

Full SAP Calculation Printout



Property Reference	UNIT 39				Issued on Date	28/06/2023
Assessment Reference	UNIT 39			Prop Type Ref		
Property	Alexander House, UNIT 39, 205-207 King's Road, RG1 4LS					
SAP Rating	79 C	DER	5.51	TER	14.27	
Environmental	96 A	% DER < TER				61.39
CO ₂ Emissions (t/year)	0.35	DFEE	48.29	TFEE	46.49	
Compliance Check	See BREL	% DFEE < TFEE				-3.88
% DPER < TPER	22.84	DPER	57.81	TPER	74.92	
Assessor Details	Mr. Ondrej Gajdos				Assessor ID	W452-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	67.8000 (1b)	x 2.5000 (2b)	= 169.5000 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.8000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.5000 (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) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	Yes
Measured/design AP50	Blower Door
Infiltration rate	4.0000 (17)
Number of sides sheltered	0.2000 (18)
	3 (19)

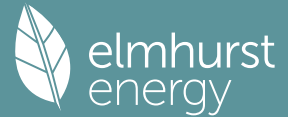
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1550 (21)

	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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (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
1 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
2 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
3 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
1			2.1000	1.0000	2.1000		(26)

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top floor exposed new	33.0000	19.5000	13.5000	0.1800	2.4300	18.0000	243.0000 (29a)
corridor new	52.5000	2.1000	50.4000	0.2400	12.0960	60.0000	3024.0000 (29a)
lift/stair new	17.0000		17.0000	0.2400	4.0800	9.0000	153.0000 (29a)
flat roof new	31.3000		31.3000	0.1300	4.0690	9.0000	281.7000 (30)
roof terrace new	36.5000		36.5000	0.1300	4.7450	9.0000	328.5000 (30)
Total net area of external elements Aum(A, m2)			170.3000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	53.6170			(33)
pw			10.7500	0.0000	0.0000	20.0000	215.0000 (32)
pf			67.8000			30.0000	2034.0000 (32d)
iw			88.0000			9.0000	792.0000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7071.2000 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 104.2950 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.8000	0.0500	0.4400
E3 Sill	7.8000	0.0500	0.3900
E4 Jamb	19.2000	0.0500	0.9600
E7 Party floor between dwellings (in blocks of flats)	27.8000	0.0700	1.9460
E14 Flat roof	32.2000	0.0800	2.5760
E15 Flat roof with parapet	13.4000	0.1500	2.0100
E16 Corner (normal)	12.5000	0.0900	1.1250
E17 Corner (inverted - internal area greater than external area)	10.0000	-0.0900	-0.9000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E24 Eaves (insulation at ceiling level - inverted)	4.4000	0.2400	1.0560
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.9030 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 63.5200 (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	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	(38)
Average = Sum(39)m / 12 =	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	(39)
HLP	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	(40)
HLP (average)													1.3494
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1916 (42)
Hot water usage for mixer showers													
60.9647	60.0486	58.7135	56.1591	54.2740	52.1718	50.9769	52.3019	53.7543	56.0114	58.6207	60.7312	(42a)	
Hot water usage for baths													
26.3401	25.9489	25.3980	24.3823	23.6217	22.7784	22.3229	22.8699	23.4655	24.3679	25.4045	26.2510	(42b)	
Hot water usage for other uses													
37.0737	35.7255	34.3774	33.0293	31.6811	30.3330	30.3330	31.6811	33.0293	34.3774	35.7255	37.0737	(42c)	
Average daily hot water use (litres/day)												114.3322 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
124.3785	121.7230	118.4889	113.5707	109.5769	105.2832	103.6328	106.8529	110.2490	114.7567	119.7507	124.0559	(44)	
Energy content (annual)	196.9851	173.3319	182.1130	155.4726	147.5116	129.4580	125.3349	132.3062	135.9481	155.7238	170.6069	194.2415 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =	1899.0336		
29.5478	25.9998	27.3170	23.3209	22.1267	19.4187	18.8002	19.8459	20.3922	23.3586	25.5910	29.1362	(46)	
Water storage loss:													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.1500 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.6210 (55)	
Total storage loss													
19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(56)	
If cylinder contains dedicated solar storage													
19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month													
239.4985	211.7311	224.6264	196.6146	190.0250	170.6000	167.8483	174.8196	177.0901	198.2372	211.7489	236.7549	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
FGHRS	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													
239.4985	211.7311	224.6264	196.6146	190.0250	170.6000	167.8483	174.8196	177.0901	198.2372	211.7489	236.7549	(64)	
									Total per year (kWh/year) = Sum(64)m =	2399.5946	(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													
99.5083	88.3522	94.5633	84.6082	83.0583	75.9584	75.6846	78.0025	78.1163	85.7889	89.6404	98.5960	(65)	

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	(66)
Lighting gains	(calculated in Appendix L, equation L9 or L9a), also see Table 5												
	23.0017	20.4299	16.6147	12.5784	9.4025	7.9380	8.5773	11.1491	14.9643	19.0006	22.1765	23.6410	(67)
Appliances gains	(calculated in Appendix L, equation L13 or L13a), also see Table 5												
	286.7297	289.7051	282.2073	266.2453	246.0962	227.1589	214.5077	211.5323	219.0301	234.9921	255.1411	274.0784	(68)
Cooking gains	(calculated in Appendix L, equation L15 or L15a), also see Table 5												
	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	(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)													
	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	(71)
Water heating gains (Table 5)													
	133.7477	131.4765	127.1012	117.5114	111.6375	105.4978	101.7266	104.8421	108.4949	115.3076	124.5005	132.5215	(72)
Total internal gains													
	537.6510	535.7834	520.0951	490.5071	461.3082	434.7666	418.9834	421.6954	436.6612	463.4722	495.9900	524.4128	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				6.5000	10.6334	0.6300	0.8000	0.7700	24.1406 (74)			
East				6.5000	19.6403	0.6300	0.8000	0.7700	44.5887 (76)			
East				6.5000	19.6403	0.6300	0.8000	0.7700	44.5887 (76)			
Solar gains	113.3180	220.5838	365.6869	544.9203	683.1262	707.2485	669.9858	564.3842	428.3885	261.9159	140.9742	93.4599 (83)
Total gains	650.9689	756.3671	885.7820	1035.4273	1144.4344	1142.0150	1088.9692	986.0796	865.0497	725.3880	636.9643	617.8728 (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	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699		
alpha	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313		
util living area	0.9238	0.8929	0.8340	0.7318	0.5981	0.4579	0.3482	0.3942	0.5910	0.7972	0.8975	0.9318	(86)	
Living	18.4550	18.8090	19.3853	20.0407	20.5432	20.8282	20.9359	20.9116	20.6703	19.9749	19.0771	18.3594		
Non living	16.8969	17.3361	18.0435	18.8239	19.3890	19.6798	19.7710	19.7560	19.5432	18.7761	17.6819	16.7779		
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0		
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0		
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10		
MIT	19.6981	18.8090	19.3853	20.0407	20.5432	20.8282	20.9359	20.9116	20.6703	19.9749	19.0771	18.7288	(87)	
Th 2	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	(88)	
util rest of house	0.9125	0.8775	0.8106	0.6952	0.5453	0.3863	0.2609	0.3023	0.5181	0.7592	0.8800	0.9215	(89)	
MIT 2	18.6441	17.3361	18.0435	18.8239	19.3890	19.6798	19.7710	19.7560	19.5432	18.7761	17.6819	17.3229	(90)	
Living area fraction									fLA = Living area / (4) =			0.4705	(91)	
MIT	19.1400	18.0291	18.6749	19.3964	19.9321	20.2201	20.3191	20.2997	20.0735	19.3401	18.3384	17.9844	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.1400	18.0291	18.6749	19.3964	19.9321	20.2201	20.3191	20.2997	20.0735	19.3401	18.3384	17.9844	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9052	0.8488	0.7845	0.6814	0.5513	0.4122	0.2995	0.3417	0.5357	0.7422	0.8527	0.9015	(94)
Useful gains	589.2834	642.0015	694.9144	705.5701	630.9560	470.7461	326.1613	336.9441	463.4333	538.3937	543.1639	556.9975	(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													
	1357.6724	1201.1504	1113.8462	960.2885	753.1300	514.1687	340.2493	356.7752	546.5015	799.6101	1028.1689	1261.0965	(97)
Space heating kWh													
	571.6814	375.7481	311.6853	183.3973	90.8975	0.0000	0.0000	0.0000	0.0000	194.3449	349.2036	523.8496	(98a)
Space heating requirement - total per year (kWh/year)												2600.8077	
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													
	571.6814	375.7481	311.6853	183.3973	90.8975	0.0000	0.0000	0.0000	0.0000	194.3449	349.2036	523.8496	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2600.8077	
Space heating per m2										(98c) / (4) =		38.3600	(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 %)	244.6181	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	571.6814	375.7481	311.6853	183.3973	90.8975	0.0000	0.0000	0.0000	0.0000	194.3449	349.2036	523.8496	(98)
Space heating efficiency (main heating system 1)	244.6181	244.6181	244.6181	244.6181	244.6181	0.0000	0.0000	0.0000	0.0000	244.6181	244.6181	244.6181	(210)
Space heating fuel (main heating system)	233.7037	153.6060	127.4171	74.9729	37.1589	0.0000	0.0000	0.0000	0.0000	79.4483	142.7546	214.1500	(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	239.4985	211.7311	224.6264	196.6146	190.0250	170.6000	167.8483	174.8196	177.0901	198.2372	211.7489	236.7549	(64)
Efficiency of water heater	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	(216)
Fuel for water heating, kWh/month	126.0928	111.4737	118.2629	103.5150	100.0457	89.8187	88.3699	92.0403	93.2356	104.3693	111.4830	124.6484	(217)
Space cooling fuel requirement	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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	20.1333	16.1516	14.5428	10.6547	8.2300	6.7239	7.5076	9.7587	12.6756	16.6311	18.7848	20.6928	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1063.2117	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												189.9382	
Water heating fuel used												1263.3553	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												162.4869	(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												2489.0539	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1063.2117	16.4900	175.3236 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1263.3553	16.4900	208.3273 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	162.4869	16.4900	26.7941 (250)
Additional standing charges			0.0000 (251)
Total energy cost			410.4450 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.3099 (257)
SAP value		78.7660
SAP rating (Section 12)		79 (258)
SAP band		C

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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	1063.2117	0.1552	165.0590 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1263.3553	0.1410	178.1082 (264)
Space and water heating			343.1672 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	162.4869	0.1443	23.4519 (268)
Total CO2, kg/year			366.6191 (272)
CO2 emissions per m2			5.4100 (273)
EI value			95.6448
EI rating			96 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	67.8000 (1b)	x 2.5000 (2b)	= 169.5000 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.5000 (5)

2. Ventilation rate

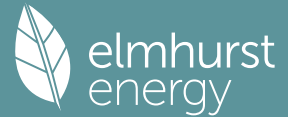
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1550 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate	0.1666	0.1589	0.1589	0.1473	0.1511	0.1318	0.1318	0.1279	0.1318	0.1473	0.1434	0.1550 (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
1 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
2 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
3 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	33.0000	19.5000	13.5000	0.1800	2.4300	18.0000	243.0000 (29a)
corridor new	52.5000	2.1000	50.4000	0.2400	12.0960	60.0000	3024.0000 (29a)
lift/stair new	17.0000		17.0000	0.2400	4.0800	9.0000	153.0000 (29a)

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flat roof new	31.3000	31.3000	0.1300	4.0690	9.0000	281.7000 (30)
roof terrace new	36.5000	36.5000	0.1300	4.7450	9.0000	328.5000 (30)
Total net area of external elements Aum(A, m2)		170.3000				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	53.6170			(33)
pw		10.7500	0.0000	0.0000	20.0000	215.0000 (32)
pf		67.8000			30.0000	2034.0000 (32d)
iw		88.0000			9.0000	792.0000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7071.2000 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 104.2950 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.8000	0.0500	0.4400
E3 Sill	7.8000	0.0500	0.3900
E4 Jamb	19.2000	0.0500	0.9600
E7 Party floor between dwellings (in blocks of flats)	27.8000	0.0700	1.9460
E14 Flat roof	32.2000	0.0800	2.5760
E15 Flat roof with parapet	13.4000	0.1500	2.0100
E16 Corner (normal)	12.5000	0.0900	1.1250
E17 Corner (inverted - internal area greater than external area)	10.0000	-0.0900	-0.9000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E24 Eaves (insulation at ceiling level - inverted)	4.4000	0.2400	1.0560
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.9030 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss		(33) + (36) + (36a) =	63.5200 (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	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	(38)
Heat transfer coeff	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	(39)
Average = Sum(39)m / 12 =													91.4875
HLP	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	(40)
HLP (average)													1.3494
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1916 (42)
Hot water usage for mixer showers													
60.9647	60.0486	58.7135	56.1591	54.2740	52.1718	50.9769	52.3019	53.7543	56.0114	58.6207	60.7312	60.7312	(42a)
Hot water usage for baths													
26.3401	25.9489	25.3980	24.3823	23.6217	22.7784	22.3229	22.8699	23.4655	24.3679	25.4045	26.2510	26.2510	(42b)
Hot water usage for other uses													
37.0737	35.7255	34.3774	33.0293	31.6811	30.3330	30.3330	31.6811	33.0293	34.3774	35.7255	37.0737	37.0737	(42c)
Average daily hot water use (litres/day)													114.3322 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.3785	121.7230	118.4889	113.5707	109.5769	105.2832	103.6328	106.8529	110.2490	114.7567	119.7507	124.0559	(44)
Energy conte	196.9851	173.3319	182.1130	155.4726	147.5116	129.4580	125.3349	132.3062	135.9481	155.7238	170.6069	194.2415	(45)
Energy content (annual)										Total = Sum(45)m =			1899.0336
Distribution loss (46)m = 0.15 x (45)m													
29.5478	25.9998	27.3170	23.3209	22.1267	19.4187	18.8002	19.8459	20.3922	23.3586	25.5910	29.1362	29.1362	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.1500 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.6210 (55)
Total storage loss													
19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	(56)
If cylinder contains dedicated solar storage													
19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
239.4985	211.7311	224.6264	196.6146	190.0250	170.6000	167.8483	174.8196	177.0901	198.2372	211.7489	236.7549	236.7549	(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													
239.4985	211.7311	224.6264	196.6146	190.0250	170.6000	167.8483	174.8196	177.0901	198.2372	211.7489	236.7549	236.7549	(64)
Total per year (kWh/year) = Sum(64)m =													2399.5946 (64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month													
99.5083	88.3522	94.5633	84.6082	83.0583	75.9584	75.6846	78.0025	78.1163	85.7889	89.6404	98.5960	98.5960	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	(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	23.0017	20.4299	16.6147	12.5784	9.4025	7.9380	8.5773	11.1491	14.9643	19.0006	22.1765	23.6410 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	286.7297	289.7051	282.2073	266.2453	246.0962	227.1589	214.5077	211.5323	219.0301	234.9921	255.1411	274.0784 (68)
Pumps, fans	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409 (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)	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621 (71)
Total internal gains	133.7477	131.4765	127.1012	117.5114	111.6375	105.4978	101.7266	104.8421	108.4949	115.3076	124.5005	132.5215 (72)
	537.6510	535.7834	520.0951	490.5071	461.3082	434.7666	418.9834	421.6954	436.6612	463.4722	495.9900	524.4128 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				6.5000	12.7650		0.6300		0.8000		0.7700		28.9801 (74)
East				6.5000	23.8018		0.6300		0.8000		0.7700		54.0364 (76)
East				6.5000	23.8018		0.6300		0.8000		0.7700		54.0364 (76)
Solar gains	137.0528	233.5055	384.6595	581.5572	709.3806	776.2835	728.3799	629.8599	480.3185	297.7423	168.0543	113.6219	(83)
Total gains	674.7038	769.2889	904.7545	1072.0642	1170.6888	1211.0501	1147.3633	1051.5553	916.9797	761.2144	664.0443	638.0348	(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	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699
alpha	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313
util living area	0.9108	0.8795	0.8109	0.6891	0.5365	0.3672	0.2555	0.2849	0.5153	0.7539	0.8762	0.9195 (86)
Living	18.6922	19.0134	19.5974	20.2399	20.6896	20.9147	20.9760	20.9684	20.7901	20.1889	19.3311	18.6158
Non living	17.1950	17.5912	18.3022	19.0535	19.5425	19.7524	19.7950	19.7920	19.6558	19.0242	17.9964	17.1011
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.8194	19.0134	19.5974	20.2399	20.6896	20.9147	20.9760	20.9684	20.7901	20.1889	19.3311	18.9493 (87)
Th 2	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024 (88)
util rest of house	0.8972	0.8617	0.7837	0.6469	0.4764	0.2906	0.1658	0.1888	0.4338	0.7078	0.8545	0.9071 (89)
MIT 2	18.7629	17.5912	18.3022	19.0535	19.5425	19.7524	19.7950	19.7920	19.6558	19.0242	17.9964	17.5879 (90)
Living area fraction	19.2600	18.2604	18.9116	19.6117	20.0822	20.2993	20.3506	20.3455	fLA = Living area / (4) =	20.1895	19.5722	18.6244
MIT	19.2600	18.2604	18.9116	19.6117	20.0822	20.2993	20.3506	20.3455	20.1895	19.5722	18.6244	18.2284 (92)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT	19.2600	18.2604	18.9116	19.6117	20.0822	20.2993	20.3506	20.3455	20.1895	19.5722	18.6244	18.2284 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	600.6143	641.0859	687.7896	685.6419	574.9752	391.4200	238.1099	245.2519	423.1751	531.1457	549.8338	565.5110 (95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000 (96)
Heat loss rate W	1295.4610	1149.1148	1053.1663	888.4990	657.0845	411.6268	242.5011	251.1774	474.7726	738.5039	971.9982	1201.0860 (97)
Space heating kWh	516.9660	341.3954	271.8402	146.0571	61.0893	0.0000	0.0000	0.0000	0.0000	154.2745	303.9584	472.8678 (98a)
Space heating requirement - total per year (kWh/year)												2268.4486
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	516.9660	341.3954	271.8402	146.0571	61.0893	0.0000	0.0000	0.0000	0.0000	154.2745	303.9584	472.8678 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2268.4486
Space heating per m2										(98c) / (4) =		33.4579 (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 %)											244.6181 (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											

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Space heating efficiency (main heating system 1)	516.9660	341.3954	271.8402	146.0571	61.0893	0.0000	0.0000	0.0000	0.0000	154.2745	303.9584	472.8678 (98)
Space heating fuel (main heating system)	244.6181	244.6181	244.6181	244.6181	244.6181	0.0000	0.0000	0.0000	0.0000	244.6181	244.6181	244.6181 (210)
Space heating efficiency (main heating system 2)	211.3360	139.5626	111.1284	59.7082	24.9733	0.0000	0.0000	0.0000	0.0000	63.0675	124.2584	193.3086 (211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Water heating requirement	239.4985	211.7311	224.6264	196.6146	190.0250	170.6000	167.8483	174.8196	177.0901	198.2372	211.7489	236.7549 (64)
Efficiency of water heater (217)m	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382 (216)
Fuel for water heating, kWh/month	126.0928	111.4737	118.2629	103.5150	100.0457	89.8187	88.3699	92.0403	93.2356	104.3693	111.4830	124.6484 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	20.1333	16.1516	14.5428	10.6547	8.2300	6.7239	7.5076	9.7587	12.6756	16.6311	18.7848	20.6928 (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												927.3431 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												189.9382
Water heating fuel used												1263.3553 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												162.4869 (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												2353.1853 (238)

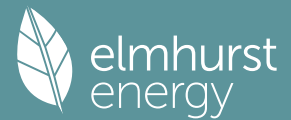
10a. Fuel costs - using BEDF prices (521)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	927.3431	18.3900	170.5384 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1263.3553	18.3900	232.3310 (247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	162.4869	18.3900	29.8813 (250)
Additional standing charges			0.0000 (251)
Total energy cost			432.7508 (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	927.3431	0.1558	144.4647 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1263.3553	0.1410	178.1082 (264)
Space and water heating			322.5729 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	162.4869	0.1443	23.4519 (268)
Total CO2, kg/year			346.0248 (272)

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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	927.3431	1.5767	1462.1369 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1263.3553	1.5213	1921.9400 (278)
Space and water heating			3384.0769 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	162.4869	1.5338	249.2279 (282)
Total Primary energy kWh/year			3633.3048 (286)

SAP 10 EPC IMPROVEMENTS

UNIT 39

Current energy efficiency rating: C 79
Current environmental impact rating: A 96

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

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

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

Potential energy efficiency rating: C 79
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 521 TEST (19 Jun 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £433	Potential £433	Saving £0
Electricity			
Space heating	£171	£171	£0
Water heating	£232	£232	£0
Lighting	£30	£30	£0
Total cost of fuels	£433	£433	£0
Total cost of uses	£433	£433	£0
Delivered energy	35 kWh/m²	35 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	54 kWh/m²	54 kWh/m²	0 kWh/m²

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

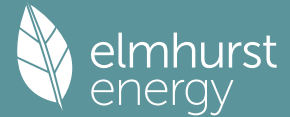
1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	67.8000 (1b)	x 2.5000 (2b)	= 169.5000 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	169.5000 (5)

2. Ventilation rate

	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)

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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	Air changes per hour	0.0000 (8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			4.0000	(17)
Infiltration rate			0.2000	(18)
Number of sides sheltered			3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750		(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1550		(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)
Mechanical extract ventilation - centralised	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821	(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
1 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
2 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
3 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	33.0000	19.5000	13.5000	0.1800	2.4300	18.0000	243.0000 (29a)
corridor new	52.5000	2.1000	50.4000	0.2400	12.0960	60.0000	3024.0000 (29a)
lift/stair new	17.0000		17.0000	0.2400	4.0800	9.0000	153.0000 (29a)
flat roof new	31.3000		31.3000	0.1300	4.0690	9.0000	281.7000 (30)
roof terrace new	36.5000		36.5000	0.1300	4.7450	9.0000	328.5000 (30)
Total net area of external elements Aum(A, m2)			170.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.6170		(33)
pw			10.7500	0.0000	0.0000	20.0000	215.0000 (32)
pf			67.8000			30.0000	2034.0000 (32d)
iw			88.0000			9.0000	792.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7071.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		104.2950 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.8000	0.0500	0.4400
E3 Sill	7.8000	0.0500	0.3900
E4 Jamb	19.2000	0.0500	0.9600
E7 Party floor between dwellings (in blocks of flats)	27.8000	0.0700	1.9460
E14 Flat roof	32.2000	0.0800	2.5760
E15 Flat roof with parapet	13.4000	0.1500	2.0100
E16 Corner (normal)	12.5000	0.0900	1.1250
E17 Corner (inverted - internal area greater than external area)	10.0000	-0.0900	-0.9000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E24 Eaves (insulation at ceiling level - inverted)	4.4000	0.2400	1.0560
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.9030 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 63.5200 (37)

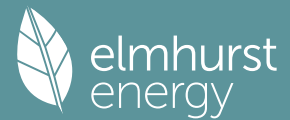
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	(38)
Average = Sum(39)m / 12 =	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1916 (42)
Hot water usage for mixer showers													
Hot water usage for baths	60.9647	60.0486	58.7135	56.1591	54.2740	52.1718	50.9769	52.3019	53.7543	56.0114	58.6207	60.7312	(42a)

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Hot water usage for other uses	26.3401	25.9489	25.3980	24.3823	23.6217	22.7784	22.3229	22.8699	23.4655	24.3679	25.4045	26.2510 (42b)
Average daily hot water use (litres/day)	37.0737	35.7255	34.3774	33.0293	31.6811	30.3330	30.3330	31.6811	33.0293	34.3774	35.7255	37.0737 (42c)
												114.3322 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	124.3785	121.7230	118.4889	113.5707	109.5769	105.2832	103.6328	106.8529	110.2490	114.7567	119.7507	124.0559 (44)
Distribution loss (46)m = 0.15 x (45)m	196.9851	173.3319	182.1130	155.4726	147.5116	129.4580	125.3349	132.3062	135.9481	155.7238	170.6069	194.2415 (45)
										Total = Sum(45)m =		1899.0336
Water storage loss:	29.5478	25.9998	27.3170	23.3209	22.1267	19.4187	18.8002	19.8459	20.3922	23.3586	25.5910	29.1362 (46)
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1500 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6210 (55)
Total storage loss	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510 (56)
If cylinder contains dedicated solar storage	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	239.4985	211.7311	224.6264	196.6146	190.0250	170.6000	167.8483	174.8196	177.0901	198.2372	211.7489	236.7549 (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	239.4985	211.7311	224.6264	196.6146	190.0250	170.6000	167.8483	174.8196	177.0901	198.2372	211.7489	236.7549 (64)
										Total per year (kWh/year) = Sum(64)m =		2399.5946 (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	99.5083	88.3522	94.5633	84.6082	83.0583	75.9584	75.6846	78.0025	78.1163	85.7889	89.6404	98.5960 (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	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0017	20.4299	16.6147	12.5784	9.4025	7.9380	8.5773	11.1491	14.9643	19.0006	22.1765	23.6410 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	286.7297	289.7051	282.2073	266.2453	246.0962	227.1589	214.5077	211.5323	219.0301	234.9921	255.1411	274.0784 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409 (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)	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621 (71)
Water heating gains (Table 5)	133.7477	131.4765	127.1012	117.5114	111.6375	105.4978	101.7266	104.8421	108.4949	115.3076	124.5005	132.5215 (72)
Total internal gains	537.6510	535.7834	520.0951	490.5071	461.3082	434.7666	418.9834	421.6954	436.6612	463.4722	495.9900	524.4128 (73)

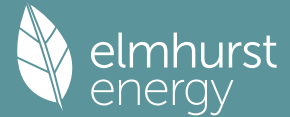
6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
North			6.5000	10.6334	0.6300	0.8000	0.7700	24.1406 (74)				
East			6.5000	19.6403	0.6300	0.8000	0.7700	44.5887 (76)				
East			6.5000	19.6403	0.6300	0.8000	0.7700	44.5887 (76)				
Solar gains	113.3180	220.5838	365.6869	544.9203	683.1262	707.2485	669.9858	564.3842	428.3885	261.9159	140.9742	93.4599 (83)
Total gains	650.9689	756.3671	885.7820	1035.4273	1144.4344	1142.0150	1088.9692	986.0796	865.0497	725.3880	636.9643	617.8728 (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	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699
alpha	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313
util living area	0.9238	0.8929	0.8340	0.7318	0.5981	0.4579	0.3482	0.3942	0.5910	0.7972	0.8975	0.9318 (86)
Living	18.4550	18.8090	19.3853	20.0407	20.5432	20.8282	20.9359	20.9116	20.6703	19.9749	19.0771	18.3594
Non living	16.8969	17.3361	18.0435	18.8239	19.3890	19.6798	19.7710	19.7560	19.5432	18.7761	17.6819	16.7779
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0

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16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.6981	18.8090	19.3853	20.0407	20.5432	20.8282	20.9359	20.9116	20.6703	19.9749	19.0771	18.7288 (87)
Th 2	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024 (88)
util rest of house												
	0.9125	0.8775	0.8106	0.6952	0.5453	0.3863	0.2609	0.3023	0.5181	0.7592	0.8800	0.9215 (89)
MIT 2	18.6441	17.3361	18.0435	18.8239	19.3890	19.6798	19.7710	19.7560	19.5432	18.7761	17.6819	17.3229 (90)
Living area fraction									fLA = Living area / (4) =			0.4705 (91)
MIT	19.1400	18.0291	18.6749	19.3964	19.9321	20.2201	20.3191	20.2997	20.0735	19.3401	18.3384	17.9844 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1400	18.0291	18.6749	19.3964	19.9321	20.2201	20.3191	20.2997	20.0735	19.3401	18.3384	17.9844 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9052	0.8488	0.7845	0.6814	0.5513	0.4122	0.2995	0.3417	0.5357	0.7422	0.8527	0.9015 (94)
Useful gains	589.2834	642.0015	694.9144	705.5701	630.9560	470.7461	326.1613	336.9441	463.4333	538.3937	543.1639	556.9975 (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	1357.6724	1201.1504	1113.8462	960.2885	753.1300	514.1687	340.2493	356.7752	546.5015	799.6101	1028.1689	1261.0965 (97)
Space heating kWh	571.6814	375.7481	311.6853	183.3973	90.8975	0.0000	0.0000	0.0000	0.0000	194.3449	349.2036	523.8496 (98a)
Space heating requirement - total per year (kWh/year)												2600.8077
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	571.6814	375.7481	311.6853	183.3973	90.8975	0.0000	0.0000	0.0000	0.0000	194.3449	349.2036	523.8496 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2600.8077
Space heating per m2										(98c) / (4) =		38.3600 (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 %)												244.6181 (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	571.6814	375.7481	311.6853	183.3973	90.8975	0.0000	0.0000	0.0000	0.0000	194.3449	349.2036	523.8496 (98)
Space heating efficiency (main heating system 1)	244.6181	244.6181	244.6181	244.6181	244.6181	0.0000	0.0000	0.0000	0.0000	244.6181	244.6181	244.6181 (210)
Space heating fuel (main heating system)	233.7037	153.6060	127.4171	74.9729	37.1589	0.0000	0.0000	0.0000	0.0000	79.4483	142.7546	214.1500 (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	239.4985	211.7311	224.6264	196.6146	190.0250	170.6000	167.8483	174.8196	177.0901	198.2372	211.7489	236.7549 (64)
Efficiency of water heater (217)m	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382 (216)
Fuel for water heating, kWh/month	126.0928	111.4737	118.2629	103.5150	100.0457	89.8187	88.3699	92.0403	93.2356	104.3693	111.4830	124.6484 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	20.1333	16.1516	14.5428	10.6547	8.2300	6.7239	7.5076	9.7587	12.6756	16.6311	18.7848	20.6928 (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												1063.2117 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												189.9382
Water heating fuel used												1263.3553 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

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Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	162.4869 (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	2489.0539 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1063.2117	16.4900	175.3236 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1263.3553	16.4900	208.3273 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	162.4869	16.4900	26.7941 (250)
Additional standing charges			0.0000 (251)
Total energy cost			410.4450 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.3099 (257)
SAP value	78.7660
SAP rating (Section 12)	79 (258)
SAP band	C

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	1063.2117	0.1552	165.0590 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1263.3553	0.1410	178.1082 (264)
Space and water heating			343.1672 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	162.4869	0.1443	23.4519 (268)
Total CO2, kg/year			366.6191 (272)
CO2 emissions per m2			5.4100 (273)
EI value			95.6448
EI rating			96 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (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)
Ground floor	67.8000 (1b)	x 2.5000 (2b)	= 169.5000 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.5000 (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)

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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	Air changes per hour	0.0000 / (5) =	0.0000 (8)
Pressure test			Yes		
Pressure Test Method			Blower Door		
Measured/design AP50					4.0000 (17)
Infiltration rate					0.2000 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)			
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1550 (21)			

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1666	0.1589	0.1589	0.1473	0.1511	0.1318	0.1318	0.1279	0.1318	0.1473	0.1434	0.1550	(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	
1 (Uw = 1.30)			6.5000	1.2357	8.0323			(27)
2 (Uw = 1.30)			6.5000	1.2357	8.0323			(27)
3 (Uw = 1.30)			6.5000	1.2357	8.0323			(27)
1			2.1000	1.0000	2.1000			(26)
top floor exposed new	33.0000	19.5000	13.5000	0.1800	2.4300	18.0000	243.0000	(29a)
corridor new	52.5000	2.1000	50.4000	0.2400	12.0960	60.0000	3024.0000	(29a)
lift/stair new	17.0000		17.0000	0.2400	4.0800	9.0000	153.0000	(29a)
flat roof new	31.3000		31.3000	0.1300	4.0690	9.0000	281.7000	(30)
roof terrace new	36.5000		36.5000	0.1300	4.7450	9.0000	328.5000	(30)
Total net area of external elements Aum(A, m2)			170.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.6170			(33)
pw			10.7500	0.0000	0.0000	20.0000	215.0000	(32)
pf			67.8000			30.0000	2034.0000	(32d)
iw			88.0000			9.0000	792.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	7071.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		104.2950 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.8000	0.0500	0.4400
E3 Sill	7.8000	0.0500	0.3900
E4 Jamb	19.2000	0.0500	0.9600
E7 Party floor between dwellings (in blocks of flats)	27.8000	0.0700	1.9460
E14 Flat roof	32.2000	0.0800	2.5760
E15 Flat roof with parapet	13.4000	0.1500	2.0100
E16 Corner (normal)	12.5000	0.0900	1.1250
E17 Corner (inverted - internal area greater than external area)	10.0000	-0.0900	-0.9000
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E24 Eaves (insulation at ceiling level - inverted)	4.4000	0.2400	1.0560

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.9030 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	63.5200 (37)

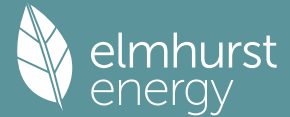
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675	27.9675 (38)
Average = Sum(39)m / 12 =	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875	91.4875 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	1.3494	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1916 (42)
Hot water usage for mixer showers	60.9647	60.0486	58.7135	56.1591	54.2740	52.1718	50.9769	52.3019	53.7543	56.0114	58.6207	60.7312	(42a)
Hot water usage for baths	26.3401	25.9489	25.3980	24.3823	23.6217	22.7784	22.3229	22.8699	23.4655	24.3679	25.4045	26.2510	(42b)
Hot water usage for other uses	37.0737	35.7255	34.3774	33.0293	31.6811	30.3330	30.3330	31.6811	33.0293	34.3774	35.7255	37.0737	(42c)

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Average daily hot water use (litres/day)												114.3322 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	124.3785	121.7230	118.4889	113.5707	109.5769	105.2832	103.6328	106.8529	110.2490	114.7567	119.7507	124.0559 (44)
Energy content (annual)	196.9851	173.3319	182.1130	155.4726	147.5116	129.4580	125.3349	132.3062	135.9481	155.7238	170.6069	194.2415 (45)
Distribution loss (46)m = 0.15 x (45)m	29.5478	25.9998	27.3170	23.3209	22.1267	19.4187	18.8002	19.8459	20.3922	23.3586	25.5910	29.1362 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1500 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6210 (55)
Total storage loss	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510 (56)
If cylinder contains dedicated solar storage	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	239.4985	211.7311	224.6264	196.6146	190.0250	170.6000	167.8483	174.8196	177.0901	198.2372	211.7489	236.7549 (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	239.4985	211.7311	224.6264	196.6146	190.0250	170.6000	167.8483	174.8196	177.0901	198.2372	211.7489	236.7549 (64)
	Total per year (kWh/year) = Sum(64)m =											2399.5946 (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	99.5083	88.3522	94.5633	84.6082	83.0583	75.9584	75.6846	78.0025	78.1163	85.7889	89.6404	98.5960 (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	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931	131.4931 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0017	20.4299	16.6147	12.5784	9.4025	7.9380	8.5773	11.1491	14.9643	19.0006	22.1765	23.6410 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	286.7297	289.7051	282.2073	266.2453	246.0962	227.1589	214.5077	211.5323	219.0301	234.9921	255.1411	274.0784 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409	50.3409 (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)	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621	-87.6621 (71)
Water heating gains (Table 5)	133.7477	131.4765	127.1012	117.5114	111.6375	105.4978	101.7266	104.8421	108.4949	115.3076	124.5005	132.5215 (72)
Total internal gains	537.6510	535.7834	520.0951	490.5071	461.3082	434.7666	418.9834	421.6954	436.6612	463.4722	495.9900	524.4128 (73)

6. Solar gains

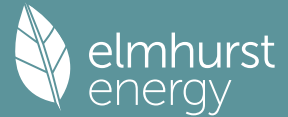
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	6.5000	12.7650	0.6300	0.8000	0.7700	28.9801 (74)
East	6.5000	23.8018	0.6300	0.8000	0.7700	54.0364 (76)
East	6.5000	23.8018	0.6300	0.8000	0.7700	54.0364 (76)

Solar gains	137.0528	233.5055	384.6595	581.5572	709.3806	776.2835	728.3799	629.8599	480.3185	297.7423	168.0543	113.6219 (83)
Total gains	674.7038	769.2889	904.7545	1072.0642	1170.6888	1211.0501	1147.3633	1051.5553	916.9797	761.2144	664.0443	638.0348 (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	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699	21.4699
alpha	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313	2.4313
util living area	0.9108	0.8795	0.8109	0.6891	0.5365	0.3672	0.2555	0.2849	0.5153	0.7539	0.8762	0.9195 (86)
Living	18.6922	19.0134	19.5974	20.2399	20.6896	20.9147	20.9760	20.9684	20.7901	20.1889	19.3311	18.6158
Non living	17.1950	17.5912	18.3022	19.0535	19.5425	19.7524	19.7950	19.7920	19.6558	19.0242	17.9964	17.1011
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.8194	19.0134	19.5974	20.2399	20.6896	20.9147	20.9760	20.9684	20.7901	20.1889	19.3311	18.9493 (87)
Th 2	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024	19.8024 (88)

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util rest of house												
MIT 2	0.8972	0.8617	0.7837	0.6469	0.4764	0.2906	0.1658	0.1888	0.4338	0.7078	0.8545	0.9071 (89)
Living area fraction	18.7629	17.5912	18.3022	19.0535	19.5425	19.7524	19.7950	19.7920	19.6558	19.0242	17.9964	17.5879 (90)
MIT	19.2600	18.2604	18.9116	19.6117	20.0822	20.2993	20.3506	20.3455	fLA = Living area / (4) =			0.4705 (91)
Temperature adjustment									20.1895	19.5722	18.6244	18.2284 (92)
adjusted MIT	19.2600	18.2604	18.9116	19.6117	20.0822	20.2993	20.3506	20.3455	20.1895	19.5722	18.6244	0.0000 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8902	0.8333	0.7602	0.6396	0.4911	0.3232	0.2075	0.2332	0.4615	0.6978	0.8280	0.8863 (94)
Useful gains	600.6143	641.0859	687.7896	685.6419	574.9752	391.4200	238.1099	245.2519	423.1751	531.1457	549.8338	565.5110 (95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000 (96)
Heat loss rate W	1295.4610	1149.1148	1053.1663	888.4990	657.0845	411.6268	242.5011	251.1774	474.7726	738.5039	971.9982	1201.0860 (97)
Space heating kWh	516.9660	341.3954	271.8402	146.0571	61.0893	0.0000	0.0000	0.0000	0.0000	154.2745	303.9584	472.8678 (98a)
Space heating requirement - total per year (kWh/year)												2268.4486
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	516.9660	341.3954	271.8402	146.0571	61.0893	0.0000	0.0000	0.0000	0.0000	154.2745	303.9584	472.8678 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2268.4486
Space heating per m2										(98c) / (4) =		33.4579 (99)

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

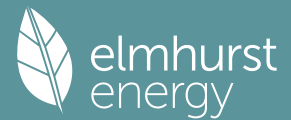
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												244.6181 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (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	516.9660	341.3954	271.8402	146.0571	61.0893	0.0000	0.0000	0.0000	0.0000	154.2745	303.9584	472.8678 (98)
Space heating efficiency (main heating system 1)	244.6181	244.6181	244.6181	244.6181	244.6181	0.0000	0.0000	0.0000	0.0000	244.6181	244.6181	244.6181 (210)
Space heating fuel (main heating system)	211.3360	139.5626	111.1284	59.7082	24.9733	0.0000	0.0000	0.0000	0.0000	63.0675	124.2584	193.3086 (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	239.4985	211.7311	224.6264	196.6146	190.0250	170.6000	167.8483	174.8196	177.0901	198.2372	211.7489	236.7549 (64)
Efficiency of water heater												189.9382 (216)
(217)m	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382	189.9382 (217)
Fuel for water heating, kWh/month	126.0928	111.4737	118.2629	103.5150	100.0457	89.8187	88.3699	92.0403	93.2356	104.3693	111.4830	124.6484 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	20.1333	16.1516	14.5428	10.6547	8.2300	6.7239	7.5076	9.7587	12.6756	16.6311	18.7848	20.6928 (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												927.3431 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												189.9382
Water heating fuel used												1263.3553 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												162.4869 (232)

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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	2353.1853 (238)

10a. Fuel costs - using BEDF prices (521)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	927.3431	18.3900	170.5384 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1263.3553	18.3900	232.3310 (247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	162.4869	18.3900	29.8813 (250)
Additional standing charges			0.0000 (251)
Total energy cost			432.7508 (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	927.3431	0.1558	144.4647 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1263.3553	0.1410	178.1082 (264)
Space and water heating			322.5729 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	162.4869	0.1443	23.4519 (268)
Total CO2, kg/year			346.0248 (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	927.3431	1.5767	1462.1369 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1263.3553	1.5213	1921.9400 (278)
Space and water heating			3384.0769 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	162.4869	1.5338	249.2279 (282)
Total Primary energy kWh/year			3633.3048 (286)