		0.4824						
E14 Flat roof				3.2300	0.0800		0.2584						
E9 Balcony between dwellings, wall insulation continuous				4.8800	0.0200		0.0976						
E24 Eaves (insulation at ceiling level - inverted)				3.2300	0.2400		0.7752						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.4511 (36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =		21.3616 (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	35.0782	34.8441	34.6146	33.5365	33.3348	32.3959	32.3959	32.2220	32.7576	33.3348	33.7429	34.1694	(38)
Average = Sum(39)m / 12 =	56.4399	56.2057	55.9762	54.8982	54.6965	53.7576	53.7576	53.5837	54.1192	54.6965	55.1045	55.5311	(39)
													54.8972
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8015	0.7981	0.7949	0.7796	0.7767	0.7634	0.7634	0.7609	0.7685	0.7767	0.7825	0.7886	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
													0.7796
													31

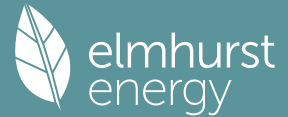
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2563 (42)
Hot water usage for mixer showers													
	62.0500	61.1175	59.7587	57.1588	55.2402	53.1006	51.8844	53.2329	54.7112	57.0085	59.6642	61.8123	(42a)
Hot water usage for baths													
	26.8068	26.4086	25.8480	24.8143	24.0403	23.1820	22.7184	23.2751	23.8813	24.7997	25.8547	26.7161	(42b)
Hot water usage for other uses													
	37.7365	36.3643	34.9921	33.6198	32.2476	30.8754	30.8754	32.2476	33.6198	34.9921	36.3643	37.7365	(42c)
Average daily hot water use (litres/day)													116.3681 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.5933	123.8905	120.5988	115.5930	111.5281	107.1579	105.4782	108.7556	112.2123	116.8002	121.8832	126.2650	(44)
Energy conte	200.4929	176.4184	185.3558	158.2410	150.1382	131.7632	127.5667	134.6622	138.3690	158.4968	173.6449	197.7004	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
	30.0739	26.4628	27.8034	23.7362	22.5207	19.7645	19.1350	20.1993	20.7553	23.7745	26.0467	29.6551	(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													
WWHRS	247.0878	218.5041	231.9507	203.3328	196.7331	176.8550	174.1616	181.2571	183.4608	205.0917	218.7368	244.2953	(62)
PV diverter	-28.3667	-25.0877	-26.2704	-21.7529	-20.2730	-17.3477	-16.2607	-17.2916	-17.9486	-21.1594	-23.9711	-27.8414	(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													
	218.7211	193.4164	205.6803	181.5799	176.4602	159.5073	157.9009	163.9655	165.5122	183.9323	194.7657	216.4539	(64)
12Total per year (kWh/year)													2217.8956 (64)
Electric shower(s)													2218 (64)
	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													
	103.9398	92.3277	98.9067	88.6886	87.1969	79.8847	79.6918	82.0511	82.0812	89.9761	93.8104	103.0113	(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	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	112.8139	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	104.4591	115.6511	104.4591	107.9410	104.4591	107.9410	104.4591	104.4591	107.9410	104.4591	107.9410	104.4591	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	198.2753	200.3328	195.1480	184.1102	170.1770	157.0818	148.3334	146.2759	151.4607	162.4984	176.4316	189.5269	(68)
Pumps, fans	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	34.2814	(69)
	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

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Losses e.g. evaporation (negative values) (Table 5)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511 (71)
Water heating gains (Table 5)	139.7040	137.3924	132.9392	123.1786	117.2001	110.9510	107.1127	110.2837	114.0016	120.9356	130.2922	138.4561 (72)
Total internal gains	502.2826	513.2205	492.3904	475.0741	451.6804	432.8180	416.7493	417.8629	430.2475	447.7373	474.5091	492.2862 (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	621.6876	712.0435	755.3783	790.7943	799.7077	776.8360	748.9688	725.5642	711.0938	664.7411	616.6221	595.0990	(84)										

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil, m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.0856	58.3276	58.5667	59.7168	59.9370	60.9838	60.9838	61.1817	60.5763	59.9370	59.4932	59.0362
alpha	4.8724	4.8885	4.9044	4.9811	4.9958	5.0656	5.0656	5.0788	5.0384	4.9958	4.9662	4.9357
util living area	0.9509	0.9127	0.8590	0.7529	0.6102	0.4389	0.3152	0.3388	0.5152	0.7624	0.9085	0.9577 (86)
MIT	20.2087	20.4251	20.6328	20.8440	20.9531	20.9929	20.9989	20.9985	20.9840	20.8593	20.5343	20.1797 (87)
Th 2	20.2521	20.2549	20.2578	20.2711	20.2736	20.2852	20.2852	20.2873	20.2807	20.2736	20.2685	20.2633 (88)
util rest of house	0.9425	0.8992	0.8386	0.7218	0.5688	0.3913	0.2643	0.2867	0.4648	0.7263	0.8923	0.9504 (89)
MIT 2	19.3436	19.6106	19.8621	20.1156	20.2327	20.2804	20.2847	20.2866	20.2690	20.1388	19.7589	19.3166 (90)
Living area fraction	19.6887	19.9355	20.1695	20.4061	20.5201	20.5646	20.5696	20.5705	20.5542	20.4262	20.0682	19.6609 (92)
MIT	19.6887	19.9355	20.1695	20.4061	20.5201	20.5646	20.5696	20.5705	20.5542	20.4262	20.0682	19.6609 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6887	19.9355	20.1695	20.4061	20.5201	20.5646	20.5696	20.5705	20.5542	20.4262	20.0682	19.6609 (93)

8. Space heating requirement

Utilisation	0.9352	0.8927	0.8359	0.7278	0.5831	0.4100	0.2846	0.3075	0.4842	0.7342	0.8873	0.9433 (94)
Useful gains	581.3829	635.6697	631.4498	575.5099	466.3244	318.5032	213.1311	223.0816	344.2827	488.0571	547.1586	561.3548 (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	868.5347	845.0801	765.1673	631.6666	482.4258	320.6418	213.3951	223.4726	349.2967	537.4586	714.6062	858.5581 (97)
Space heating kWh	213.6410	140.7238	99.4858	40.4328	11.9794	0.0000	0.0000	0.0000	0.0000	36.7547	120.5623	221.1192 (98a)
Space heating requirement - total per year (kWh/year)												884.6989
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	213.6410	140.7238	99.4858	40.4328	11.9794	0.0000	0.0000	0.0000	0.0000	36.7547	120.5623	221.1192 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												884.6989
Space heating per m ²										(98c) / (4) =		12.5632 (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	213.6410	140.7238	99.4858	40.4328	11.9794	0.0000	0.0000	0.0000	0.0000	36.7547	120.5623	221.1192 (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)	231.4637	152.4635	107.7853	43.8058	12.9787	0.0000	0.0000	0.0000	0.0000	39.8209	130.6200	239.5658 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	218.7211	193.4164	205.6803	181.5799	176.4602	159.5073	157.9009	163.9655	165.5122	183.9323	194.7657	216.4539 (64)
Efficiency of water heater (217)m	84.0071	83.3581	82.5268	81.3006	80.3175	79.8000	79.8000	79.8000	79.8000	81.1701	83.0170	79.8000 (216)
Fuel for water heating, kWh/month	260.3603	232.0307	249.2286	223.3437	219.7033	199.8838	197.8708	205.4705	207.4088	226.6009	234.6095	257.3534 (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	7.3041	7.3041	7.0685	7.3041 (231)
Lighting	21.7045	17.4122	15.6777	11.4862	8.8723	7.2487	8.0936	10.5203	13.6649	17.9290	20.2508	22.3078 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.8780	-27.9725	-42.2345	-49.9593	-56.0454	-53.1114	-52.4689	-48.4578	-41.7571	-33.0708	-21.2330	-16.1669 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.8992	-14.8260	-30.0585	-46.0237	-61.7205	-62.3304	-61.5919	-51.7460	-37.4053	-21.4814	-9.3003	-5.4323	(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												958.5037	(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												2713.8644	(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)												175.1680	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-870.1712	(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												3063.3649	(238)

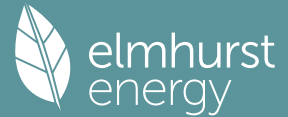
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	958.5037	0.2100	201.2858 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2713.8644	0.2100	569.9115 (264)
Space and water heating			771.1973 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	175.1680	0.1443	25.2822 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-461.3558	0.1336	-61.6149
PV Unit electricity exported	-408.8154	0.1253	-51.2398
Total			-112.8546 (269)
Total CO2, kg/year			695.5541 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8800 (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	958.5037	1.1300	1083.1091 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2713.8644	1.1300	3066.6668 (278)
Space and water heating			4149.7759 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	175.1680	1.5338	268.6785 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-461.3558	1.4935	-689.0468
PV Unit electricity exported	-408.8154	0.4600	-188.0743
Total			-877.1210 (283)
Total Primary energy kWh/year			3671.4342 (286)
Target Primary Energy Rate (TPER)			52.1400 (287)

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Plot Reference	Plot 11				Issued on Date	22/12/2025	
Assessment Reference	Plot 11			Plot Type Ref			
Plot Address	Flat 4, 6 Cross Road Manchester, M21 9SA				SAP Version	10.2	
SAP Rating	90 B	DER	2.56	TER	9.88		
Environmental	98 A	% DER < TER				74.09	
CO ₂ Emissions (t/year)	0.16	DFEE	17.69	TFEE	18.79		
Compliance Check	See BREL	% DFEE < TFEE				5.88	
% DPER < TPER	47.99	DPER	27.12	TPER	52.14		
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	70.4200 (1b)	2.5000 (2b)	176.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	176.0500 (5)

2. Ventilation rate

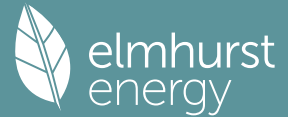
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	2.7100 (17)
Infiltration rate	0.1355 (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) = 0.1152 (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	0.1468	0.1440	0.1411	0.1267	0.1238	0.1094	0.1094	0.1065	0.1152	0.1238	0.1296	0.1353 (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	0.2868	0.2840	0.2811	0.2667	0.2638	0.2494	0.2494	0.2465	0.2552	0.2638	0.2696	0.2753 (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	32.9900	11.2000	21.7900	0.1800	3.9222	110.0000	2396.9002 (29a)
External Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100 (30)
Total net area of external elements Aum(A, m ²)			34.4800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 18.9942		(33)
Main dwelling							
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000 (32)
Corridor			24.7600	0.0000	0.0000	45.0000	1114.2000 (32)
Party Floor 1			70.4200			40.0000	2816.8000 (32d)
Party Ceiling			68.9300			30.0000	2067.9000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11802.0302 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							167.5949 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	21.4000	0.0370	0.7918
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	58.6600	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	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E14 Flat roof	3.2300	0.1600	0.5168
E9 Balcony between dwellings, wall insulation continuous	4.8800	0.1500	0.7320
E24 Eaves (insulation at ceiling level - inverted)	3.2300	0.1500	0.4845
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.3420 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	22.3362 (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	16.6649	16.4976	16.3303	15.4939	15.3266	14.4902	14.4902	14.3229	14.8248	15.3266	15.6612	15.9957	(38)
Heat transfer coeff	39.0011	38.8338	38.6665	37.8301	37.6628	36.8264	36.8264	36.6591	37.1610	37.6628	37.9974	38.3320	(39)
Average = Sum(39)m / 12 =												37.7883	
HLP	0.5538	0.5515	0.5491	0.5372	0.5348	0.5230	0.5230	0.5206	0.5277	0.5348	0.5396	0.5443	(40)
HLP (average)												0.5366	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2563 (42)
Hot water usage for mixer showers	62.0500	61.1175	59.7587	57.1588	55.2402	53.1006	51.8844	53.2329	54.7112	57.0085	59.6642	61.8123	(42a)
Hot water usage for baths	26.8068	26.4086	25.8480	24.8143	24.0403	23.1820	22.7184	23.2751	23.8813	24.7997	25.8547	26.7161	(42b)
Hot water usage for other uses	37.7365	36.3643	34.9921	33.6198	32.2476	30.8754	30.8754	32.2476	33.6198	34.9921	36.3643	37.7365	(42c)
Average daily hot water use (litres/day)												116.3681	(43)
Daily hot water use	126.5933	123.8905	120.5988	115.5930	111.5281	107.1579	105.4782	108.7556	112.2123	116.8002	121.8832	126.2650	(44)
Energy conte	200.4929	176.4184	185.3558	158.2410	150.1382	131.7632	127.5667	134.6622	138.3690	158.4968	173.6449	197.7004	(45)
Energy content (annual)										Total = Sum(45)m =		1932.8495	
Distribution loss (46)m = 0.15 x (45)m	30.0739	26.4628	27.8034	23.7362	22.5207	19.7645	19.1350	20.1993	20.7553	23.7745	26.0467	29.6551	(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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518	(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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518	(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	66.6639	58.6591	61.6308	52.6151	49.9210	43.8113	42.4159	44.7752	46.0077	52.7002	57.7369	65.7354	(65)

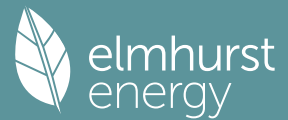
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0776	19.6091	15.9472	12.0731	9.0248	7.6191	8.2327	10.7012	14.3631	18.2372	21.2855	22.6912	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.9333	299.0042	291.2657	274.7914	253.9956	234.4504	221.3931	218.3222	226.0607	242.5350	263.3308	282.8760	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	(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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	(71)
Water heating gains (Table 5)	89.6020	87.2903	82.8371	73.0766	67.0981	60.8490	57.0106	60.1817	63.8996	70.8336	80.1902	88.3540	(72)
Total internal gains	503.5324	501.8232	485.9696	455.8606	426.0379	398.8380	382.5559	385.1246	400.2428	427.5253	460.7260	489.8407	(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	623.8700	702.1991	751.0115	774.0468	776.7835	745.5430	717.3702	695.2293	683.2827	646.2240	603.9491	593.4565 (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	84.0577	84.4198	84.7850	86.6596	87.0445	89.0214	89.0214	89.4277	88.2200	87.0445	86.2781	85.5250
alpha	6.6038	6.6280	6.6523	6.7773	6.8030	6.9348	6.9348	6.9618	6.8813	6.8030	6.7519	6.7017
util living area	0.8864	0.8134	0.7162	0.5844	0.4498	0.3161	0.2259	0.2425	0.3750	0.5980	0.8059	0.9028 (86)
MIT	20.7628	20.8695	20.9450	20.9869	20.9979	20.9999	21.0000	21.0000	20.9995	20.9873	20.8995	20.7382 (87)
Th 2	20.4717	20.4739	20.4760	20.4868	20.4890	20.4998	20.4998	20.5020	20.4955	20.4890	20.4847	20.4804 (88)
util rest of house	0.8732	0.7960	0.6950	0.5610	0.4254	0.2914	0.2002	0.2163	0.3477	0.5705	0.7855	0.8910 (89)
MIT 2	20.2055	20.3318	20.4188	20.4742	20.4872	20.4997	20.4998	20.5020	20.4952	20.4773	20.3784	20.1844 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.4278	20.5463	20.6287	20.6787	20.6909	20.6992	20.6993	20.7006	20.6964	20.6807	20.5863	20.4053 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4278	20.5463	20.6287	20.6787	20.6909	20.6992	20.6993	20.7006	20.6964	20.6807	20.5863	20.4053 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8720	0.7984	0.7013	0.5698	0.4351	0.3012	0.2104	0.2268	0.3586	0.5809	0.7896	0.8891 (94)
Useful gains	544.0259	560.6675	526.6603	441.0473	337.9501	224.5749	150.9616	157.6538	244.9913	375.3995	476.8903	527.6666 (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	629.0023	607.6047	546.3077	445.5887	338.6241	224.6132	150.9641	157.6578	245.1271	379.6690	512.4428	621.1821 (97)
Space heating kWh	63.2225	31.5418	14.6177	3.2698	0.5015	0.0000	0.0000	0.0000	0.0000	3.1765	25.5978	69.5755 (98a)
Space heating requirement - total per year (kWh/year)												211.5031
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	63.2225	31.5418	14.6177	3.2698	0.5015	0.0000	0.0000	0.0000	0.0000	3.1765	25.5978	69.5755 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												211.5031
Space heating per m2												(98c) / (4) = 3.0035 (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	63.2225	31.5418	14.6177	3.2698	0.5015	0.0000	0.0000	0.0000	0.0000	3.1765	25.5978	69.5755	(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)	63.2225	31.5418	14.6177	3.2698	0.5015	0.0000	0.0000	0.0000	0.0000	3.1765	25.5978	69.5755	(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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518	(64)
Efficiency of water heater (217)m	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	(216)
Fuel for water heating, kWh/month	66.0618	58.3118	61.6652	53.5371	51.4362	45.8466	44.8802	46.9411	47.7652	53.8639	58.0112	65.2507	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.6813	12.3573	13.6813	13.2399	13.6813	13.2399	13.6813	13.6813	13.2399	13.6813	13.2399	13.6813	(231)
Lighting	19.3244	15.5028	13.9585	10.2266	7.8993	6.4538	7.2060	9.3667	12.1664	15.9629	18.0301	19.8615	(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													211.5031 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													344.2901
Water heating fuel used													653.5711 (219)

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Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)		
mechanical ventilation fans (SFP = 0.7500)	161.0857	(230a)
Total electricity for the above, kWh/year	161.0857	(231)
Electricity for lighting (calculated in Appendix L)	155.9590	(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	1182.1189	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	211.5031	16.4900	34.8769 (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)	653.5711	16.4900	107.7739 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	161.0857	16.4900	26.5630 (249)
Energy for lighting	155.9590	16.4900	25.7176 (250)
Additional standing charges			0.0000 (251)
Total energy cost			194.9314 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6080 (257)
SAP value	90.1443	
SAP rating (Section 12)	90	(258)
SAP band	B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	211.5031	0.1596	33.7603 (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)	653.5711	0.1412	92.2672 (264)
Space and water heating			126.0275 (265)
Pumps, fans and electric keep-hot	161.0857	0.1387	22.3446 (267)
Energy for lighting	155.9590	0.1443	22.5097 (268)
Total CO2, kg/year			170.8818 (272)
CO2 emissions per m2			2.4300 (273)
EI value			98.0161
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

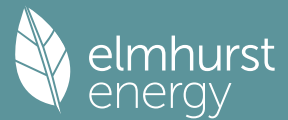
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	70.4200 (1b)	x 2.5000 (2b)	= 176.0500 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	176.0500 (5)

2. Ventilation rate

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

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Measured/design AP50												2.7100 (17)
Infiltration rate												0.1355 (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) = 0.1152 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.3000	4.2000	4.2000	3.9000	4.0000	3.4000	3.3000	3.3000	3.4000	3.8000	3.8000	3.9000 (22)
Adj infilt rate	1.0750	1.0500	1.0500	0.9750	1.0000	0.8500	0.8250	0.8250	0.8500	0.9500	0.9500	0.9750 (22a)
Balanced mechanical ventilation with heat recovery	0.1238	0.1209	0.1209	0.1123	0.1152	0.0979	0.0950	0.0950	0.0979	0.1094	0.1094	0.1123 (22b)
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.2638	0.2609	0.2609	0.2523	0.2552	0.2379	0.2350	0.2350	0.2379	0.2494	0.2494	0.2523 (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	32.9900	11.2000	21.7900	0.1800	3.9222	110.0000	2396.9002 (29a)
External Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100 (30)
Total net area of external elements Aum(A, m2)			34.4800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		18.9942		(33)
Main dwelling							
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000 (32)
Corridor			24.7600	0.0000	0.0000	45.0000	1114.2000 (32)
Party Floor 1			70.4200			40.0000	2816.8000 (32d)
Party Ceiling			68.9300			30.0000	2067.9000 (32b)
Internal Wall			107.7800			9.0000	970.0200 (32c)
Heat capacity Cm = Sum(A x k)							(28) ... (30) + (32) + (32a) ... (32e) = 11802.0302 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							167.5949 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)				21.4000	0.0370	0.7918	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				58.6600	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				2.6800	0.0320	0.0858	
E25 Staggered party wall between dwellings				8.0400	0.0300	0.2412	
E14 Flat roof				3.2300	0.1600	0.5168	
E9 Balcony between dwellings, wall insulation continuous				4.8800	0.1500	0.7320	
E24 Eaves (insulation at ceiling level - inverted)				3.2300	0.1500	0.4845	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.3420 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	22.3362 (37)

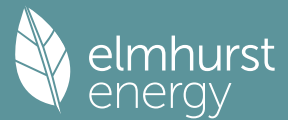
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	15.3266	15.1593	15.1593	14.6575	14.8248	13.8211	13.6538	13.6538	13.8211	14.4902	14.4902	14.6575 (38)
Average = Sum(39)m / 12 =	37.6628	37.4956	37.4956	36.9937	37.1610	36.1573	35.9900	35.9900	36.1573	36.8264	36.8264	36.9937 (39)
												36.8125
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.5348	0.5325	0.5325	0.5253	0.5277	0.5135	0.5111	0.5111	0.5135	0.5230	0.5230	0.5253 (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													2.2563 (42)
Hot water usage for mixer showers													
	62.0500	61.1175	59.7587	57.1588	55.2402	53.1006	51.8844	53.2329	54.7112	57.0085	59.6642	61.8123	(42a)
Hot water usage for baths													
	26.8068	26.4086	25.8480	24.8143	24.0403	23.1820	22.7184	23.2751	23.8813	24.7997	25.8547	26.7161	(42b)
Hot water usage for other uses													
	37.7365	36.3643	34.9921	33.6198	32.2476	30.8754	30.8754	32.2476	33.6198	34.9921	36.3643	37.7365	(42c)
Average daily hot water use (litres/day)													116.3681 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	126.5933	123.8905	120.5988	115.5930	111.5281	107.1579	105.4782	108.7556	112.2123	116.8002	121.8832	126.2650	(44)
Energy conte	200.4929	176.4184	185.3558	158.2410	150.1382	131.7632	127.5667	134.6622	138.3690	158.4968	173.6449	197.7004	(45)
Energy content (annual)										Total =	Sum(45)m =	1932.8495	
Distribution loss (46)m = 0.15 x (45)m													
	30.0739	26.4628	27.8034	23.7362	22.5207	19.7645	19.1350	20.1993	20.7553	23.7745	26.0467	29.6551	(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													
	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													

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227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518 (64)
Total per year (kWh/year) = Sum(64)m =											2250.1805 (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											
66.6639	58.6591	61.6308	52.6151	49.9210	43.8113	42.4159	44.7752	46.0077	52.7002	57.7369	65.7354 (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	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	22.0776	19.6091	15.9472	12.0731	9.0248	7.6191	8.2327	10.7012	14.3631	18.2372	21.2855	22.6912 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	295.9333	299.0042	291.2657	274.7914	253.9956	234.4504	221.3931	218.3222	226.0607	242.5350	263.3308	282.8760 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939 (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)												
	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511 (71)
Water heating gains (Table 5)												
	89.6020	87.2903	82.8371	73.0766	67.0981	60.8490	57.0106	60.1817	63.8996	70.8336	80.1902	88.3540 (72)
Total internal gains												
	503.5324	501.8232	485.9696	455.8606	426.0379	398.8380	382.5559	385.1246	400.2428	427.5253	460.7260	489.8407 (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	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	609.6883	683.1403	736.5704	762.8412	756.2403	733.0482	697.5059	673.0127	675.2556	635.7144	590.5647	583.3289 (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	87.0445	87.4328	87.4328	88.6189	88.2200	90.6689	91.0903	91.0903	90.6689	89.0214	89.0214	88.6189
alpha	6.8030	6.8289	6.8289	6.9079	6.8813	7.0446	7.0727	7.0727	7.0446	6.9348	6.9348	6.9079
util living area												
	0.8610	0.7814	0.6740	0.5348	0.3976	0.2614	0.1909	0.2086	0.3372	0.5573	0.7708	0.8798 (86)
MIT												
	20.8299	20.9122	20.9672	20.9936	20.9992	21.0000	21.0000	21.0000	20.9998	20.9929	20.9338	20.8086 (87)
Th 2												
	20.4890	20.4912	20.4912	20.4977	20.4955	20.5085	20.5107	20.5107	20.5085	20.4998	20.4998	20.4977 (88)
util rest of house												
	0.8456	0.7623	0.6519	0.5114	0.3730	0.2372	0.1657	0.1824	0.3110	0.5298	0.7486	0.8659 (89)
MIT 2												
	20.3014	20.3973	20.4579	20.4916	20.4949	20.5085	20.5107	20.5107	20.5084	20.4935	20.4314	20.2846 (90)
Living area fraction												
	20.5122	20.6027	20.6610	20.6919	20.6961	20.7045	20.7059	20.7059	20.7044	20.6927	20.6318	20.4936 (91)
Temperature adjustment												
	20.5122	20.6027	20.6610	20.6919	20.6961	20.7045	20.7059	20.7059	20.7044	20.6927	20.6318	20.4936 (92)
adjusted MIT												
	20.5122	20.6027	20.6610	20.6919	20.6961	20.7045	20.7059	20.7059	20.7044	20.6927	20.6318	20.4936 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8463	0.7665	0.6593	0.5205	0.3828	0.2468	0.1757	0.1928	0.3214	0.5404	0.7546	0.8657 (94)
Useful gains	516.0026	523.6568	485.6563	397.0457	289.4665	180.9437	122.5769	129.7744	217.0540	343.5649	445.6434	505.0094 (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												
	576.7000	555.0359	497.2301	399.2307	289.7091	180.9508	122.5773	129.7753	217.1037	345.9003	468.8669	573.1666 (97)
Space heating kWh												
	45.1588	21.0868	8.6109	1.5732	0.1805	0.0000	0.0000	0.0000	0.0000	1.7375	16.7209	50.7089 (98a)
Space heating requirement - total per year (kWh/year)												
												145.7776
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												
	45.1588	21.0868	8.6109	1.5732	0.1805	0.0000	0.0000	0.0000	0.0000	1.7375	16.7209	50.7089 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
												145.7776
Space heating per m ²												
										(98c) / (4) =		2.0701 (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												
	45.1588	21.0868	8.6109	1.5732	0.1805	0.0000	0.0000	0.0000	0.0000	1.7375	16.7209	50.7089 (98)
Space heating efficiency (main heating system 1)												
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)

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Space heating fuel (main heating system)	45.1588	21.0868	8.6109	1.5732	0.1805	0.0000	0.0000	0.0000	0.0000	1.7375	16.7209	50.7089	(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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518	(64)
Efficiency of water heater (217)m	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	(216)
Fuel for water heating, kWh/month	66.0618	58.3118	61.6652	53.5371	51.4362	45.8466	44.8802	46.9411	47.7652	53.8639	58.0112	65.2507	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.6813	12.3573	13.6813	13.2399	13.6813	13.2399	13.6813	13.6813	13.2399	13.6813	13.2399	13.6813	(231)
Lighting	19.3244	15.5028	13.9585	10.2266	7.8993	6.4538	7.2060	9.3667	12.1664	15.9629	18.0301	19.8615	(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												145.7776	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												344.2901	
Water heating fuel used												653.5711	(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)												161.0857	(230a)
Total electricity for the above, kWh/year												161.0857	(231)
Electricity for lighting (calculated in Appendix L)												155.9590	(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												1116.3934	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	145.7776	28.4300	41.4446	(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)	653.5711	28.4300	185.8103	(247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000	(247a)
Pumps, fans and electric keep-hot	161.0857	28.4300	45.7967	(249)
Energy for lighting	155.9590	28.4300	44.3391	(250)
Additional standing charges			0.0000	(251)
Total energy cost			317.3906	(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	145.7776	0.1600	23.3278	(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)	653.5711	0.1412	92.2672	(264)
Space and water heating			115.5950	(265)
Pumps, fans and electric keep-hot	161.0857	0.1387	22.3446	(267)
Energy for lighting	155.9590	0.1443	22.5097	(268)
Total CO2, kg/year			160.4493	(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	145.7776	1.5923	232.1146	(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)	653.5711	1.5220	994.7507	(278)
Space and water heating			1226.8652	(279)
Pumps, fans and electric keep-hot	161.0857	1.5128	243.6905	(281)
Energy for lighting	155.9590	1.5338	239.2151	(282)
Total Primary energy kWh/year			1709.7709	(286)

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SAP 10 EPC IMPROVEMENTS

Plot 11

Current energy efficiency rating: B 90
Current environmental impact rating: A 98

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

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

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

Potential energy efficiency rating: B 90
Potential environmental impact rating: A 98

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

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

	Current	Potential	Saving
Electricity	£317	£317	£0
Space heating	£87	£87	£0
Water heating	£186	£186	£0
Lighting	£44	£44	£0
Total cost of fuels	£317	£317	£0
Total cost of uses	£317	£317	£0
Delivered energy	16 kWh/m²	16 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	24 kWh/m²	24 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	70.4200 (1b)	x 2.5000 (2b)	= 176.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.0500 (5)

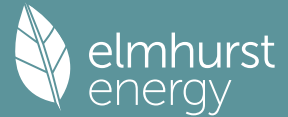
2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		2.7100 (17)	
Infiltration rate		0.1355 (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) =	0.1152 (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	0.1468	0.1440	0.1411	0.1267	0.1238	0.1094	0.1094	0.1065	0.1152	0.1238	0.1296	0.1353 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)

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Effective ac 0.2868 0.2840 0.2811 0.2667 0.2638 0.2494 0.2494 0.2465 0.2552 0.2638 0.2696 0.2753 (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	32.9900	11.2000	21.7900	0.1800	3.9222	110.0000	2396.9002	(29a)
External Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100	(30)
Total net area of external elements Aum(A, m2)			34.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.9942			(33)
Main dwelling								
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000	(32)
Corridor			24.7600	0.0000	0.0000	45.0000	1114.2000	(32)
Party Floor 1			70.4200			40.0000	2816.8000	(32d)
Party Ceiling			68.9300			30.0000	2067.9000	(32b)
Internal Wall			107.7800			9.0000	970.0200	(32c)

Heat capacity Cm = Sum(A x k)

(28)...(30) + (32) + (32a)...(32e) = 11802.0302 (34)

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

167.5949 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	21.4000	0.0370	0.7918
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	58.6600	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	2.6800	0.0320	0.0858
E25 Staggered party wall between dwellings	8.0400	0.0300	0.2412
E14 Flat roof	3.2300	0.1600	0.5168
E9 Balcony between dwellings, wall insulation continuous	4.8800	0.1500	0.7320
E24 Eaves (insulation at ceiling level - inverted)	3.2300	0.1500	0.4845

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

3.3420 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 22.3362 (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	16.6649	16.4976	16.3303	15.4939	15.3266	14.4902	14.4902	14.3229	14.8248	15.3266	15.6612	15.9957
Heat transfer coeff	39.0011	38.8338	38.6665	37.8301	37.6628	36.8264	36.8264	36.6591	37.1610	37.6628	37.9974	38.3320
Average = Sum(39)m / 12 =												37.7883

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.5538	0.5515	0.5491	0.5372	0.5348	0.5230	0.5230	0.5206	0.5277	0.5348	0.5396	0.5443
HLP (average)												0.5366
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

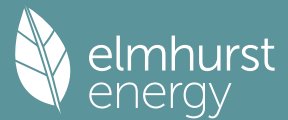
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2563	(42)
Hot water usage for mixer showers													
62.0500	61.1175	59.7587	57.1588	55.2402	53.1006	51.8844	53.2329	54.7112	57.0085	59.6642	61.8123	61.8123	(42a)
Hot water usage for baths													
26.8068	26.4086	25.8480	24.8143	24.0403	23.1820	22.7184	23.2751	23.8813	24.7997	25.8547	26.7161	26.7161	(42b)
Hot water usage for other uses													
37.7365	36.3643	34.9921	33.6198	32.2476	30.8754	30.8754	32.2476	33.6198	34.9921	36.3643	37.7365	37.7365	(42c)
Average daily hot water use (litres/day)												116.3681	(43)
Daily hot water use													
126.5933	123.8905	120.5988	115.5930	111.5281	107.1579	105.4782	108.7556	112.2123	116.8002	121.8832	126.2650	126.2650	(44)
Energy conte	200.4929	176.4184	185.3558	158.2410	150.1382	131.7632	127.5667	134.6622	138.3690	158.4968	173.6449	197.7004	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
30.0739	26.4628	27.8034	23.7362	22.5207	19.7645	19.1350	20.1993	20.7553	23.7745	26.0467	29.6551	29.6551	(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	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	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													
227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518	224.6518	(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													
227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518	224.6518	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
66.6639	58.6591	61.6308	52.6151	49.9210	43.8113	42.4159	44.7752	46.0077	52.7002	57.7369	65.7354	65.7354	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
22.0776	19.6091	15.9472	12.0731	9.0248	7.6191	8.2327	10.7012	14.3631	18.2372	21.2855	22.6912	22.6912	(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.9333	299.0042	291.2657	274.7914	253.9956	234.4504	221.3931	218.3222	226.0607	242.5350	263.3308	282.8760 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939 (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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511 (71)
Water heating gains (Table 5)	89.6020	87.2903	82.8371	73.0766	67.0981	60.8490	57.0106	60.1817	63.8996	70.8336	80.1902	88.3540 (72)
Total internal gains	503.5324	501.8232	485.9696	455.8606	426.0379	398.8380	382.5559	385.1246	400.2428	427.5253	460.7260	489.8407 (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	623.8700	702.1991	751.0115	774.0468	776.7835	745.5430	717.3702	695.2293	683.2827	646.2240	603.9491	593.4565 (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	84.0577	84.4198	84.7850	86.6596	87.0445	89.0214	89.0214	89.4277	88.2200	87.0445	86.2781	85.5250
alpha	6.6038	6.6280	6.6523	6.7773	6.8030	6.9348	6.9348	6.9618	6.8813	6.8030	6.7519	6.7017
util living area	0.8864	0.8134	0.7162	0.5844	0.4498	0.3161	0.2259	0.2425	0.3750	0.5980	0.8059	0.9028 (86)
MIT	20.7628	20.8695	20.9450	20.9869	20.9979	20.9999	21.0000	21.0000	20.9995	20.9873	20.8995	20.7382 (87)
Th 2	20.4717	20.4739	20.4760	20.4868	20.4890	20.4998	20.4998	20.5020	20.4955	20.4890	20.4847	20.4804 (88)
util rest of house	0.8732	0.7960	0.6950	0.5610	0.4254	0.2914	0.2002	0.2163	0.3477	0.5705	0.7855	0.8910 (89)
MIT 2	20.2055	20.3318	20.4188	20.4742	20.4872	20.4997	20.4998	20.5020	20.4952	20.4773	20.3784	20.1844 (90)
Living area fraction	20.4278	20.5463	20.6287	20.6787	20.6909	20.6992	20.6993	20.7006	20.6964	20.6807	20.5863	20.4053 (92)
MIT	20.4278	20.5463	20.6287	20.6787	20.6909	20.6992	20.6993	20.7006	20.6964	20.6807	20.5863	20.4053 (93)
Temperature adjustment												0.0000
adjusted MIT	20.4278	20.5463	20.6287	20.6787	20.6909	20.6992	20.6993	20.7006	20.6964	20.6807	20.5863	20.4053 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	544.0259	560.6675	526.6603	441.0473	337.9501	224.5749	150.9616	157.6538	244.9913	375.3995	476.8903	527.6666 (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	629.0023	607.6047	546.3077	445.5887	338.6241	224.6132	150.9641	157.6578	245.1271	379.6690	512.4428	621.1821 (97)
Space heating kWh	63.2225	31.5418	14.6177	3.2698	0.5015	0.0000	0.0000	0.0000	0.0000	3.1765	25.5978	69.5755 (98a)
Space heating requirement - total per year (kWh/year)												211.5031
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	63.2225	31.5418	14.6177	3.2698	0.5015	0.0000	0.0000	0.0000	0.0000	3.1765	25.5978	69.5755 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												211.5031
Space heating per m2										(98c) / (4) =		3.0035 (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
63.2225	31.5418	14.6177	3.2698	0.5015	0.0000	0.0000	0.0000	0.0000	0.0000	3.1765	25.5978	69.5755 (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)	63.2225	31.5418	14.6177	3.2698	0.5015	0.0000	0.0000	0.0000	0.0000	3.1765	25.5978	69.5755 (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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518 (64)
Water heating requirement	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518 (64)
Efficiency of water heater (217)m	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901 (216)
Fuel for water heating, kWh/month	66.0618	58.3118	61.6652	53.5371	51.4362	45.8466	44.8802	46.9411	47.7652	53.8639	58.0112	65.2507 (219)
Space cooling fuel requirement												

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(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.6813	12.3573	13.6813	13.2399	13.6813	13.2399	13.6813	13.6813	13.2399	13.6813	13.2399	13.6813	(231)
Lighting	19.3244	15.5028	13.9585	10.2266	7.8993	6.4538	7.2060	9.3667	12.1664	15.9629	18.0301	19.8615	(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												211.5031	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												344.2901	
Water heating fuel used												653.5711	(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)												161.0857	(230a)
Total electricity for the above, kWh/year												161.0857	(231)
Electricity for lighting (calculated in Appendix L)												155.9590	(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												1182.1189	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	211.5031	16.4900	34.8769	(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)	653.5711	16.4900	107.7739	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	161.0857	16.4900	26.5630	(249)
Energy for lighting	155.9590	16.4900	25.7176	(250)
Additional standing charges			0.0000	(251)
Total energy cost			194.9314	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.6080	(257)
SAP value		90.1443	
SAP rating (Section 12)		90	(258)
SAP band		B	

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

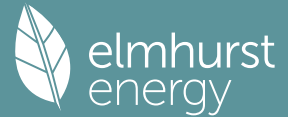
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	211.5031	0.1596	33.7603	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	653.5711	0.1412	92.2672	(264)
Space and water heating			126.0275	(265)
Pumps, fans and electric keep-hot	161.0857	0.1387	22.3446	(267)
Energy for lighting	155.9590	0.1443	22.5097	(268)
Total CO2, kg/year			170.8818	(272)
CO2 emissions per m2			2.4300	(273)
EI value			98.0161	
EI rating			98	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	70.4200 (1b)	x 2.5000 (2b)	= 176.0500 (1b) - (3b)	
Ground floor				

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

70.4200

(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 176.0500 (4)
(5)

2. Ventilation rate

												m3 per hour
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												0 * 10 = 0.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of flueless gas fires												0 * 40 = 0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans												0.0000 / (5) = 0.0000 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												2.7100 (17)
Infiltration rate												0.1355 (18)
Number of sides sheltered												2 (19)
												Shelter factor
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.1152 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.3000	4.2000	4.2000	3.9000	4.0000	3.4000	3.3000	3.3000	3.4000	3.8000	3.8000	3.9000	(22)
Adj infilt rate	1.0750	1.0500	1.0500	0.9750	1.0000	0.8500	0.8250	0.8250	0.8500	0.9500	0.9500	0.9750	(22a)
	0.1238	0.1209	0.1209	0.1123	0.1152	0.0979	0.0950	0.0950	0.0979	0.1094	0.1094	0.1123	(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	0.2638	0.2609	0.2609	0.2523	0.2552	0.2379	0.2350	0.2350	0.2379	0.2494	0.2494	0.2523	(25)

3. Heat losses and heat loss parameter

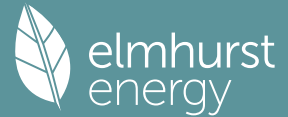
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Window N/E			3.6800	1.3258	4.8788			(27)
Window S/W			7.5200	1.3258	9.9697			(27)
EXT Wall	32.9900	11.2000	21.7900	0.1800	3.9222	110.0000	2396.9002	(29a)
External Roof	1.4900		1.4900	0.1500	0.2235	9.0000	13.4100	(30)
Total net area of external elements Aum(A, m2)			34.4800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.9942		(33)
Main dwelling								
Party Wall			53.8400	0.0000	0.0000	45.0000	2422.8000	(32)
Corridor			24.7600	0.0000	0.0000	45.0000	1114.2000	(32)
Party Floor 1			70.4200			40.0000	2816.8000	(32d)
Party Ceiling			68.9300			30.0000	2067.9000	(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) = 11802.0302 (34)
List of Thermal Bridges								167.5949 (35)
K1 Element				Length	Psi-value		Total	
E7 Party floor between dwellings (in blocks of flats)				21.4000	0.0370		0.7918	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				58.6600	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				2.6800	0.0320		0.0858	
E25 Staggered party wall between dwellings				8.0400	0.0300		0.2412	
E14 Flat roof				3.2300	0.1600		0.5168	
E9 Balcony between dwellings, wall insulation continuous				4.8800	0.1500		0.7320	
E24 Eaves (insulation at ceiling level - inverted)				3.2300	0.1500		0.4845	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.3420 (36)
Point Thermal Bridges								0.0000
Total fabric heat loss								(33) + (36) + (36a) = 22.3362 (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	15.3266	15.1593	15.1593	14.6575	14.8248	13.8211	13.6538	13.6538	13.8211	14.4902	14.4902	14.6575	(38)
Average = Sum(39)m / 12 =	37.6628	37.4956	37.4956	36.9937	37.1610	36.1573	35.9900	35.9900	36.1573	36.8264	36.8264	36.9937	(39)
													36.8125
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.5348	0.5325	0.5325	0.5253	0.5277	0.5135	0.5111	0.5111	0.5135	0.5230	0.5230	0.5253	(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													2.2563 (42)
Hot water usage for mixer showers													
	62.0500	61.1175	59.7587	57.1588	55.2402	53.1006	51.8844	53.2329	54.7112	57.0085	59.6642	61.8123	(42a)
Hot water usage for baths													
	26.8068	26.4086	25.8480	24.8143	24.0403	23.1820	22.7184	23.2751	23.8813	24.7997	25.8547	26.7161	(42b)
Hot water usage for other uses													
	37.7365	36.3643	34.9921	33.6198	32.2476	30.8754	30.8754	32.2476	33.6198	34.9921	36.3643	37.7365	(42c)
Average daily hot water use (litres/day)													116.3681 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.5933	123.8905	120.5988	115.5930	111.5281	107.1579	105.4782	108.7556	112.2123	116.8002	121.8832	126.2650	(44)
Energy content (annual)	200.4929	176.4184	185.3558	158.2410	150.1382	131.7632	127.5667	134.6622	138.3690	158.4968	173.6449	197.7004	(45)
Distribution loss (46)m = 0.15 x (45)m	30.0739	26.4628	27.8034	23.7362	22.5207	19.7645	19.1350	20.1993	20.7553	23.7745	26.0467	29.6551	(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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518	(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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518	(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	66.6639	58.6591	61.6308	52.6151	49.9210	43.8113	42.4159	44.7752	46.0077	52.7002	57.7369	65.7354	(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	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	135.3767	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0776	19.6091	15.9472	12.0731	9.0248	7.6191	8.2327	10.7012	14.3631	18.2372	21.2855	22.6912	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	295.9333	299.0042	291.2657	274.7914	253.9956	234.4504	221.3931	218.3222	226.0607	242.5350	263.3308	282.8760	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	50.7939	(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)	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	-90.2511	(71)
Water heating gains (Table 5)	89.6020	87.2903	82.8371	73.0766	67.0981	60.8490	57.0106	60.1817	63.8996	70.8336	80.1902	88.3540	(72)
Total internal gains	503.5324	501.8232	485.9696	455.8606	426.0379	398.8380	382.5559	385.1246	400.2428	427.5253	460.7260	489.8407	(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	609.6883	683.1403	736.5704	762.8412	756.2403	733.0482	697.5059	673.0127	675.2556	635.7144	590.5647	583.3289 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	87.0445	87.4328	87.4328	88.6189	88.2200	90.6689	91.0903	91.0903	90.6689	89.0214	89.0214	88.6189		
alpha	6.8030	6.8289	6.8289	6.9079	6.8813	7.0446	7.0727	7.0727	7.0446	6.9348	6.9348	6.9079		
util living area	0.8610	0.7814	0.6740	0.5348	0.3976	0.2614	0.1909	0.2086	0.3372	0.5573	0.7708	0.8798	(86)	
MIT	20.8299	20.9122	20.9672	20.9936	20.9992	21.0000	21.0000	21.0000	20.9998	20.9929	20.9338	20.8086	(87)	
Th 2	20.4890	20.4912	20.4912	20.4977	20.4955	20.5085	20.5107	20.5107	20.5085	20.4998	20.4998	20.4977	(88)	
util rest of house	0.8456	0.7623	0.6519	0.5114	0.3730	0.2372	0.1657	0.1824	0.3110	0.5298	0.7486	0.8659	(89)	
MIT 2	20.3014	20.3973	20.4579	20.4916	20.4949	20.5085	20.5107	20.5107	20.5084	20.4935	20.4314	20.2846	(90)	
Living area fraction									FLA = Living area / (4) =			0.3989	(91)	
MIT	20.5122	20.6027	20.6610	20.6919	20.6961	20.7045	20.7059	20.7059	20.7044	20.6927	20.6318	20.4936	(92)	
Temperature adjustment												0.0000		
adjusted MIT	20.5122	20.6027	20.6610	20.6919	20.6961	20.7045	20.7059	20.7059	20.7044	20.6927	20.6318	20.4936	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8463	0.7665	0.6593	0.5205	0.3828	0.2468	0.1757	0.1928	0.3214	0.5404	0.7546	0.8657	(94)
Useful gains	516.0026	523.6568	485.6563	397.0457	289.4665	180.9437	122.5769	129.7744	217.0540	343.5649	445.6434	505.0094	(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	576.7000	555.0359	497.2301	399.2307	289.7091	180.9508	122.5773	129.7753	217.1037	345.9003	468.8669	573.1666	(97)
Space heating kWh	45.1588	21.0868	8.6109	1.5732	0.1805	0.0000	0.0000	0.0000	0.0000	1.7375	16.7209	50.7089	(98a)
Space heating requirement - total per year (kWh/year)												145.7776	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

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Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	45.1588	21.0868	8.6109	1.5732	0.1805	0.0000	0.0000	0.0000	0.0000	1.7375	16.7209	50.7089 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												145.7776
Space heating per m2												(98c) / (4) = 2.0701 (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	45.1588	21.0868	8.6109	1.5732	0.1805	0.0000	0.0000	0.0000	0.0000	1.7375	16.7209	50.7089 (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)	45.1588	21.0868	8.6109	1.5732	0.1805	0.0000	0.0000	0.0000	0.0000	1.7375	16.7209	50.7089 (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	227.4443	200.7616	212.3072	184.3230	177.0896	157.8452	154.5181	161.6136	164.4510	185.4482	199.7269	224.6518 (64)
Efficiency of water heater	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901	344.2901 (216)
Fuel for water heating, kWh/month	66.0618	58.3118	61.6652	53.5371	51.4362	45.8466	44.8802	46.9411	47.7652	53.8639	58.0112	65.2507 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	13.6813	12.3573	13.6813	13.2399	13.6813	13.2399	13.6813	13.6813	13.2399	13.6813	13.2399	13.6813 (231)
Lighting	19.3244	15.5028	13.9585	10.2266	7.8993	6.4538	7.2060	9.3667	12.1664	15.9629	18.0301	19.8615 (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												145.7776 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												344.2901
Water heating fuel used												653.5711 (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)												161.0857 (230a)
Total electricity for the above, kWh/year												161.0857 (231)
Electricity for lighting (calculated in Appendix L)												155.9590 (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												1116.3934 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	145.7776	28.4300	41.4446 (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)	653.5711	28.4300	185.8103 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	161.0857	28.4300	45.7967 (249)
Energy for lighting	155.9590	28.4300	44.3391 (250)
Additional standing charges			0.0000 (251)
Total energy cost			317.3906 (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	145.7776	0.1600	23.3278 (261)

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Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	653.5711	0.1412	92.2672 (264)
Space and water heating			115.5950 (265)
Pumps, fans and electric keep-hot	161.0857	0.1387	22.3446 (267)
Energy for lighting	155.9590	0.1443	22.5097 (268)
Total CO2, kg/year			160.4493 (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	145.7776	1.5923	232.1146 (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)	653.5711	1.5220	994.7507 (278)
Space and water heating			1226.8652 (279)
Pumps, fans and electric keep-hot	161.0857	1.5128	243.6905 (281)
Energy for lighting	155.9590	1.5338	239.2151 (282)
Total Primary energy kWh/year			1709.7709 (286)