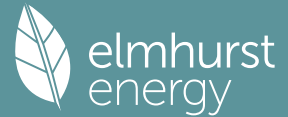


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Property Reference	4907-AU06-6316-033.R				Issued on Date	19/03/2025
Assessment Reference	Plot 033	Prop Type Ref	GF Flat-TC			
Property	FLAT 2, 38 Spey Road, Tilehurst, Reading, RG30 4NF					
SAP Rating	84 B	DER	5.12	TER	13.52	
Environmental	97 A	% DER < TER				62.13
CO ₂ Emissions (t/year)	0.22	DFEE	25.94	TFEE	29.77	
Compliance Check	See BREL	% DFEE < TFEE				12.88
% DPER < TPER	25.80	DPER	53.17	TPER	71.66	
Assessor Details	Mr. Paul Frearson				Assessor ID	AA61-0001
Client	Bellway Homes, Thames Valley					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0400 (1b)	2.4100 (2b)	120.5964 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	120.5964 (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	3.6900	(17)
Infiltration rate	0.1845	(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) =	0.1568 (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	0.2000	0.1960	0.1921	0.1725	0.1686	0.1490	0.1490	0.1451	0.1568	0.1686	0.1764	0.1843 (22b)
Mechanical extract ventilation - centralised												
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)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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			1.9100	1.2357	2.3603		(27)
French Door			4.0400	1.3258	5.3561		(27)
Corridor Door			2.0800	1.0000	2.0800		(26)
GF B&B J150 P/A=0.22			50.0400	0.1000	5.0040	75.0000	3753.0000 (28a)
EW Brick AAC018/019	15.8700		9.9200	0.2600	2.5792	60.0000	595.2000 (29a)
E-WM-30 Corridor Wall	23.1200	2.0800	21.0400	0.2100	4.4184	52.3000	1100.3920 (29a)
Total net area of external elements Aum(A, m ²)			89.0300				(31)
Fabric heat loss, W/K = Sum (A x k)				(26)...(30) + (32) =	21.7979		(33)
Main dwelling							
Party Wall			36.4800	0.0000	0.0000	45.0000	1641.6000 (32)
Party Ceiling			50.0400			30.0000	1501.2000 (32b)
GF Timber			102.3800			9.0000	921.4200 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9512.8120 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		190.1042 (35)
List of Thermal Bridges		

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	2.8400	0.0370	0.1051
E4 Jamb	8.2700	0.0140	0.1158
E5 Ground floor (normal)	6.1500	0.0380	0.2337
E7 Party floor between dwellings (in blocks of flats)	6.1500	0.0390	0.2399
E16 Corner (normal)	5.1600	0.0340	0.1754
P1 Party wall - Ground floor	14.1400	0.0470	0.6646
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.1400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	1.0200	0.0270	0.0275
E4 Jamb	4.2000	0.0850	0.3570
E5 Ground floor (normal)	8.9600	0.0450	0.4032
E7 Party floor between dwellings (in blocks of flats)	8.9600	0.0330	0.2957
E25 Staggered party wall between dwellings	7.7400	0.0380	0.2941
E17 Corner (inverted - internal area greater than external area)	2.5800	0.0000	0.0000
E18 Party wall between dwellings	2.5800	0.0390	0.1006
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.0126 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	24.8105 (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	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	(38)
Heat transfer coeff	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	(39)
Average = Sum(39)m / 12 =													44.7089
HLP	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	(40)
HLP (average)													0.8935
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6913 (42)
Hot water usage for mixer showers	52.5767	51.7865	50.6352	48.4322	46.8065	44.9936	43.9631	45.1057	46.3583	48.3049	50.5551	52.3752	(42a)
Hot water usage for baths	22.7329	22.3953	21.9199	21.0433	20.3869	19.6590	19.2659	19.7380	20.2520	21.0308	21.9255	22.6561	(42b)
Hot water usage for other uses	31.9504	30.7886	29.6267	28.4649	27.3031	26.1412	26.1412	27.3031	28.4649	29.6267	30.7886	31.9504	(42c)
Average daily hot water use (litres/day)													98.5967 (43)
Daily hot water use	107.2600	104.9704	102.1818	97.9404	94.4964	90.7938	89.3702	92.1467	95.0752	98.9624	103.2692	106.9817	(44)
Energy conte	169.8736	149.4764	157.0496	134.0755	127.2104	111.6416	108.0855	114.0969	117.2372	134.2911	147.1259	167.5075	(45)
Energy content (annual)										Total = Sum(45)m =			1637.6710
Distribution loss (46)m = 0.15 x (45)m	25.4810	22.4215	23.5574	20.1113	19.0816	16.7462	16.2128	17.1145	17.5856	20.1437	22.0689	25.1261	(46)
Water storage loss:													
Store volume													200.0000 (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	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589	(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	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			1955.0020 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													0.0000 (64a)
Heat gains from water heating, kWh/month	56.4830	49.7009	52.2190	44.5801	42.2975	37.1208	35.9384	37.9372	38.9814	44.6518	48.9193	55.6962	(65)

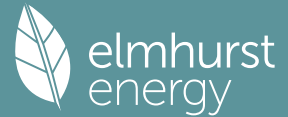
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.6545	91.5103	82.6545	85.4097	82.6545	85.4097	82.6545	82.6545	85.4097	82.6545	85.4097	82.6545	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.3378	148.8667	145.0139	136.8118	126.4581	116.7270	110.2261	108.6972	112.5500	120.7521	131.1059	140.8369	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	(71)
Water heating gains (Table 5)	75.9180	73.9597	70.1868	61.9168	56.8514	51.5567	48.3043	50.9909	54.1408	60.0158	67.9435	74.8605	(72)
Total internal gains	354.2795	362.7060	346.2244	332.5074	314.3332	302.0626	289.5541	290.7118	300.4696	311.7916	332.8282	346.7211	(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
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Southwest			1.9100		36.7938		0.4600		0.0000		0.7700		24.8918 (79)
Southwest			4.0400		36.7938		0.6000		0.7000		0.7700		43.2652 (79)

Solar gains	68.1571	116.0967	158.8485	196.8210	220.4560	218.8618	211.0061	193.3734	171.9994	128.3116	81.6364	58.3282 (83)
Total gains	422.4365	478.8027	505.0730	529.3285	534.7892	520.9243	500.5602	484.0851	472.4690	440.1032	414.4647	405.0493 (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	59.1034	59.1034	59.1034	59.1034	59.1034	59.1034	59.1034	59.1034	59.1034	59.1034	59.1034	59.1034
alpha	4.9402	4.9402	4.9402	4.9402	4.9402	4.9402	4.9402	4.9402	4.9402	4.9402	4.9402	4.9402
util living area	0.9730	0.9510	0.9167	0.8406	0.7132	0.5361	0.3906	0.4213	0.6230	0.8537	0.9505	0.9776 (86)
MIT	20.0589	20.2583	20.4804	20.7307	20.9035	20.9807	20.9967	20.9951	20.9603	20.7496	20.3620	20.0041 (87)
Th 2	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731 (88)
util rest of house	0.9673	0.9411	0.9002	0.8106	0.6652	0.4717	0.3184	0.3472	0.5582	0.8199	0.9388	0.9728 (89)
MIT 2	19.0897	19.3373	19.6094	19.9035	20.0900	20.1607	20.1717	20.1709	20.1451	19.9313	19.4700	19.0211 (90)
Living area fraction									fLA = Living area / (4) =			0.4996 (91)
MIT	19.5739	19.7974	20.0446	20.3167	20.4964	20.5704	20.5838	20.5827	20.5524	20.3401	19.9156	19.5122 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5739	19.7974	20.0446	20.3167	20.4964	20.5704	20.5838	20.5827	20.5524	20.3401	19.9156	19.5122 (93)

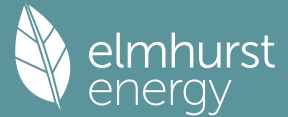
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9623	0.9359	0.8974	0.8162	0.6846	0.5031	0.3544	0.3841	0.5886	0.8272	0.9346	0.9680 (94)
Useful gains	406.4967	448.1287	453.2331	432.0308	366.1041	262.0512	177.4155	185.9546	278.1064	364.0649	387.3533	392.1016 (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												
Space heating	682.8797	666.0485	605.5636	510.4304	393.2787	266.9283	178.1132	187.0033	288.4783	435.4713	572.9732	684.5919 (97)
kWh												
Space heating	205.6289	146.4421	113.3339	56.4477	20.2179	0.0000	0.0000	0.0000	0.0000	53.1264	133.6463	217.6128 (98a)
requirement - total per year (kWh/year)												946.4559
Solar heating												
kWh												
Space heating	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)
contribution - total per year (kWh/year)												0.0000
Solar heating												
kWh												
Space heating	205.6289	146.4421	113.3339	56.4477	20.2179	0.0000	0.0000	0.0000	0.0000	53.1264	133.6463	217.6128 (98c)
requirement after solar contribution - total per year (kWh/year)												946.4559
Space heating												
per m2										(98c) / (4) =		18.9140 (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	205.6289	146.4421	113.3339	56.4477	20.2179	0.0000	0.0000	0.0000	0.0000	53.1264	133.6463	217.6128 (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)	205.6289	146.4421	113.3339	56.4477	20.2179	0.0000	0.0000	0.0000	0.0000	53.1264	133.6463	217.6128 (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	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589 (64)	
Efficiency of water heater (217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200 (216)	
Fuel for water heating, kWh/month	60.6511	53.5621	56.6994	49.3521	47.5046	42.4392	41.6113	43.4637	44.1634	49.6864	53.3736	59.9220 (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	2.7991	2.5282	2.7991	2.7088	2.7991	2.7088	2.7991	2.7991	2.7088	2.7991	2.7088	2.7991 (231)	
Lighting	16.1692	12.9715	11.6794	8.5569	6.6096	5.4001	6.0295	7.8373	10.1799	13.3566	15.0862	16.6186 (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													946.4559 (211)
Space heating fuel - main system 2													0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	324.5200
Water heating fuel used	602.4288 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2240)	
mechanical ventilation fans (SFP = 0.2240)	32.9566 (230a)
Total electricity for the above, kWh/year	32.9566 (231)
Electricity for lighting (calculated in Appendix L)	130.4947 (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	1712.3361 (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	946.4559	0.1563	147.9058 (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)	602.4288	0.1411	85.0105 (264)
Space and water heating			232.9163 (265)
Pumps, fans and electric keep-hot	32.9566	0.1387	4.5715 (267)
Energy for lighting	130.4947	0.1443	18.8344 (268)
Total CO2, kg/year			256.3222 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.1200 (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	946.4559	1.5785	1494.0102 (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)	602.4288	1.5218	916.7732 (278)
Space and water heating			2410.7834 (279)
Pumps, fans and electric keep-hot	32.9566	1.5128	49.8567 (281)
Energy for lighting	130.4947	1.5338	200.1572 (282)
Total Primary energy kWh/year			2660.7973 (286)
Dwelling Primary energy Rate (DPER)			53.1700 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	50.0400 (1b)	x 2.4100 (2b)	= 120.5964 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.5964 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1658 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4158	(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) =		0.3535 (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												

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Effective ac	0.4507	0.4418	0.4330	0.3888	0.3800	0.3358	0.3358	0.3270	0.3535	0.3800	0.3976	0.4153 (22b)
	0.6016	0.5976	0.5937	0.5756	0.5722	0.5564	0.5564	0.5535	0.5625	0.5722	0.5791	0.5862 (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 Opaque door			2.0800	1.0000	2.0800		(26)
TER Opening Type			5.9500	1.1450	6.8130		(27)
GF B&B J150 P/A=0.22			50.0400	0.1300	6.5052		(28a)
EW Brick AAC018/019	15.8700	5.9500	9.9200	0.1800	1.7856		(29a)
E-WM-30 Corridor Wall	23.1200	2.0800	21.0400	0.1800	3.7872		(29a)
Total net area of external elements Aum(A, m2)			89.0300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.9710		(33)
Main dwelling							
Party Wall			36.4800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							200.1042 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				2.8400	0.0500	0.1420	
E4 Jamb				8.2700	0.0500	0.4135	
E5 Ground floor (normal)				6.1500	0.1600	0.9840	
E7 Party floor between dwellings (in blocks of flats)				6.1500	0.0700	0.4305	
E16 Corner (normal)				5.1600	0.0900	0.4644	
P1 Party wall - Ground floor				14.1400	0.0800	1.1312	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				14.1400	0.0000	0.0000	
E2 Other lintels (including other steel lintels)				1.0200	0.0500	0.0510	
E4 Jamb				4.2000	0.0500	0.2100	
E5 Ground floor (normal)				8.9600	0.1600	1.4336	
E7 Party floor between dwellings (in blocks of flats)				8.9600	0.0700	0.6272	
E25 Staggered party wall between dwellings				7.7400	0.0600	0.4644	
E17 Corner (inverted - internal area greater than external area)				2.5800	-0.0900	-0.2322	
E18 Party wall between dwellings				2.5800	0.0600	0.1548	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.2744 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	27.2454 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6913 (42)
Hot water usage for mixer showers	52.5767	51.7865	50.6352	48.4322	46.8065	44.9936	43.9631	45.1057	46.3583	48.3049	50.5551	52.3752 (42a)	
Hot water usage for baths	22.7329	22.3953	21.9199	21.0433	20.3869	19.6590	19.2659	19.7380	20.2520	21.0308	21.9255	22.6561 (42b)	
Hot water usage for other uses	31.9504	30.7886	29.6267	28.4649	27.3031	26.1412	26.1412	27.3031	28.4649	29.6267	30.7886	31.9504 (42c)	
Average daily hot water use (litres/day)												98.5967 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	107.2600	104.9704	102.1818	97.9404	94.4964	90.7938	89.3702	92.1467	95.0752	98.9624	103.2692	106.9817 (44)	
Distribution loss (46)m = 0.15 x (45)m	169.8736	149.4764	157.0496	134.0755	127.2104	111.6416	108.0855	114.0969	117.2372	134.2911	147.1259	167.5075 (45)	
Water storage loss:										Total = Sum(45)m =		1637.6710	
Store volume	25.4810	22.4215	23.5574	20.1113	19.0816	16.7462	16.2128	17.1145	17.5856	20.1437	22.0689	25.1261 (46)	
a) If manufacturer declared loss factor is known (kWh/day):												150.0000 (47)	
Temperature factor from Table 2b												1.3938 (48)	
Enter (49) or (54) in (55)												0.5400 (49)	
Total storage loss												0.7527 (55)	
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 (56)	
Primary 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 (57)	
Combi 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)	
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
WWHRS	216.4685	191.5622	203.6445	179.1673	173.8053	156.7334	154.6804	160.6918	162.3290	180.8860	192.2177	214.1024 (62)	
PV diverter	-24.0359	-21.2575	-22.2596	-18.4319	-17.1778	-14.6992	-13.7781	-14.6517	-15.2084	-17.9290	-20.3113	-23.5907 (63a)	
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
12Total per year (kWh/year)	192.4326	170.3047	181.3848	160.7355	156.6274	142.0342	140.9022	146.0401	147.1207	162.9570	171.9064	190.5116 (64)	
Electric shower(s)								Total per year (kWh/year) = Sum(64)m =				1962.9572 (64)	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1963 (64)	
Heat gains from water heating, kWh/month												0.0000 (64a)	
	93.7589	83.3695	89.4949	80.6536	79.5734	73.1943	73.2143	75.2131	75.0548	81.9277	84.9928	92.9721 (65)	
												0.0000 (64a)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	82.6545	91.5103	82.6545	85.4097	82.6545	85.4097	82.6545	82.6545	85.4097	82.6545	85.4097	82.6545 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	147.3378	148.8667	145.0139	136.8118	126.4581	116.7270	110.2261	108.6972	112.5500	120.7521	131.1059	140.8369 (68)
Pumps, fans	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511 (71)
Total internal gains	126.0200	124.0617	120.2888	112.0189	106.9535	101.6587	98.4064	101.0929	104.2428	110.1179	118.0456	124.9626 (72)
	407.3815	415.8080	399.3265	385.6095	367.4352	352.1646	339.6561	340.8138	350.5717	364.8937	385.9303	399.8231 (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			

Southwest					5.9500	36.7938	0.6300	0.7000			0.7700	66.9058 (79)			

Solar gains				66.9058	113.9653	155.9324	193.2077	216.4088	214.8438	207.1324	189.8234	168.8418	125.9560	80.1377	57.2574 (83)
Total gains				474.2873	529.7734	555.2588	578.8172	583.8440	567.0084	546.7885	530.6372	519.4134	490.8497	466.0680	457.0806 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	54.3409	54.5080	54.6728	55.4604	55.6103	56.3189	56.3189	56.4521	56.0438	55.6103	55.3079	54.9953
util living area	4.6227	4.6339	4.6449	4.6974	4.7074	4.7546	4.7546	4.7635	4.7363	4.7074	4.6872	4.6664
	0.9697	0.9492	0.9173	0.8434	0.7202	0.5416	0.3944	0.4228	0.6249	0.8478	0.9446	0.9736 (86)
MIT	19.9672	20.1659	20.4019	20.6882	20.8826	20.9763	20.9957	20.9940	20.9530	20.7265	20.3205	19.9388 (87)
Th 2	20.0643	20.0669	20.0695	20.0815	20.0837	20.0942	20.0942	20.0962	20.0902	20.0837	20.0792	20.0744 (88)
util rest of house	0.9628	0.9382	0.8994	0.8112	0.6680	0.4709	0.3147	0.3418	0.5542	0.8104	0.9308	0.9676 (89)
MIT 2	18.8888	19.1370	19.4278	19.7738	19.9848	20.0796	20.0926	20.0937	20.0583	19.8254	19.3416	18.8609 (90)
Living area fraction												0.4996 (91)
MIT	19.4275	19.6510	19.9144	20.2306	20.4334	20.5276	20.5438	20.5435	20.5053	20.2756	19.8307	19.3994 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4275	19.6510	19.9144	20.2306	20.4334	20.5276	20.5438	20.5435	20.5053	20.2756	19.8307	19.3994 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9571	0.9325	0.8961	0.8168	0.6887	0.5053	0.3545	0.3822	0.5873	0.8189	0.9265	0.9622 (94)
Ext temp.	453.9289	494.0132	497.5400	472.7789	402.1178	286.4987	193.8433	202.8204	305.0709	401.9532	431.8108	439.7918 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	774.3066	752.7197	682.4527	568.2532	436.8150	292.7480	194.7722	204.1530	317.8928	483.9428	640.2281	768.7271 (97)
Space heating requirement - total per year (kWh/year)	238.3610	173.8508	137.5750	68.7415	25.8148	0.0000	0.0000	0.0000	0.0000	61.0003	150.0605	244.7279 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	238.3610	173.8508	137.5750	68.7415	25.8148	0.0000	0.0000	0.0000	0.0000	61.0003	150.0605	244.7279 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1100.1317 (99)
Space heating per m2										(98c) / (4) =		21.9850 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	238.3610	173.8508	137.5750	68.7415	25.8148	0.0000	0.0000	0.0000	0.0000	61.0003	150.0605	244.7279 (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)	258.2460	188.3541	149.0520	74.4761	27.9683	0.0000	0.0000	0.0000	0.0000	66.0891	162.5791	265.1440 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	192.4326	170.3047	181.3848	160.7355	156.6274	142.0342	140.9022	146.0401	147.1207	162.9570	171.9064	190.5116 (64)
Efficiency of water heater (217)m	84.5409	84.1060	83.4479	82.2986	80.9610	79.8000	79.8000	79.8000	79.8000	82.0655	83.7564	84.6225 (217)
Fuel for water heating, kWh/month	227.6207	202.4880	217.3628	195.3076	193.4603	177.9877	176.5692	183.0077	184.3618	198.5695	205.2456	225.1312 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	17.1740	13.7776	12.4052	9.0886	7.0203	5.7356	6.4041	8.3243	10.8125	14.1866	16.0237	17.6513 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												

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(233a)m	-17.2560	-25.2331	-37.6099	-43.9153	-48.7947	-46.1031	-45.5795	-42.3440	-36.8363	-29.6180	-19.3047	-14.8179	(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	-7.1668	-15.3168	-30.8847	-47.0245	-62.7836	-63.2732	-62.4884	-52.5950	-38.1667	-22.0680	-9.6243	-5.6464	(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												1191.9087	(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												2387.1121	(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)												138.6038	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-824.4508	(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												2979.1738	(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	1191.9087	0.2100	250.3008 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2387.1121	0.2100	501.2935 (264)
Space and water heating			751.5944 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	138.6038	0.1443	20.0048 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-407.4124	0.1338	-54.5118
PV Unit electricity exported	-417.0384	0.1255	-52.3433
Total			-106.8551 (269)
Total CO2, kg/year			676.6734 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5200 (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	1191.9087	1.1300	1346.8569 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2387.1121	1.1300	2697.4366 (278)
Space and water heating			4044.2935 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	138.6038	1.5338	212.5951 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-407.4124	1.4945	-608.8605
PV Unit electricity exported	-417.0384	0.4607	-192.1290
Total			-800.9894 (283)
Total Primary energy kWh/year			3586.0000 (286)
Target Primary Energy Rate (TPER)			71.6600 (287)

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

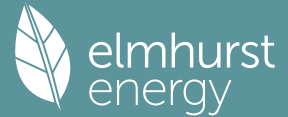
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	50.0400 (1b)	x 2.4100 (2b)	= 120.5964 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.5964 (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)

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000	Air changes per hour	0.1658 (8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50				3.6900 (17)
Infiltration rate				0.3503 (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) =			0.2978 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.3797	0.3722	0.3648	0.3276	0.3201	0.2829	0.2829	0.2755	0.2978	0.3201	0.3350	0.3499	(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	0.5721	0.5693	0.5665	0.5537	0.5512	0.5400	0.5400	0.5379	0.5443	0.5512	0.5561	0.5612	(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			1.9100	1.2357	2.3603			(27)
French Door			4.0400	1.3258	5.3561			(27)
Corridor Door			2.0800	1.0000	2.0800			(26)
GF B&B J150 P/A=0.22			50.0400	0.1000	5.0040	75.0000	3753.0000	(28a)
EW Brick AAC018/019	15.8700	5.9500	9.9200	0.2600	2.5792	60.0000	595.2000	(29a)
E-WM-30 Corridor Wall	23.1200	2.0800	21.0400	0.2100	4.4184	52.3000	1100.3920	(29a)
Total net area of external elements Aum(A, m2)			89.0300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.7979			(33)
Main dwelling								
Party Wall			36.4800	0.0000	0.0000	45.0000	1641.6000	(32)
Party Ceiling			50.0400			40.0000	2001.6000	(32b)
GF Timber			102.3800			9.0000	921.4200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10013.2120 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		200.1042 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	2.8400	0.0370	0.1051
E2 Other lintels (including other steel lintels)	8.2700	0.0140	0.1158
E4 Jamb	6.1500	0.0380	0.2337
E5 Ground floor (normal)	6.1500	0.0390	0.2399
E7 Party floor between dwellings (in blocks of flats)	5.1600	0.0340	0.1754
El6 Corner (normal)	14.1400	0.0470	0.6646
P1 Party wall - Ground floor	14.1400	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	1.0200	0.0270	0.0275
E2 Other lintels (including other steel lintels)	4.2000	0.0850	0.3570
E4 Jamb	8.9600	0.0450	0.4032
E5 Ground floor (normal)	8.9600	0.0330	0.2957
E7 Party floor between dwellings (in blocks of flats)	7.7400	0.0380	0.2941
E25 Staggered party wall between dwellings	2.5800	0.0000	0.0000
El7 Corner (inverted - internal area greater than external area)	2.5800	0.0390	0.1006
El8 Party wall between dwellings			3.0126 (36)

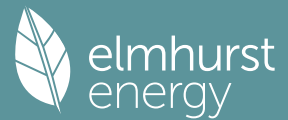
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	(36a) =	0.0000
Point Thermal bridges	(33) + (36) + (36a) =	24.8105 (37)
Total fabric heat loss		

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	22.7670	22.6556	22.5464	22.0336	21.9376	21.4909	21.4909	21.4082	21.6630	21.9376	22.1317	22.3346	(38)
Average = Sum(39)m / 12 =	47.5775	47.4661	47.3569	46.8441	46.7481	46.3015	46.3015	46.2187	46.4735	46.7481	46.9422	47.1451	(39)
												46.8436	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9508	0.9486	0.9464	0.9361	0.9342	0.9253	0.9253	0.9236	0.9287	0.9342	0.9381	0.9421	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6913 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	22.7329	22.3953	21.9199	21.0433	20.3869	19.6590	19.2659	19.7380	20.2520	21.0308	21.9255	22.6561	(42b)
Hot water usage for other uses	31.9504	30.7886	29.6267	28.4649	27.3031	26.1412	26.1412	27.3031	28.4649	29.6267	30.7886	31.9504	(42c)
Average daily hot water use (litres/day)												50.1228	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	54.6833	53.1839	51.5466	49.5081	47.6899	45.8002	45.4071	47.0410	48.7169	50.6576	52.7141	54.6065	(44)
Energy content (annual)	86.6050	75.7331	79.2252	67.7742	64.1998	56.3167	54.9159	58.2466	60.0728	68.7418	75.1008	85.5005	(45)
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:													
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)

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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	73.6142	64.3731	67.3414	57.6080	54.5698	47.8692	46.6786	49.5096	51.0619	58.4305	63.8357	72.6754 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	73.6142	64.3731	67.3414	57.6080	54.5698	47.8692	46.6786	49.5096	51.0619	58.4305	63.8357	72.6754 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				707.5676 (64)
Electric shower(s)	42.1051	37.5160	40.9661	39.0934	39.8270	37.9911	39.2575	39.8270	39.0934	40.9661	40.1958	42.1051 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				478.9436 (64a)
Heat gains from water heating, kWh/month	28.9298	25.4723	27.0769	24.1754	23.5992	21.4651	21.4840	22.3342	22.5388	24.8492	26.0079	28.6951 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	84.5639	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.6545	91.5103	82.6545	85.4097	82.6545	85.4097	82.6545	82.6545	85.4097	82.6545	85.4097	82.6545	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.3378	148.8667	145.0139	136.8118	126.4581	116.7270	110.2261	108.6972	112.5500	120.7521	131.1059	140.8369	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	31.4564	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	(71)
Water heating gains (Table 5)	38.8842	37.9052	36.3936	33.5769	31.7194	29.8126	28.8763	30.0190	31.3039	33.3994	36.1220	38.5687	(72)
Total internal gains	317.2457	326.6515	312.4313	304.1675	289.2011	280.3185	270.1261	269.7399	277.6327	285.1752	301.0067	310.4293	(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
Southwest				1.9100	36.7938	0.4600	0.0000			0.7700			24.8918 (79)
Southwest				4.0400	36.7938	0.6000	0.7000			0.7700			43.2652 (79)
Solar gains	68.1571	116.0967	158.8485	196.8210	220.4560	218.8618	211.0061	193.3734	171.9994	128.3116	81.6364	58.3282	(83)
Total gains	385.4028	442.7481	471.2798	500.9886	509.6571	499.1802	481.1322	463.1133	449.6321	413.4868	382.6432	368.7576	(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	58.4614	58.5986	58.7337	59.3767	59.4986	60.0726	60.0726	60.1801	59.8502	59.4986	59.2526	58.9975	
alpha	4.8974	4.9066	4.9156	4.9584	4.9666	5.0048	5.0048	5.0120	4.9900	4.9666	4.9502	4.9332	
util living area	0.9849	0.9699	0.9447	0.8791	0.7601	0.5751	0.4201	0.4540	0.6695	0.8920	0.9693	0.9876	(86)
MIT	19.8970	20.1097	20.3576	20.6629	20.8736	20.9752	20.9957	20.9937	20.9476	20.6869	20.2493	19.8605	(87)
Th 2	20.1245	20.1264	20.1283	20.1369	20.1385	20.1461	20.1461	20.1475	20.1432	20.1385	20.1352	20.1318	(88)
util rest of house	0.9813	0.9630	0.9319	0.8521	0.7114	0.5053	0.3402	0.3723	0.6008	0.8622	0.9609	0.9845	(89)
MIT 2	19.1285	19.3382	19.5796	19.8715	20.0534	20.1339	20.1447	20.1454	20.1145	19.9000	19.4843	19.0983	(90)
Living area fraction									fLA = Living area / (4) =			0.4996	(91)
MIT	19.5125	19.7236	19.9683	20.2669	20.4632	20.5542	20.5699	20.5692	20.5307	20.2931	19.8665	19.4791	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5125	19.7236	19.9683	20.2669	20.4632	20.5542	20.5699	20.5692	20.5307	20.2931	19.8665	19.4791	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9781	0.9592	0.9292	0.8565	0.7306	0.5392	0.3801	0.4131	0.6329	0.8681	0.9578	0.9817	(94)
Ext temp.	376.9687	424.6665	437.9038	429.0839	372.3624	269.1809	182.8883	191.2995	284.5673	358.9427	366.5146	362.0132	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	723.7707	703.6201	637.8154	532.4712	409.6631	275.6890	183.8113	192.6953	298.8589	453.1360	599.2864	720.3358	(97)
Space heating requirement - total per year (kWh/year)	258.0207	187.4568	148.7343	74.4389	27.7517	0.0000	0.0000	0.0000	0.0000	70.0798	167.5957	266.5921	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)	258.0207	187.4568	148.7343	74.4389	27.7517	0.0000	0.0000	0.0000	0.0000	70.0798	167.5957	266.5921	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1200.6700	(98c)
Space heating per m ²										(98c) / (4) =		23.9942	(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	435.2337	342.6308	351.2625	0.0000	0.0000	0.0000	0.0000	(100)

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9132	0.9566	0.9459	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	397.4466	327.7574	332.2690	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	547.7410	528.5023	509.0964	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	108.2119	149.3542	131.5596	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)									fc = cooled area / (4) =			1.0000 (105)
Space cooling kWh	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 requirement	0.0000	0.0000	0.0000	0.0000	0.0000	27.0530	37.3386	32.8899	0.0000	0.0000	0.0000	0.0000 (107)
Energy for space heating												97.2814 (107)
Energy for space cooling												23.9942 (99)
Total												1.9441 (108)
Fabric Energy Efficiency (DFEE)												25.9383 (109)
												25.9 (109)

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

1. Overall dwelling characteristics

Main dwelling		Area (m2)	Storey height (m)	Volume (m3)	
Ground floor		50.0400 (1b)	x 2.4100 (2b)	= 120.5964 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0400			(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	120.5964 (5)	

2. Ventilation rate

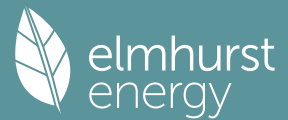
		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)	
Number of open flues	0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)	
Number of blocked chimneys	0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)	
Number of passive vents	0 * 10 =	0.0000 (7b)	
Number of flueless gas fires	0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1658 (8)	
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	5.0000 (17)		
Infiltration rate	0.4158 (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) =	0.3535 (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	0.4507	0.4418	0.4330	0.3888	0.3800	0.3358	0.3358	0.3270	0.3535	0.3800	0.3976	0.4153 (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	0.6016	0.5976	0.5937	0.5756	0.5722	0.5564	0.5564	0.5535	0.5625	0.5722	0.5791	0.5862 (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 Opaque door			2.0800	1.0000	2.0800		(26)
TER Opening Type			5.9500	1.1450	6.8130		(27)
GF B&B J150 P/A=0.22			50.0400	0.1300	6.5052		(28a)
EW Brick AAC018/019	15.8700	5.9500	9.9200	0.1800	1.7856		(29a)
E-WM-30 Corridor Wall	23.1200	2.0800	21.0400	0.1800	3.7872		(29a)
Total net area of external elements Aum(A, m2)			89.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.9710		(33)
Main dwelling							
Party Wall			36.4800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							200.1042 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				2.8400	0.0500	0.1420	
E4 Jamb				8.2700	0.0500	0.4135	
E5 Ground floor (normal)				6.1500	0.1600	0.9840	
E7 Party floor between dwellings (in blocks of flats)				6.1500	0.0700	0.4305	
E16 Corner (normal)				5.1600	0.0900	0.4644	
P1 Party wall - Ground floor				14.1400	0.0800	1.1312	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				14.1400	0.0000	0.0000	
E2 Other lintels (including other steel lintels)				1.0200	0.0500	0.0510	
E4 Jamb				4.2000	0.0500	0.2100	
E5 Ground floor (normal)				8.9600	0.1600	1.4336	
E7 Party floor between dwellings (in blocks of flats)				8.9600	0.0700	0.6272	
E25 Staggered party wall between dwellings				7.7400	0.0600	0.4644	
E17 Corner (inverted - internal area greater than external area)				2.5800	-0.0900	-0.2322	

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E18 Party wall between dwellings
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss

2.5800
0.0600
0.1548
6.2744 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 27.2454 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m
Heat transfer coeff
Average = Sum(39)m / 12 =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0229	1.0197	1.0167	1.0022	0.9995	0.9870	0.9870	0.9846	0.9918	0.9995	1.0050	1.0107 (40)
HLP (average)												1.0022
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Hot water usage for mixer showers
Hot water usage for baths
Hot water usage for other uses
Average daily hot water use (litres/day)

Daily hot water use
Energy conte
Energy content (annual)
Distribution loss (46)m = 0.15 x (45)m
Water storage loss:
Total storage loss
If cylinder contains dedicated solar storage
Primary loss
Combi loss
Total heat required for water heating calculated for each month
WWHRS
PV diverter
Solar input
FGHRS
Output from w/h
12Total per year (kWh/year)
Electric shower(s)
Heat gains from water heating, kWh/month

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

Metabolic gains (Table 5), Watts
(66)m
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
Pumps, fans
Losses e.g. evaporation (negative values) (Table 5)
Water heating gains (Table 5)
Total internal gains

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
Southwest	5.9500	36.7938	0.6300	0.7000	0.7700	66.9058 (79)
Solar gains	66.9058	113.9653	155.9324	193.2077	216.4088	214.8438
Total gains	384.1515	440.6168	468.3636	497.3753	505.6099	495.1623

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)
Utilisation factor for gains for living area, nil,m (see Table 9a)
tau
alpha
util living area

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MIT	19.7552	19.9723	20.2358	20.5758	20.8255	20.9614	20.9925	20.9894	20.9235	20.6120	20.1379	19.7249 (87)
Th 2	20.0643	20.0669	20.0695	20.0815	20.0837	20.0942	20.0942	20.0962	20.0902	20.0837	20.0792	20.0744 (88)
util rest of house	0.9828	0.9670	0.9403	0.8700	0.7400	0.5333	0.3598	0.3934	0.6300	0.8782	0.9649	0.9857 (89)
MIT 2	18.9413	19.1564	19.4148	19.7451	19.9649	20.0751	20.0919	20.0926	20.0480	19.7858	19.3309	18.9193 (90)
Living area fraction									fLA = Living area / (4) =			0.4996 (91)
MIT	19.3479	19.5640	19.8250	20.1601	20.3949	20.5179	20.5418	20.5406	20.4854	20.1986	19.7341	19.3218 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3479	19.5640	19.8250	20.1601	20.3949	20.5179	20.5418	20.5406	20.4854	20.1986	19.7341	19.3218 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9795	0.9628	0.9367	0.8725	0.7575	0.5695	0.4045	0.4387	0.6626	0.8821	0.9614	0.9827 (94)	
Useful gains	376.2679	424.2175	438.6946	433.9368	383.0048	282.0114	193.0463	201.6206	295.8159	362.6696	366.4404	361.3259 (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	770.2319	748.2788	677.9016	564.7159	434.8891	292.2703	194.6779	204.0129	316.9044	480.0900	635.3706	764.8007 (97)	
Space heating kWh	293.1092	217.7692	177.9700	94.1609	38.6019	0.0000	0.0000	0.0000	0.0000	87.3607	193.6298	300.1852 (98a)	
Space heating requirement - total per year (kWh/year)												1402.7870	
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	293.1092	217.7692	177.9700	94.1609	38.6019	0.0000	0.0000	0.0000	0.0000	87.3607	193.6298	300.1852 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1402.7870	
Space heating per m2											(98c) / (4) =	28.0333 (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	464.2422	365.4672	374.4591	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8841	0.9376	0.9243	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	410.4560	342.6608	346.1040	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	543.0447	523.9746	504.9470	0.0000	0.0000	0.0000	0.0000 (103)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	95.4638	134.8974	118.1792	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	23.8660	33.7244	29.5448	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling requirement												87.1351 (107)	
Energy for space heating												28.0333 (99)	
Energy for space cooling												1.7413 (108)	
Total												29.7746 (109)	
Fabric Energy Efficiency (TFEE)												29.8 (109)	

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

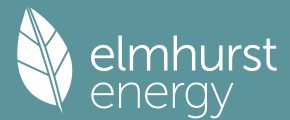
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	50.0400 (1b)	x 2.4100 (2b)	= 120.5964 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0400			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	120.5964 (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	3.6900	(17)
Infiltration rate	0.1845	(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) =	0.1568 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Mechanical extract ventilation - centralised	0.2000	0.1960	0.1921	0.1725	0.1686	0.1490	0.1490	0.1451	0.1568	0.1686	0.1764	0.1843	(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)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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			1.9100	1.2357	2.3603			(27)
French Door			4.0400	1.3258	5.3561			(27)
Corridor Door			2.0800	1.0000	2.0800			(26)
GF B&B J150 P/A=0.22			50.0400	0.1000	5.0040	75.0000	3753.0000	(28a)
EW Brick AAC018/019	15.8700	5.9500	9.9200	0.2600	2.5792	60.0000	595.2000	(29a)
E-WM-30 Corridor Wall	23.1200	2.0800	21.0400	0.2100	4.4184	52.3000	1100.3920	(29a)
Total net area of external elements Aum(A, m2)			89.0300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.7979			(33)
Main dwelling								
Party Wall			36.4800	0.0000	0.0000	45.0000	1641.6000	(32)
Party Ceiling			50.0400			40.0000	2001.6000	(32b)
GF Timber			102.3800			9.0000	921.4200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 10013.2120 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.1042 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	2.8400	0.0370	0.1051
E2 Other lintels (including other steel lintels)	8.2700	0.0140	0.1158
E4 Jamb	6.1500	0.0380	0.2337
E5 Ground floor (normal)	6.1500	0.0390	0.2399
E7 Party floor between dwellings (in blocks of flats)	5.1600	0.0340	0.1754
E16 Corner (normal)	14.1400	0.0470	0.6646
P1 Party wall - Ground floor	14.1400	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	1.0200	0.0270	0.0275
E2 Other lintels (including other steel lintels)	4.2000	0.0850	0.3570
E4 Jamb	8.9600	0.0450	0.4032
E5 Ground floor (normal)	8.9600	0.0330	0.2957
E7 Party floor between dwellings (in blocks of flats)	7.7400	0.0380	0.2941
E25 Staggered party wall between dwellings	2.5800	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.5800	0.0390	0.1006
E18 Party wall between dwellings			

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

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 24.8105 (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	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	(38)
Average = Sum(39)m / 12 =	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	(39)

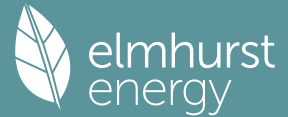
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6913 (42)
Hot water usage for mixer showers	52.5767	51.7865	50.6352	48.4322	46.8065	44.9936	43.9631	45.1057	46.3583	48.3049	50.5551	52.3752	(42a)
Hot water usage for baths	22.7329	22.3953	21.9199	21.0433	20.3869	19.6590	19.2659	19.7380	20.2520	21.0308	21.9255	22.6561	(42b)
Hot water usage for other uses	31.9504	30.7886	29.6267	28.4649	27.3031	26.1412	26.1412	27.3031	28.4649	29.6267	30.7886	31.9504	(42c)
Average daily hot water use (litres/day)													98.5967 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	107.2600	104.9704	102.1818	97.9404	94.4964	90.7938	89.3702	92.1467	95.0752	98.9624	103.2692	106.9817	(44)
Energy content (annual)	169.8736	149.4764	157.0496	134.0755	127.2104	111.6416	108.0855	114.0969	117.2372	134.2911	147.1259	167.5075	(45)
Distribution loss (46)m = 0.15 x (45)m	25.4810	22.4215	23.5574	20.1113	19.0816	16.7462	16.2128	17.1145	17.5856	20.1437	22.0689	25.1261	(46)
Water storage loss:													
Store volume													200.0000 (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	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589	(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	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589	(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)

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Heat gains from water heating, kWh/month
56.4830 49.7009 52.2190 44.5801 42.2975 37.1208 35.9384 37.9372 38.9814 44.6518 48.9193 55.6962 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4729	16.4074	13.3434	10.1018	7.5512	6.3751	6.8885	8.9539	12.0179	15.2595	17.8101	18.9863	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.9072	222.1892	216.4387	204.1967	188.7434	174.2195	164.5166	162.2346	167.9851	180.2271	195.6804	210.2043	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	(71)
Water heating gains (Table 5)	75.9180	73.9597	70.1868	61.9168	56.8514	51.5567	48.3043	50.9909	54.1408	60.0158	67.9435	74.8605	(72)
Total internal gains	394.9626	393.2208	380.6335	356.8799	333.8106	312.8157	300.3739	302.8440	314.8083	336.1669	362.0986	384.7157	(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	
Southwest				1.9100	36.7938	0.4600		0.0000		0.7700		24.8918 (79)	
Southwest				4.0400	36.7938	0.6000		0.7000		0.7700		43.2652 (79)	
Solar gains	68.1571	116.0967	158.8485	196.8210	220.4560	218.8618	211.0061	193.3734	171.9994	128.3116	81.6364	58.3282	(83)
Total gains	463.1196	509.3175	539.4820	553.7009	554.2666	531.6775	511.3800	496.2173	486.8077	464.4785	443.7350	443.0439	(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	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	
alpha	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	
util living area	0.9657	0.9440	0.9037	0.8274	0.6987	0.5277	0.3829	0.4118	0.6101	0.8378	0.9422	0.9718	(86)
MIT	20.1937	20.3564	20.5671	20.7770	20.9232	20.9850	20.9976	20.9965	20.9691	20.7958	20.4524	20.1368	(87)
Th 2	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	(88)
util rest of house	0.9584	0.9327	0.8849	0.7956	0.6497	0.4636	0.3118	0.3391	0.5452	0.8013	0.9285	0.9657	(89)
MIT 2	19.2545	19.4550	19.7102	19.9536	20.1084	20.1637	20.1721	20.1716	20.1519	19.9801	19.5771	19.1837	(90)
Living area fraction	19.7237	19.9054	20.1383	20.3650	20.5155	20.5740	20.5845	20.5837	20.5602	20.3876	20.0144	19.6599	(91)
MIT	19.7237	19.9054	20.1383	20.3650	20.5155	20.5740	20.5845	20.5837	20.5602	20.3876	20.0144	19.6599	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7237	19.9054	20.1383	20.3650	20.5155	20.5740	20.5845	20.5837	20.5602	20.3876	20.0144	19.6599	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9537	0.9286	0.8840	0.8034	0.6706	0.4950	0.3474	0.3754	0.5762	0.8114	0.9256	0.9611	(94)
Useful gains	441.6684	472.9270	476.8956	444.8424	371.6838	263.1942	177.6334	186.2790	280.4945	376.8694	410.7001	425.8064	(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	689.5778	670.8732	609.7538	512.5867	394.1301	267.0927	178.1440	187.0489	288.8269	437.5939	577.3888	691.1934	(97)
Space heating kWh	184.4446	133.0199	98.8464	48.7759	16.7000	0.0000	0.0000	0.0000	0.0000	45.1790	120.0159	197.4479	(98a)
Space heating requirement - total per year (kWh/year)												844.4297	
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	184.4446	133.0199	98.8464	48.7759	16.7000	0.0000	0.0000	0.0000	0.0000	45.1790	120.0159	197.4479	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												844.4297	
Space heating per m2										(98c) / (4) =		16.8751	(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	184.4446	133.0199	98.8464	48.7759	16.7000	0.0000	0.0000	0.0000	0.0000	45.1790	120.0159	197.4479	(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)	184.4446	133.0199	98.8464	48.7759	16.7000	0.0000	0.0000	0.0000	0.0000	45.1790	120.0159	197.4479	(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)													

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Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
												0.0000 (213)
Water heating requirement	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589 (64)
Efficiency of water heater (217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200 (216)
Fuel for water heating, kWh/month	60.6511	53.5621	56.6994	49.3521	47.5046	42.4392	41.6113	43.4637	44.1634	49.6864	53.3736	59.9220 (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	2.7991	2.5282	2.7991	2.7088	2.7991	2.7088	2.7991	2.7991	2.7088	2.7991	2.7088	2.7991 (231)
Lighting	16.1692	12.9715	11.6794	8.5569	6.6096	5.4001	6.0295	7.8373	10.1799	13.3566	15.0862	16.6186 (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												844.4297 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												324.5200
Water heating fuel used												602.4288 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2240)												
mechanical ventilation fans (SFP = 0.2240)												32.9566 (230a)
Total electricity for the above, kWh/year												32.9566 (231)
Electricity for lighting (calculated in Appendix L)												130.4947 (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												1610.3098 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	844.4297	16.4900	139.2465 (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)	602.4288	16.4900	99.3405 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	32.9566	16.4900	5.4345 (249)
Energy for lighting	130.4947	16.4900	21.5186 (250)
Additional standing charges			0.0000 (251)
Total energy cost			265.5401 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.0058 (257)
SAP value	83.6954
SAP rating (Section 12)	84 (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	844.4297	0.1564	132.1013 (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)	602.4288	0.1411	85.0105 (264)
Space and water heating			217.1118 (265)
Pumps, fans and electric keep-hot	32.9566	0.1387	4.5715 (267)
Energy for lighting	130.4947	0.1443	18.8344 (268)
Total CO2, kg/year			240.5177 (272)
CO2 emissions per m2			4.8100 (273)
EI value			96.6089
EI rating			97 (274)
EI band			A

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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

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.0400 (1b)	x 2.4100 (2b)	= 120.5964 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.5964 (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	= (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												3.6900	(17)
Infiltration rate												0.1845	(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) =	0.1568 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.4000	4.1000	4.1000	3.9000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Adj infilt rate	1.1000	1.0250	1.0250	0.9750	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
	0.1725	0.1607	0.1607	0.1529	0.1529	0.1333	0.1333	0.1294	0.1333	0.1490	0.1451	0.1568	(22b)
Mechanical extract ventilation - centralised													
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)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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			1.9100	1.2357	2.3603			(27)					
French Door			4.0400	1.3258	5.3561			(27)					
Corridor Door			2.0800	1.0000	2.0800			(26)					
GF B&B J150 P/A=0.22			50.0400	0.1000	5.0040			(28a)					
EW Brick AAC018/019	15.8700	5.9500	9.9200	0.2600	2.5792	60.0000	595.2000	(29a)					
E-WM-30 Corridor Wall	23.1200	2.0800	21.0400	0.2100	4.4184	52.3000	1100.3920	(29a)					
Total net area of external elements Aum(A, m2)			89.0300					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.7979			(33)					
Main dwelling													
Party Wall			36.4800	0.0000	0.0000	45.0000	1641.6000	(32)					
Party Ceiling			50.0400			40.0000	2001.6000	(32b)					
GF Timber			102.3800			9.0000	921.4200	(32c)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10013.2120	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							200.1042	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				2.8400	0.0370	0.1051							
E4 Jamb				8.2700	0.0140	0.1158							
E5 Ground floor (normal)				6.1500	0.0380	0.2337							
E7 Party floor between dwellings (in blocks of flats)				6.1500	0.0390	0.2399							
E16 Corner (normal)				5.1600	0.0340	0.1754							
P1 Party wall - Ground floor				14.1400	0.0470	0.6646							
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				14.1400	0.0000	0.0000							
E2 Other lintels (including other steel lintels)				1.0200	0.0270	0.0275							
E4 Jamb				4.2000	0.0850	0.3570							
E5 Ground floor (normal)				8.9600	0.0450	0.4032							
E7 Party floor between dwellings (in blocks of flats)				8.9600	0.0330	0.2957							
E25 Staggered party wall between dwellings				7.7400	0.0380	0.2941							
E17 Corner (inverted - internal area greater than external area)				2.5800	0.0000	0.0000							
E18 Party wall between dwellings				2.5800	0.0390	0.1006							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.0126 (36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	24.8105	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 19.8984	Feb 19.8984	Mar 19.8984	Apr 19.8984	May 19.8984	Jun 19.8984	Jul 19.8984	Aug 19.8984	Sep 19.8984	Oct 19.8984	Nov 19.8984	Dec 19.8984	(38)
Heat transfer coeff	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	(39)
Average = Sum(39)m / 12 =												44.7089	
HLP	Jan 0.8935	Feb 0.8935	Mar 0.8935	Apr 0.8935	May 0.8935	Jun 0.8935	Jul 0.8935	Aug 0.8935	Sep 0.8935	Oct 0.8935	Nov 0.8935	Dec 0.8935	(40)
HLP (average)												0.8935	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6913 (42)
Hot water usage for mixer showers												52.3752 (42a)
Hot water usage for baths												22.6561 (42b)
Hot water usage for other uses												31.9504 (42c)
Average daily hot water use (litres/day)												98.5967 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.2600	104.9704	102.1818	97.9404	94.4964	90.7938	89.3702	92.1467	95.0752	98.9624	103.2692	106.9817 (44)
Energy content (annual)	169.8736	149.4764	157.0496	134.0755	127.2104	111.6416	108.0855	114.0969	117.2372	134.2911	147.1259	167.5075 (45)
Distribution loss (46)m = 0.15 x (45)m												25.4810
Water storage loss:												200.0000 (47)
Store volume												1.6100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8694 (55)
Enter (49) or (54) in (55)												
Total storage loss												26.9514 (56)
If cylinder contains dedicated solar storage												26.9514 (57)
Primary loss												0.0000 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month												196.8250
WWHRS												173.8196
PV diverter												0.0000 (63b)
Solar input												0.0000 (63c)
FGHRS												0.0000 (63d)
Output from w/h												196.8250
	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589 (62)
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												56.4830
	56.4830	49.7009	52.2190	44.5801	42.2975	37.1208	35.9384	37.9372	38.9814	44.6518	48.9193	55.6962 (65)
5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												101.4767
(66)m	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												18.4729
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												219.9072
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												46.8390
Pumps, fans												0.0000
Losses e.g. evaporation (negative values) (Table 5)												-67.6511
Water heating gains (Table 5)												75.9180
Total internal gains												394.9626
	394.9626	393.2208	380.6335	356.8799	333.8106	312.8157	300.3739	302.8440	314.8083	336.1669	362.0986	384.7157 (73)
6. Solar gains												
[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a		Specific data		Specific data		factor		W	
			W/m2		or Table 6b		or Table 6c		Table 6d			
Southwest	1.9100		42.9509		0.4600		0.0000		0.7700		29.0572 (79)	
Southwest	4.0400		42.9509		0.6000		0.7000		0.7700		50.5052 (79)	
Solar gains	79.5625	118.3935	161.1585	203.9697	224.0332	235.9964	224.9780	209.0395	186.3956	140.4965	93.8601	68.5012 (83)
Total gains	474.5251	511.6143	541.7919	560.8496	557.8437	548.8121	525.3519	511.8835	501.2039	476.6634	455.9587	453.2169 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124
util living area	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475
	0.9568	0.9351	0.8841	0.7907	0.6355	0.4363	0.2890	0.3139	0.5410	0.7905	0.9242	0.9637 (86)
MIT	20.2842	20.4221	20.6404	20.8337	20.9553	20.9947	20.9995	20.9992	20.9838	20.8589	20.5456	20.2377 (87)
Th 2	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731 (88)
util rest of house	0.9475	0.9218	0.8615	0.7536	0.5810	0.3711	0.2189	0.2421	0.4736	0.7464	0.9065	0.9557 (89)
MIT 2	19.3672	19.5359	19.7972	20.0156	20.1385	20.1703	20.1729	20.1728	20.1631	20.0470	19.6898	19.3101 (90)
Living area fraction	19.8253	19.9786	20.2185	20.4243	20.5466	20.5821	20.5859	20.5857	20.5731	20.4526	20.1173	19.7736 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8253	19.9786	20.2185	20.4243	20.5466	20.5821	20.5859	20.5857	20.5731	20.4526	20.1173	19.7736 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9430	0.9183	0.8629	0.7654	0.6061	0.4035	0.2539	0.2780	0.5066	0.7621	0.9052	0.9511	(94)
Useful gains	447.4957	469.8267	467.5011	429.2841	338.1198	221.4654	133.4098	142.2874	253.9277	363.2414	412.7314	431.0608	(95)
Ext temp.	4.9000	5.5000	7.3000	9.7000	12.7000	15.6000	17.6000	17.4000	14.8000	11.4000	7.8000	4.9000	(96)
Heat loss rate W	667.2955	647.3238	577.5711	479.4727	350.8121	222.7464	133.4960	142.4294	258.1100	404.7329	550.6954	664.9804	(97)
Space heating kWh	163.5310	119.2780	81.8921	36.1358	9.4430	0.0000	0.0000	0.0000	0.0000	30.8697	99.3341	174.0362	(98a)
Space heating requirement - total per year (kWh/year)												714.5199	
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	163.5310	119.2780	81.8921	36.1358	9.4430	0.0000	0.0000	0.0000	0.0000	30.8697	99.3341	174.0362	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												714.5199	
Space heating per m2										(98c) / (4) =		14.2790	(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	163.5310	119.2780	81.8921	36.1358	9.4430	0.0000	0.0000	0.0000	0.0000	30.8697	99.3341	174.0362	(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)	163.5310	119.2780	81.8921	36.1358	9.4430	0.0000	0.0000	0.0000	0.0000	30.8697	99.3341	174.0362	(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	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589	(64)	
Efficiency of water heater (217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	(216)	
Fuel for water heating, kWh/month	60.6511	53.5621	56.6994	49.3521	47.5046	42.4392	41.6113	43.4637	44.1634	49.6864	53.3736	59.9220	(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	2.7991	2.5282	2.7991	2.7088	2.7991	2.7088	2.7991	2.7991	2.7088	2.7991	2.7088	2.7991	(231)	
Lighting	16.1692	12.9715	11.6794	8.5569	6.6096	5.4001	6.0295	7.8373	10.1799	13.3566	15.0862	16.6186	(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												714.5199	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												324.5200		
Water heating fuel used												602.4288	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2240)														
mechanical ventilation fans (SFP = 0.2240)													32.9566	(230a)
Total electricity for the above, kWh/year													32.9566	(231)
Electricity for lighting (calculated in Appendix L)													130.4947	(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													1480.4000	(238)

10a. Fuel costs - using BEDF prices (567)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	714.5199	26.0600	186.2039 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	602.4288	26.0600	156.9929 (247)

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Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	32.9566	26.0600	8.5885 (249)
Energy for lighting	130.4947	26.0600	34.0069 (250)
Additional standing charges			0.0000 (251)
Total energy cost			385.7922 (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	714.5199	0.1571	112.2490 (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)	602.4288	0.1411	85.0105 (264)
Space and water heating			197.2595 (265)
Pumps, fans and electric keep-hot	32.9566	0.1387	4.5715 (267)
Energy for lighting	130.4947	0.1443	18.8344 (268)
Total CO2, kg/year			220.6655 (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	714.5199	1.5816	1130.0674 (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)	602.4288	1.5218	916.7732 (278)
Space and water heating			2046.8406 (279)
Pumps, fans and electric keep-hot	32.9566	1.5128	49.8567 (281)
Energy for lighting	130.4947	1.5338	200.1572 (282)
Total Primary energy kWh/year			2296.8545 (286)

SAP 10 EPC IMPROVEMENTS

Plot 033

Current energy efficiency rating: B 84
Current environmental impact rating: A 97

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

Potential energy efficiency rating: B 84
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 567 TEST (07 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

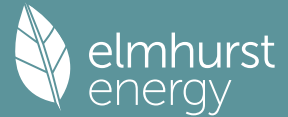
	Current £386	Potential £386	Saving £0
Electricity			
Space heating	£195	£195	£0
Water heating	£157	£157	£0
Lighting	£34	£34	£0
Total cost of fuels	£386	£386	£0
Total cost of uses	£386	£386	£0
Delivered energy	30 kWh/m²	30 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	4 kg/m²	0 kg/m²
Primary energy	46 kWh/m²	46 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Main dwelling	50.0400 (1b)	x 2.4100 (2b)	= 120.5964 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0400		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.5964 (5)

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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) =										
Pressure test	0.0000	/	(5)	=	0.0000	(8)					
Pressure Test Method	Yes										
Measured/design AP50	Blower Door										
Infiltration rate	3.6900 (17)										
Number of sides sheltered	0.1845 (18)										
	2 (19)										
Shelter factor	(20) = 1 - [0.075 x (19)] =										
Infiltration rate adjusted to include shelter factor	0.8500 (20)										
	(21) = (18) x (20) =										
	0.1568 (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	0.2000	0.1960	0.1921	0.1725	0.1686	0.1490	0.1490	0.1451	0.1568	0.1686	0.1764	0.1843 (22b)
Mechanical extract ventilation - centralised												
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)											
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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			1.9100	1.2357	2.3603		(27)
French Door			4.0400	1.3258	5.3561		(27)
Corridor Door			2.0800	1.0000	2.0800		(26)
GF B&B J150 P/A=0.22			50.0400	0.1000	5.0040	75.0000	3753.0000 (28a)
EW Brick AAC018/019	15.8700	5.9500	9.9200	0.2600	2.5792	60.0000	595.2000 (29a)
E-WM-30 Corridor Wall	23.1200	2.0800	21.0400	0.2100	4.4184	52.3000	1100.3920 (29a)
Total net area of external elements Aum(A, m2)			89.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.7979		(33)
Main dwelling							
Party Wall			36.4800	0.0000	0.0000	45.0000	1641.6000 (32)
Party Ceiling			50.0400			40.0000	2001.6000 (32b)
GF Timber			102.3800			9.0000	921.4200 (32c)

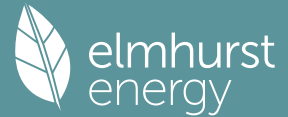
Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =											
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	10013.2120 (34)											
List of Thermal Bridges	200.1042 (35)											
K1 Element				Length		Psi-value		Total				
E2 Other lintels (including other steel lintels)				2.8400		0.0370		0.1051				
E4 Jamb				8.2700		0.0140		0.1158				
E5 Ground floor (normal)				6.1500		0.0380		0.2337				
E7 Party floor between dwellings (in blocks of flats)				6.1500		0.0390		0.2399				
E16 Corner (normal)				5.1600		0.0340		0.1754				
P1 Party wall - Ground floor				14.1400		0.0470		0.6646				
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				14.1400		0.0000		0.0000				
E2 Other lintels (including other steel lintels)				1.0200		0.0270		0.0275				
E4 Jamb				4.2000		0.0850		0.3570				
E5 Ground floor (normal)				8.9600		0.0450		0.4032				
E7 Party floor between dwellings (in blocks of flats)				8.9600		0.0330		0.2957				
E25 Staggered party wall between dwellings				7.7400		0.0380		0.2941				
E17 Corner (inverted - internal area greater than external area)				2.5800		0.0000		0.0000				
E18 Party wall between dwellings				2.5800		0.0390		0.1006				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											3.0126 (36)	
Point Thermal bridges											0.0000	
Total fabric heat loss									(33) + (36) + (36a) =		24.8105 (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
	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984 (38)
Heat transfer coeff	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089 (39)
Average = Sum(39)m / 12 =	44.7089											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935 (40)
HLP (average)	0.8935											
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6913 (42)											
Hot water usage for mixer showers	52.3752 (42a)											
Hot water usage for baths	22.6561 (42b)											
Hot water usage for other uses	31.9504 (42c)											
Average daily hot water use (litres/day)	98.5967 (43)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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Daily hot water use	107.2600	104.9704	102.1818	97.9404	94.4964	90.7938	89.3702	92.1467	95.0752	98.9624	103.2692	106.9817	(44)
Energy content (annual)	169.8736	149.4764	157.0496	134.0755	127.2104	111.6416	108.0855	114.0969	117.2372	134.2911	147.1259	167.5075	(45)
Distribution loss (46)m = 0.15 x (45)m	25.4810	22.4215	23.5574	20.1113	19.0816	16.7462	16.2128	17.1145	17.5856	20.1437	22.0689	25.1261	(46)
Water storage loss:													
Store volume												200.0000	(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	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589	(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	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589	(64)
												1955.0020	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	56.4830	49.7009	52.2190	44.5801	42.2975	37.1208	35.9384	37.9372	38.9814	44.6518	48.9193	55.6962	(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	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	18.4729	16.4074	13.3434	10.1018	7.5512	6.3751	6.8885	8.9539	12.0179	15.2595	17.8101	18.9863	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	219.9072	222.1892	216.4387	204.1967	188.7434	174.2195	164.5166	162.2346	167.9851	180.2271	195.6804	210.2043	(68)
Pumps, fans	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	(71)
Total internal gains	75.9180	73.9597	70.1868	61.9168	56.8514	51.5567	48.3043	50.9909	54.1408	60.0158	67.9435	74.8605	(72)
	394.9626	393.2208	380.6335	356.8799	333.8106	312.8157	300.3739	302.8440	314.8083	336.1669	362.0986	384.7157	(73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF		Access		Gains	
				m2	Table 6a	Specific data		Specific data		factor		W	
					W/m2	or Table 6b		or Table 6c		Table 6d			
Southwest				1.9100	36.7938	0.4600		0.0000		0.7700		24.8918 (79)	
Southwest				4.0400	36.7938	0.6000		0.7000		0.7700		43.2652 (79)	
Solar gains	68.1571	116.0967	158.8485	196.8210	220.4560	218.8618	211.0061	193.3734	171.9994	128.3116	81.6364	58.3282	(83)
Total gains	463.1196	509.3175	539.4820	553.7009	554.2666	531.6775	511.3800	496.2173	486.8077	464.4785	443.7350	443.0439	(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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	
util living area	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	
	0.9657	0.9440	0.9037	0.8274	0.6987	0.5277	0.3829	0.4118	0.6101	0.8378	0.9422	0.9718	(86)
MIT	20.1937	20.3564	20.5671	20.7770	20.9232	20.9850	20.9976	20.9965	20.9691	20.7958	20.4524	20.1368	(87)
Th 2	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	(88)
util rest of house	0.9584	0.9327	0.8849	0.7956	0.6497	0.4636	0.3118	0.3391	0.5452	0.8013	0.9285	0.9657	(89)
MIT 2	19.2545	19.4550	19.7102	19.9536	20.1084	20.1637	20.1721	20.1716	20.1519	19.9801	19.5771	19.1837	(90)
Living area fraction	19.7237	19.9054	20.1383	20.3650	20.5155	20.5740	20.5845	20.5837	20.5602	20.3876	20.0144	19.6599	(91)
MIT	19.7237	19.9054	20.1383	20.3650	20.5155	20.5740	20.5845	20.5837	20.5602	20.3876	20.0144	19.6599	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7237	19.9054	20.1383	20.3650	20.5155	20.5740	20.5845	20.5837	20.5602	20.3876	20.0144	19.6599	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9537	0.9286	0.8840	0.8034	0.6706	0.4950	0.3474	0.3754	0.5762	0.8114	0.9256	0.9611	(94)
Ext temp.	441.6684	472.9270	476.8956	444.8424	371.6838	263.1942	177.6334	186.2790	280.4945	376.8694	410.7001	425.8064	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Space heating kWh	689.5778	670.8732	609.7538	512.5867	394.1301	267.0927	178.1440	187.0489	288.8269	437.5939	577.3888	691.1934	(97)
Space heating requirement - total per year (kWh/year)	184.4446	133.0199	98.8464	48.7759	16.7000	0.0000	0.0000	0.0000	0.0000	45.1790	120.0159	197.4479	(98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	

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Space heating kWh	184.4446	133.0199	98.8464	48.7759	16.7000	0.0000	0.0000	0.0000	0.0000	45.1790	120.0159	197.4479 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												844.4297
Space heating per m2											(98c) / (4) =	16.8751 (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
184.4446	133.0199	98.8464	48.7759	16.7000	0.0000	0.0000	0.0000	0.0000	0.0000	45.1790	120.0159	197.4479 (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)	184.4446	133.0199	98.8464	48.7759	16.7000	0.0000	0.0000	0.0000	0.0000	45.1790	120.0159	197.4479 (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	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589 (64)
Efficiency of water heater (217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200 (216)
Fuel for water heating, kWh/month	60.6511	53.5621	56.6994	49.3521	47.5046	42.4392	41.6113	43.4637	44.1634	49.6864	53.3736	59.9220 (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	2.7991	2.5282	2.7991	2.7088	2.7991	2.7088	2.7991	2.7088	2.7991	2.7088	2.7991	2.7991 (231)
Lighting	16.1692	12.9715	11.6794	8.5569	6.6096	5.4001	6.0295	7.8373	10.1799	13.3566	15.0862	16.6186 (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												844.4297 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												324.5200
Water heating fuel used												602.4288 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2240)												
mechanical ventilation fans (SFP = 0.2240)												32.9566 (230a)
Total electricity for the above, kWh/year												32.9566 (231)
Electricity for lighting (calculated in Appendix L)												130.4947 (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												1610.3098 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	844.4297	16.4900	139.2465 (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)	602.4288	16.4900	99.3405 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	32.9566	16.4900	5.4345 (249)
Energy for lighting	130.4947	16.4900	21.5186 (250)
Additional standing charges			0.0000 (251)
Total energy cost			265.5401 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		1.0058 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	83.6954
SAP rating (Section 12)		84 (258)

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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	844.4297	0.1564	132.1013	(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)	602.4288	0.1411	85.0105	(264)
Space and water heating			217.1118	(265)
Pumps, fans and electric keep-hot	32.9566	0.1387	4.5715	(267)
Energy for lighting	130.4947	0.1443	18.8344	(268)
Total CO2, kg/year			240.5177	(272)
CO2 emissions per m2			4.8100	(273)
EI value			96.6089	
EI rating			97	(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	50.0400	2.4100	120.5964	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0400			
Dwelling volume			120.5964	(5)

2. Ventilation rate

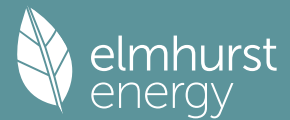
	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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	3.6900	(17)
Infiltration rate	0.1845	(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) =	0.1568 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.1000	4.1000	3.9000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.1000	1.0250	1.0250	0.9750	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1725	0.1607	0.1607	0.1529	0.1529	0.1333	0.1333	0.1294	0.1333	0.1490	0.1451	0.1568	(22b)
Mechanical extract ventilation - centralised													
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)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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			1.9100	1.2357	2.3603			(27)
French Door			4.0400	1.3258	5.3561			(27)
Corridor Door			2.0800	1.0000	2.0800			(26)
GF B&B J150 P/A=0.22			50.0400	0.1000	5.0040	75.0000	3753.0000	(28a)
EW Brick AAC018/019	15.8700	5.9500	9.9200	0.2600	2.5792	60.0000	595.2000	(29a)
E-WM-30 Corridor Wall	23.1200	2.0800	21.0400	0.2100	4.4184	52.3000	1100.3920	(29a)
Total net area of external elements Aum(A, m2)			89.0300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.7979			(33)
Main dwelling								
Party Wall			36.4800	0.0000	0.0000	45.0000	1641.6000	(32)
Party Ceiling			50.0400			40.0000	2001.6000	(32b)
GF Timber			102.3800			9.0000	921.4200	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10013.2120	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							200.1042	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				2.8400	0.0370	0.1051		

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E4 Jamb	8.2700	0.0140	0.1158
E5 Ground floor (normal)	6.1500	0.0380	0.2337
E7 Party floor between dwellings (in blocks of flats)	6.1500	0.0390	0.2399
E16 Corner (normal)	5.1600	0.0340	0.1754
P1 Party wall - Ground floor	14.1400	0.0470	0.6646
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	14.1400	0.0000	0.0000
E2 Other lintels (including other steel lintels)	1.0200	0.0270	0.0275
E4 Jamb	4.2000	0.0850	0.3570
E5 Ground floor (normal)	8.9600	0.0450	0.4032
E7 Party floor between dwellings (in blocks of flats)	8.9600	0.0330	0.2957
E25 Staggered party wall between dwellings	7.7400	0.0380	0.2941
E17 Corner (inverted - internal area greater than external area)	2.5800	0.0000	0.0000
E18 Party wall between dwellings	2.5800	0.0390	0.1006
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.0126 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	24.8105 (37)

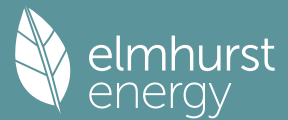
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984	19.8984 (38)
Heat transfer coeff	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089	44.7089 (39)
Average = Sum(39)m / 12 =													44.7089
HLP	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935	0.8935 (40)
HLP (average)													0.8935
Days in mont	31	28	31	30	31	30	31	31	30	31	30		31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6913 (42)
Hot water usage for mixer showers	52.5767	51.7865	50.6352	48.4322	46.8065	44.9936	43.9631	45.1057	46.3583	48.3049	50.5551	52.3752 (42a)
Hot water usage for baths	22.7329	22.3953	21.9199	21.0433	20.3869	19.6590	19.2659	19.7380	20.2520	21.0308	21.9255	22.6561 (42b)
Hot water usage for other uses	31.9504	30.7886	29.6267	28.4649	27.3031	26.1412	26.1412	27.3031	28.4649	29.6267	30.7886	31.9504 (42c)
Average daily hot water use (litres/day)												98.5967 (43)
Daily hot water use	107.2600	104.9704	102.1818	97.9404	94.4964	90.7938	89.3702	92.1467	95.0752	98.9624	103.2692	106.9817 (44)
Energy conte	169.8736	149.4764	157.0496	134.0755	127.2104	111.6416	108.0855	114.0969	117.2372	134.2911	147.1259	167.5075 (45)
Energy content (annual)										Total = Sum(45)m =		1637.6710
Distribution loss (46)m = 0.15 x (45)m	25.4810	22.4215	23.5574	20.1113	19.0816	16.7462	16.2128	17.1145	17.5856	20.1437	22.0689	25.1261 (46)
Water storage loss:												
Store volume												200.0000 (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	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589 (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	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589 (64)
								Total per year (kWh/year) = Sum(64)m =				1955.0020 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000 (64a)
Heat gains from water heating, kWh/month	56.4830	49.7009	52.2190	44.5801	42.2975	37.1208	35.9384	37.9372	38.9814	44.6518	48.9193	55.6962 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767	101.4767 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4729	16.4074	13.3434	10.1018	7.5512	6.3751	6.8885	8.9539	12.0179	15.2595	17.8101	18.9863 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.9072	222.1892	216.4387	204.1967	188.7434	174.2195	164.5166	162.2346	167.9851	180.2271	195.6804	210.2043 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390	46.8390 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511	-67.6511 (71)
Water heating gains (Table 5)	75.9180	73.9597	70.1868	61.9168	56.8514	51.5567	48.3043	50.9909	54.1408	60.0158	67.9435	74.8605 (72)
Total internal gains	394.9626	393.2208	380.6335	356.8799	333.8106	312.8157	300.3739	302.8440	314.8083	336.1669	362.0986	384.7157 (73)

6. Solar gains												
[Jan]												
		Area	Solar flux	g	FF					Access	Gains	
		m2	Table 6a	Specific data	Specific data					factor	W	
			W/m2	or Table 6b	or Table 6c					Table 6d		
Southwest		1.9100	42.9509	0.4600	0.0000					0.7700	29.0572 (79)	
Southwest		4.0400	42.9509	0.6000	0.7000					0.7700	50.5052 (79)	

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Solar gains	79.5625	118.3935	161.1585	203.9697	224.0332	235.9964	224.9780	209.0395	186.3956	140.4965	93.8601	68.5012 (83)
Total gains	474.5251	511.6143	541.7919	560.8496	557.8437	548.8121	525.3519	511.8835	501.2039	476.6634	455.9587	453.2169 (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	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124	62.2124
alpha	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475	5.1475
util living area	0.9568	0.9351	0.8841	0.7907	0.6355	0.4363	0.2890	0.3139	0.5410	0.7905	0.9242	0.9637 (86)
MIT	20.2842	20.4221	20.6404	20.8337	20.9553	20.9947	20.9995	20.9992	20.9838	20.8589	20.5456	20.2377 (87)
Th 2	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731	20.1731 (88)
util rest of house	0.9475	0.9218	0.8615	0.7536	0.5810	0.3711	0.2189	0.2421	0.4736	0.7464	0.9065	0.9557 (89)
MIT 2	19.3672	19.5359	19.7972	20.0156	20.1385	20.1703	20.1729	20.1728	20.1631	20.0470	19.6898	19.3101 (90)
Living area fraction	19.8253	19.9786	20.2185	20.4243	20.5466	20.5821	20.5859	20.5857	20.5731	20.4526	20.1173	19.7736 (92)
MIT	19.8253	19.9786	20.2185	20.4243	20.5466	20.5821	20.5859	20.5857	20.5731	20.4526	20.1173	19.7736 (93)
Temperature adjustment												0.0000
adjusted MIT	19.8253	19.9786	20.2185	20.4243	20.5466	20.5821	20.5859	20.5857	20.5731	20.4526	20.1173	19.7736 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9430	0.9183	0.8629	0.7654	0.6061	0.4035	0.2539	0.2780	0.5066	0.7621	0.9052	0.9511 (94)
Useful gains	447.4957	469.8267	467.5011	429.2841	338.1198	221.4654	133.4098	142.2874	253.9277	363.2414	412.7314	431.0608 (95)
Ext temp.	4.9000	5.5000	7.3000	9.7000	12.7000	15.6000	17.6000	17.4000	14.8000	11.4000	7.8000	4.9000 (96)
Heat loss rate W	667.2955	647.3238	577.5711	479.4727	350.8121	222.7464	133.4960	142.4294	258.1100	404.7329	550.6954	664.9804 (97)
Space heating kWh	163.5310	119.2780	81.8921	36.1358	9.4430	0.0000	0.0000	0.0000	0.0000	30.8697	99.3341	174.0362 (98a)
Space heating requirement - total per year (kWh/year)												714.5199
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	163.5310	119.2780	81.8921	36.1358	9.4430	0.0000	0.0000	0.0000	0.0000	30.8697	99.3341	174.0362 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												714.5199
Space heating per m2										(98c) / (4) =		14.2790 (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	163.5310	119.2780	81.8921	36.1358	9.4430	0.0000	0.0000	0.0000	0.0000	30.8697	99.3341	174.0362 (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)	163.5310	119.2780	81.8921	36.1358	9.4430	0.0000	0.0000	0.0000	0.0000	30.8697	99.3341	174.0362 (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	196.8250	173.8196	184.0010	160.1575	154.1618	137.7236	135.0369	141.0483	143.3192	161.2425	173.2079	194.4589 (64)
Efficiency of water heater (217)m	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200	324.5200 (216)
Fuel for water heating, kWh/month	60.6511	53.5621	56.6994	49.3521	47.5046	42.4392	41.6113	43.4637	44.1634	49.6864	53.3736	59.9220 (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	2.7991	2.5282	2.7991	2.7088	2.7991	2.7088	2.7991	2.7991	2.7088	2.7991	2.7088	2.7991 (231)
Lighting	16.1692	12.9715	11.6794	8.5569	6.6096	5.4001	6.0295	7.8373	10.1799	13.3566	15.0862	16.6186 (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												714.5199 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												324.5200
Water heating fuel used												602.4288 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2240)	
mechanical ventilation fans (SFP = 0.2240)	32.9566 (230a)
Total electricity for the above, kWh/year	32.9566 (231)
Electricity for lighting (calculated in Appendix L)	130.4947 (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	1480.4000 (238)

10a. Fuel costs - using BEDF prices (567)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	714.5199	26.0600	186.2039 (240)
Space heating - main system 2	0.0000	26.0600	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	602.4288	26.0600	156.9929 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	32.9566	26.0600	8.5885 (249)
Energy for lighting	130.4947	26.0600	34.0069 (250)
Additional standing charges			0.0000 (251)
Total energy cost			385.7922 (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	714.5199	0.1571	112.2490 (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)	602.4288	0.1411	85.0105 (264)
Space and water heating			197.2595 (265)
Pumps, fans and electric keep-hot	32.9566	0.1387	4.5715 (267)
Energy for lighting	130.4947	0.1443	18.8344 (268)
Total CO2, kg/year			220.6655 (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	714.5199	1.5816	1130.0674 (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)	602.4288	1.5218	916.7732 (278)
Space and water heating			2046.8406 (279)
Pumps, fans and electric keep-hot	32.9566	1.5128	49.8567 (281)
Energy for lighting	130.4947	1.5338	200.1572 (282)
Total Primary energy kWh/year			2296.8545 (286)