

Full SAP Calculation Printout



Property Reference	UNIT 38				Issued on Date	28/06/2023
Assessment Reference	UNIT 38			Prop Type Ref		
Property	Alexander House, UNIT 38, 205-207 King's Road, RG1 4LS					
SAP Rating	82 B	DER	6.01	TER	16.34	
Environmental	96 A	% DER < TER				63.22
CO ₂ Emissions (t/year)	0.22	DFEE	37.17	TFEE	39.54	
Compliance Check	See BREL	% DFEE < TFEE				5.99
% DPER < TPER	26.44	DPER	63.53	TPER	86.36	
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	39.3000 (1b)	x 2.5000 (2b)	= 98.2500 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.3000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 98.2500 (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)

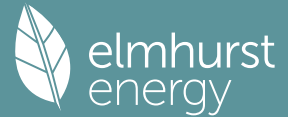
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1550 (21)

	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)			3.3800	1.2357	4.1768		(27)
2 (Uw = 1.30)			3.3800	1.2357	4.1768		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	20.2500	6.7600	13.4900	0.1800	2.4282	18.0000	242.8200 (29a)

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corridor new	14.5000	2.1000	12.4000	0.2400	2.9760	60.0000	744.0000 (29a)
flat roof new	16.9000		16.9000	0.1300	2.1970	9.0000	152.1000 (30)
roof terrace new	22.4000		22.4000	0.1300	2.9120	9.0000	201.6000 (30)
Total net area of external elements Aum(A, m2)			74.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	20.9668			(33)
pw			27.2500	0.0000	0.0000	20.0000	545.0000 (32)
pf			39.3000			30.0000	1179.0000 (32d)
iw			56.5000			9.0000	508.5000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 3573.0200 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 90.9165 (35)

List of Thermal Bridges							
K1 Element			Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)			3.7000	0.0500		0.1850	
E3 Sill			2.7000	0.0500		0.1350	
E4 Jamb			14.2000	0.0500		0.7100	
E7 Party floor between dwellings (in blocks of flats)			5.8000	0.0700		0.4060	
E14 Flat roof			16.6000	0.0800		1.3280	
E15 Flat roof with parapet			8.1000	0.1500		1.2150	
E16 Corner (normal)			2.5000	0.0900		0.2250	
E18 Party wall between dwellings			7.5000	0.0600		0.4500	
E24 Eaves (insulation at ceiling level - inverted)			2.7000	0.2400		0.6480	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3020 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	26.2688 (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	(38)
Heat transfer coeff	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	
Average = Sum(39)m / 12 =	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	(39)
													42.4801
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3879 (42)
Hot water usage for mixer showers													
	47.4892	46.7755	45.7356	43.7458	42.2774	40.6399	39.7091	40.7412	41.8725	43.6308	45.6633	47.3073	(42a)
Hot water usage for baths													
	20.5451	20.2400	19.8103	19.0181	18.4249	17.7671	17.4118	17.8384	18.3030	19.0069	19.8154	20.4757	(42b)
Hot water usage for other uses													
	28.8430	27.7942	26.7454	25.6965	24.6477	23.5989	23.5989	24.6477	25.6965	26.7454	27.7942	28.8430	(42c)
Average daily hot water use (litres/day)													89.0530 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	96.8774	94.8098	92.2913	88.4604	85.3500	82.0058	80.7197	83.2273	85.8721	89.3830	93.2729	96.6260	(44)
Energy conte	153.4301	135.0078	141.8483	121.0979	114.8975	100.8357	97.6235	103.0528	105.8888	121.2919	132.8843	151.2930	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1479.1515
	23.0145	20.2512	21.2772	18.1647	17.2346	15.1254	14.6435	15.4579	15.8833	18.1938	19.9327	22.6939	(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													
	195.9435	173.4070	184.3617	162.2399	157.4109	141.9777	140.1369	145.5662	147.0308	163.8053	174.0263	193.8064	(62)
WVHRS	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													
	195.9435	173.4070	184.3617	162.2399	157.4109	141.9777	140.1369	145.5662	147.0308	163.8053	174.0263	193.8064	(64)
													Total per year (kWh/year) = Sum(64)m = 1979.7125 (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													
	85.0262	75.6095	81.1753	73.1787	72.2141	66.4415	66.4705	68.2758	68.1216	74.3403	77.0976	84.3156	(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	(66)
	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	
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	14.4696	12.8517	10.4517	7.9126	5.9148	4.9935	5.3957	7.0135	9.4135	11.9526	13.9505	14.8717 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	178.7717	180.6268	175.9520	166.0000	153.4373	141.6302	133.7423	131.8872	136.5620	146.5140	159.0767	170.8838 (68)
Pumps, fans	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150 (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)	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143 (71)
Total internal gains	114.2826	112.5141	109.1065	101.6370	97.0620	92.2798	89.3421	91.7685	94.6134	99.9197	107.0801	113.3275 (72)
	379.9960	378.4647	367.9824	348.0218	328.8863	311.3757	300.9522	303.1414	313.0610	330.8585	352.5793	371.5551 (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
West	3.3800	19.6403	0.6300	0.8000	0.7700	23.1861 (80)
West	3.3800	19.6403	0.6300	0.8000	0.7700	23.1861 (80)

Solar gains	46.3722	90.7139	149.3928	217.8805	267.0208	273.3433	260.2340	223.5371	173.7500	107.6397	57.8207	38.1342 (83)
Total gains	426.3682	469.1786	517.3753	565.9023	595.9070	584.7190	561.1862	526.6785	486.8111	438.4981	410.4000	409.6894 (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	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640
alpha	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576
util living area	0.8703	0.8378	0.7784	0.6835	0.5613	0.4274	0.3194	0.3520	0.5238	0.7216	0.8343	0.8804 (86)
Living	19.0946	19.3621	19.7992	20.2838	20.6589	20.8763	20.9570	20.9435	20.7852	20.2940	19.6030	19.0123
Non living	17.8294	18.1581	18.6910	19.2674	19.6932	19.9201	19.9918	19.9824	19.8374	19.2970	18.4650	17.7281
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	20.0253	19.3621	19.7992	20.2838	20.6589	20.8763	20.9570	20.9435	20.7852	20.2940	19.6030	19.2903 (87)
Th 2	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164 (88)
util rest of house	0.8560	0.8205	0.7553	0.6513	0.5178	0.3707	0.2525	0.2827	0.4654	0.6852	0.8138	0.8670 (89)
MIT 2	19.1446	18.1581	18.6910	19.2674	19.6932	19.9201	19.9918	19.9824	19.8374	19.2970	18.4650	18.1404 (90)
Living area fraction									fLA = Living area / (4) =			0.5802 (91)
MIT	19.6555	18.8566	19.3339	19.8570	20.2535	20.4749	20.5517	20.5400	20.3873	19.8754	19.1252	18.8075 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6555	18.8566	19.3339	19.8570	20.2535	20.4749	20.5517	20.5400	20.3873	19.8754	19.1252	18.8075 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8503	0.7970	0.7375	0.6457	0.5287	0.3977	0.2894	0.3202	0.4882	0.6795	0.7924	0.8477 (94)
Useful gains	362.5274	373.9558	381.5464	365.4146	315.0272	232.5318	162.4241	168.6353	237.6417	297.9576	325.2040	347.3085 (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	652.3035	592.8777	545.1854	465.4558	363.3512	249.5653	167.8697	175.8669	267.0853	394.0189	510.8324	620.5288 (97)
Space heating kWh	215.5934	147.1155	121.7474	72.0296	35.9531	0.0000	0.0000	0.0000	0.0000	71.4696	133.6525	203.2759 (98a)
Space heating requirement - total per year (kWh/year)												1000.8371
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	215.5934	147.1155	121.7474	72.0296	35.9531	0.0000	0.0000	0.0000	0.0000	71.4696	133.6525	203.2759 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1000.8371
Space heating per m2										(98c) / (4) =		25.4666 (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 %)												221.3276 (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	215.5934	147.1155	121.7474	72.0296	35.9531	0.0000	0.0000	0.0000	0.0000	71.4696	133.6525	203.2759 (98)

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Space heating efficiency (main heating system 1)	221.3276	221.3276	221.3276	221.3276	221.3276	0.0000	0.0000	0.0000	0.0000	221.3276	221.3276	221.3276	(210)
Space heating fuel (main heating system)	97.4092	66.4696	55.0078	32.5444	16.2443	0.0000	0.0000	0.0000	0.0000	32.2913	60.3867	91.8439	(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	195.9435	173.4070	184.3617	162.2399	157.4109	141.9777	140.1369	145.5662	147.0308	163.8053	174.0263	193.8064	(64)
Efficiency of water heater	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	(216)
Fuel for water heating, kWh/month	102.6861	90.8757	96.6166	85.0234	82.4927	74.4048	73.4401	76.2854	77.0530	85.8438	91.2002	101.5661	(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	12.6651	10.1604	9.1483	6.7025	5.1772	4.2298	4.7228	6.1389	7.9738	10.4620	11.8169	13.0171	(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												452.1972	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.8179	
Water heating fuel used												1037.4879	(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)												102.2149	(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												1591.8999	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	452.1972	16.4900	74.5673 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1037.4879	16.4900	171.0818 (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	102.2149	16.4900	16.8552 (250)
Additional standing charges			0.0000 (251)
Total energy cost			262.5043 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)		1.1210 (257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	81.8283
SAP rating (Section 12)		82 (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
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Space heating - main system 1	452.1972	0.1553	70.2077 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1037.4879	0.1409	146.1338 (264)
Space and water heating			216.3415 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	102.2149	0.1443	14.7528 (268)
Total CO2, kg/year			231.0942 (272)
CO2 emissions per m2			5.8800 (273)
EI value			96.3266
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	39.3000 (1b)	x 2.5000 (2b)	= 98.2500 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 98.2500 (5)

2. Ventilation rate

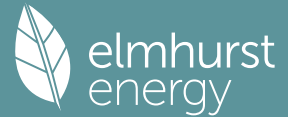
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
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)			3.3800	1.2357	4.1768		(27)
2 (Uw = 1.30)			3.3800	1.2357	4.1768		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	20.2500	6.7600	13.4900	0.1800	2.4282	18.0000	242.8200 (29a)
corridor new	14.5000	2.1000	12.4000	0.2400	2.9760	60.0000	744.0000 (29a)
flat roof new	16.9000		16.9000	0.1300	2.1970	9.0000	152.1000 (30)
roof terrace new	22.4000		22.4000	0.1300	2.9120	9.0000	201.6000 (30)
Total net area of external elements Aum(A, m2)			74.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.9668		(33)
pw			27.2500	0.0000	0.0000	20.0000	545.0000 (32)
pf			39.3000			30.0000	1179.0000 (32d)

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iw 56.5000 9.0000 508.5000 (32c)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 3573.0200 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 90.9165 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	3.7000	0.0500	0.1850
E2 Other lintels (including other steel lintels)	2.7000	0.0500	0.1350
E3 Sill	14.2000	0.0500	0.7100
E4 Jamb	5.8000	0.0700	0.4060
E7 Party floor between dwellings (in blocks of flats)	16.6000	0.0800	1.3280
E14 Flat roof	8.1000	0.1500	1.2150
E15 Flat roof with parapet	2.5000	0.0900	0.2250
E16 Corner (normal)	7.5000	0.0600	0.4500
E18 Party wall between dwellings	2.7000	0.2400	0.6480
E24 Eaves (insulation at ceiling level - inverted)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.3020 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			26.2688 (37) (33) + (36) + (36a) =

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 (38)
Heat transfer coeff 16.2112 16.2112 16.2112 16.2112 16.2112 16.2112 16.2112 16.2112 16.2112 16.2112 16.2112 16.2112 (39)
Average = Sum(39)m / 12 = 42.4801 42.4801 42.4801 42.4801 42.4801 42.4801 42.4801 42.4801 42.4801 42.4801 42.4801 42.4801 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809 (40)
HLP (average)												1.0809
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

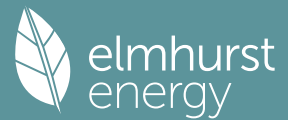
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3879 (42)
Hot water usage for mixer showers	47.4892	46.7755	45.7356	43.7458	42.2774	40.6399	39.7091	40.7412	41.8725	43.6308	45.6633	47.3073 (42a)
Hot water usage for baths	20.5451	20.2400	19.8103	19.0181	18.4249	17.7671	17.4118	17.8384	18.3030	19.0069	19.8154	20.4757 (42b)
Hot water usage for other uses	28.8430	27.7942	26.7454	25.6965	24.6477	23.5989	23.5989	24.6477	25.6965	26.7454	27.7942	28.8430 (42c)
Average daily hot water use (litres/day)												89.0530 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	96.8774	94.8098	92.2913	88.4604	85.3500	82.0058	80.7197	83.2273	85.8721	89.3830	93.2729	96.6260 (44)
Distribution loss (46)m = 0.15 x (45)m	153.4301	135.0078	141.8483	121.0979	114.8975	100.8357	97.6235	103.0528	105.8888	121.2919	132.8843	151.2930 (45)
Water storage loss:	23.0145	20.2512	21.2772	18.1647	17.2346	15.1254	14.6435	15.4579	15.8833	18.1938	19.9327	22.6939 (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	195.9435	173.4070	184.3617	162.2399	157.4109	141.9777	140.1369	145.5662	147.0308	163.8053	174.0263	193.8064 (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	195.9435	173.4070	184.3617	162.2399	157.4109	141.9777	140.1369	145.5662	147.0308	163.8053	174.0263	193.8064 (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	85.0262	75.6095	81.1753	73.1787	72.2141	66.4415	66.4705	68.2758	68.1216	74.3403	77.0976	84.3156 (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	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.4696	12.8517	10.4517	7.9126	5.9148	4.9935	5.3957	7.0135	9.4135	11.9526	13.9505	14.8717 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	178.7717	180.6268	175.9520	166.0000	153.4373	141.6302	133.7423	131.8872	136.5620	146.5140	159.0767	170.8838 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150 (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)												

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	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143 (71)
Water heating gains (Table 5)	114.2826	112.5141	109.1065	101.6370	97.0620	92.2798	89.3421	91.7685	94.6134	99.9197	107.0801	113.3275 (72)
Total internal gains	379.9960	378.4647	367.9824	348.0218	328.8863	311.3757	300.9522	303.1414	313.0610	330.8585	352.5793	371.5551 (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
West			3.3800	23.8018		0.6300		0.8000		0.7700		28.0989 (80)
West			3.3800	23.8018		0.6300		0.8000		0.7700		28.0989 (80)
Solar gains	56.1978	96.0231	156.7068	231.4253	275.8258	298.4788	281.4370	248.2010	194.0855	122.2264	69.0257	46.4806 (83)
Total gains	436.1938	474.4879	524.6893	579.4471	604.7121	609.8545	582.3893	551.3423	507.1465	453.0848	421.6050	418.0357 (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	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640
alpha	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576
util living area	0.8533	0.8208	0.7526	0.6416	0.5020	0.3445	0.2359	0.2556	0.4555	0.6762	0.8078	0.8635 (86)
Living	19.2923	19.5330	19.9703	20.4382	20.7719	20.9393	20.9842	20.9803	20.8655	20.4527	19.8081	19.2292
Non living	18.0755	18.3694	18.8981	19.4459	19.8138	19.9761	20.0102	20.0082	19.9146	19.4787	18.7156	17.9990
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	20.1264	19.5330	19.9703	20.4382	20.7719	20.9393	20.9842	20.9803	20.8655	20.4527	19.8081	19.4769 (87)
Th 2	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164 (88)
util rest of house	0.8369	0.8013	0.7265	0.6054	0.4535	0.2845	0.1675	0.1841	0.3924	0.6342	0.7838	0.8479 (89)
MIT 2	19.2426	18.3694	18.8981	19.4459	19.8138	19.9761	20.0102	20.0082	19.9146	19.4787	18.7156	18.3626 (90)
Living area fraction	19.7554	19.0445	19.5202	20.0216	20.3696	20.5349	20.5753	20.5722	fLA = Living area / (4) =	20.4663	20.0437	19.3494
MIT	19.7554	19.0445	19.5202	20.0216	20.3696	20.5349	20.5753	20.5722	20.4663	20.0437	19.3494	19.0091 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7554	19.0445	19.5202	20.0216	20.3696	20.5349	20.5753	20.5722	20.4663	20.0437	19.3494	19.0091 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8321	0.7795	0.7121	0.6056	0.4714	0.3166	0.2067	0.2249	0.4220	0.6355	0.7653	0.8295 (94)
Useful gains	362.9749	369.8680	373.6233	350.9014	285.0771	193.0831	120.3574	124.0027	214.0042	287.9244	322.6430	346.7547 (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	622.5613	566.8736	514.8652	429.9649	317.3094	201.1386	122.1413	126.2587	232.2067	362.9388	482.1230	590.8581 (97)
Space heating kWh	193.1322	132.3878	105.0840	56.9257	23.9809	0.0000	0.0000	0.0000	0.0000	55.8108	114.8256	181.6129 (98a)
Space heating requirement - total per year (kWh/year)												863.7599
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	193.1322	132.3878	105.0840	56.9257	23.9809	0.0000	0.0000	0.0000	0.0000	55.8108	114.8256	181.6129 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												863.7599
Space heating per m2										(98c) / (4) =		21.9786 (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 %)												221.3276 (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	193.1322	132.3878	105.0840	56.9257	23.9809	0.0000	0.0000	0.0000	0.0000	55.8108	114.8256	181.6129 (98)
Space heating efficiency (main heating system 1)	221.3276	221.3276	221.3276	221.3276	221.3276	0.0000	0.0000	0.0000	0.0000	221.3276	221.3276	221.3276 (210)
Space heating fuel (main heating system)	87.2608	59.8153	47.4789	25.7201	10.8350	0.0000	0.0000	0.0000	0.0000	25.2164	51.8804	82.0561 (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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	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	195.9435	173.4070	184.3617	162.2399	157.4109	141.9777	140.1369	145.5662	147.0308	163.8053	174.0263	193.8064 (64)
Efficiency of water heater	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179 (216)
Fuel for water heating, kWh/month	102.6861	90.8757	96.6166	85.0234	82.4927	74.4048	73.4401	76.2854	77.0530	85.8438	91.2002	101.5661 (219)
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)
(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	12.6651	10.1604	9.1483	6.7025	5.1772	4.2298	4.7228	6.1389	7.9738	10.4620	11.8169	13.0171 (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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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												390.2631 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												190.8179
Water heating fuel used												1037.4879 (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)												102.2149 (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												1529.9658 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	390.2631	18.3900	71.7694 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1037.4879	18.3900	190.7940 (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	102.2149	18.3900	18.7973 (250)
Additional standing charges			0.0000 (251)
Total energy cost			281.3607 (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	390.2631	0.1558	60.8050 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1037.4879	0.1409	146.1338 (264)
Space and water heating			206.9387 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	102.2149	0.1443	14.7528 (268)
Total CO2, kg/year			221.6915 (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	390.2631	1.5768	615.3611 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1037.4879	1.5208	1577.8353 (278)

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Space and water heating			2193.1964 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	102.2149	1.5338	156.7806 (282)
Total Primary energy kWh/year			2349.9770 (286)

SAP 10 EPC IMPROVEMENTS

UNIT 38

Current energy efficiency rating:	B 82
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
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Total Savings £0 0.00 kg/m²

Potential energy efficiency rating:	B 82
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 £281	Potential £281	Saving £0
Electricity			
Space heating	£72	£72	£0
Water heating	£191	£191	£0
Lighting	£19	£19	£0
Total cost of fuels	£281	£281	£0
Total cost of uses	£282	£282	£0
Delivered energy	39 kWh/m²	39 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	60 kWh/m²	60 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

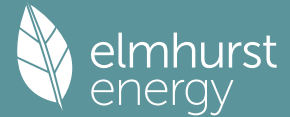
1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	39.3000 (1b)	x 2.5000 (2b)	= 98.2500 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 98.2500 (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)

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =										Air changes per hour				
Pressure test										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

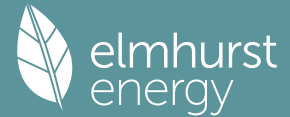
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
1 (Uw = 1.30)			3.3800	1.2357	4.1768		(27)
2 (Uw = 1.30)			3.3800	1.2357	4.1768		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	20.2500	6.7600	13.4900	0.1800	2.4282	18.0000	242.8200
corridor new	14.5000	2.1000	12.4000	0.2400	2.9760	60.0000	744.0000
flat roof new	16.9000		16.9000	0.1300	2.1970	9.0000	152.1000
roof terrace new	22.4000		22.4000	0.1300	2.9120	9.0000	201.6000
Total net area of external elements Aum(A, m2)			74.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.9668		(33)
pw			27.2500	0.0000	0.0000	20.0000	545.0000
pf			39.3000			30.0000	1179.0000
iw			56.5000			9.0000	508.5000
							(32d)
							(32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	3573.0200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							90.9165 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.7000	0.0500	0.1850	
E3 Sill				2.7000	0.0500	0.1350	
E4 Jamb				14.2000	0.0500	0.7100	
E7 Party floor between dwellings (in blocks of flats)				5.8000	0.0700	0.4060	
E14 Flat roof				16.6000	0.0800	1.3280	
E15 Flat roof with parapet				8.1000	0.1500	1.2150	
E16 Corner (normal)				2.5000	0.0900	0.2250	
E18 Party wall between dwellings				7.5000	0.0600	0.4500	
E24 Eaves (insulation at ceiling level - inverted)				2.7000	0.2400	0.6480	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3020 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	26.2688 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112
Average = Sum(39)m / 12 =	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801
	(39)											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
	(40)											
	1.0809											

4. Water heating energy requirements (kWh/year)

											1.3879 (42)		
Assumed occupancy													
Hot water usage for mixer showers	47.4892	46.7755	45.7356	43.7458	42.2774	40.6399	39.7091	40.7412	41.8725	43.6308	45.6633	47.3073 (42a)	
Hot water usage for baths	20.5451	20.2400	19.8103	19.0181	18.4249	17.7671	17.4118	17.8384	18.3030	19.0069	19.8154	20.4757 (42b)	
Hot water usage for other uses	28.8430	27.7942	26.7454	25.6965	24.6477	23.5989	23.5989	24.6477	25.6965	26.7454	27.7942	28.8430 (42c)	
Average daily hot water use (litres/day)												89.0530 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.8774	94.8098	92.2913	88.4604	85.3500	82.0058	80.7197	83.2273	85.8721	89.3830	93.2729	96.6260 (44)	
Energy conte	153.4301	135.0078	141.8483	121.0979	114.8975	100.8357	97.6235	103.0528	105.8888	121.2919	132.8843	151.2930 (45)	
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1479.1515	

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	23.0145	20.2512	21.2772	18.1647	17.2346	15.1254	14.6435	15.4579	15.8833	18.1938	19.9327	22.6939 (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												
	195.9435	173.4070	184.3617	162.2399	157.4109	141.9777	140.1369	145.5662	147.0308	163.8053	174.0263	193.8064 (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												
	195.9435	173.4070	184.3617	162.2399	157.4109	141.9777	140.1369	145.5662	147.0308	163.8053	174.0263	193.8064 (64)
												1979.7125 (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												
	85.0262	75.6095	81.1753	73.1787	72.2141	66.4415	66.4705	68.2758	68.1216	74.3403	77.0976	84.3156 (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	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	14.4696	12.8517	10.4517	7.9126	5.9148	4.9935	5.3957	7.0135	9.4135	11.9526	13.9505	14.8717 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	178.7717	180.6268	175.9520	166.0000	153.4373	141.6302	133.7423	131.8872	136.5620	146.5140	159.0767	170.8838 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150 (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)												
	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143 (71)
Water heating gains (Table 5)												
	114.2826	112.5141	109.1065	101.6370	97.0620	92.2798	89.3421	91.7685	94.6134	99.9197	107.0801	113.3275 (72)
Total internal gains												
	379.9960	378.4647	367.9824	348.0218	328.8863	311.3757	300.9522	303.1414	313.0610	330.8585	352.5793	371.5551 (73)

6. Solar gains

[Jan]												
		Area	Solar flux									
		m2	Table 6a	Specific data								
			W/m2	or Table 6b	Specific data							
					or Table 6c							
West		3.3800	19.6403	0.6300	0.8000							23.1861 (80)
West		3.3800	19.6403	0.6300	0.8000							23.1861 (80)
Solar gains	46.3722	90.7139	149.3928	217.8805	267.0208	273.3433	260.2340	223.5371	173.7500	107.6397	57.8207	38.1342 (83)
Total gains	426.3682	469.1786	517.3753	565.9023	595.9070	584.7190	561.1862	526.6785	486.8111	438.4981	410.4000	409.6894 (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	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640
alpha	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576
util living area												
	0.8703	0.8378	0.7784	0.6835	0.5613	0.4274	0.3194	0.3520	0.5238	0.7216	0.8343	0.8804 (86)
Living	19.0946	19.3621	19.7992	20.2838	20.6589	20.8763	20.9570	20.9435	20.7852	20.2940	19.6030	19.0123
Non living	17.8294	18.1581	18.6910	19.2674	19.6932	19.9201	19.9918	19.9824	19.8374	19.2970	18.4650	17.7281
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	20.0253	19.3621	19.7992	20.2838	20.6589	20.8763	20.9570	20.9435	20.7852	20.2940	19.6030	19.2903 (87)
Th 2	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164 (88)
util rest of house												
	0.8560	0.8205	0.7553	0.6513	0.5178	0.3707	0.2525	0.2827	0.4654	0.6852	0.8138	0.8670 (89)
MIT 2	19.1446	18.1581	18.6910	19.2674	19.6932	19.9201	19.9918	19.9824	19.8374	19.2970	18.4650	18.1404 (90)
Living area fraction												
	19.6555	18.8566	19.3339	19.8570	20.2535	20.4749	20.5517	20.5400	20.3873	19.8754	19.1252	18.8075 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6555	18.8566	19.3339	19.8570	20.2535	20.4749	20.5517	20.5400	20.3873	19.8754	19.1252	18.8075 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8503	0.7970	0.7375	0.6457	0.5287	0.3977	0.2894	0.3202	0.4882	0.6795	0.7924	0.8477	(94)
Useful gains	362.5274	373.9558	381.5464	365.4146	315.0272	232.5318	162.4241	168.6353	237.6417	297.9576	325.2040	347.3085	(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	652.3035	592.8777	545.1854	465.4558	363.3512	249.5653	167.8697	175.8669	267.0853	394.0189	510.8324	620.5288	(97)
Space heating kWh	215.5934	147.1155	121.7474	72.0296	35.9531	0.0000	0.0000	0.0000	0.0000	71.4696	133.6525	203.2759	(98a)
Space heating requirement - total per year (kWh/year)												1000.8371	
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	215.5934	147.1155	121.7474	72.0296	35.9531	0.0000	0.0000	0.0000	0.0000	71.4696	133.6525	203.2759	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1000.8371	
Space heating per m2										(98c) / (4) =		25.4666	(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 %)													221.3276 (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	215.5934	147.1155	121.7474	72.0296	35.9531	0.0000	0.0000	0.0000	0.0000	71.4696	133.6525	203.2759	(98)
Space heating efficiency (main heating system 1)	221.3276	221.3276	221.3276	221.3276	221.3276	0.0000	0.0000	0.0000	0.0000	221.3276	221.3276	221.3276	(210)
Space heating fuel (main heating system)	97.4092	66.4696	55.0078	32.5444	16.2443	0.0000	0.0000	0.0000	0.0000	32.2913	60.3867	91.8439	(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	195.9435	173.4070	184.3617	162.2399	157.4109	141.9777	140.1369	145.5662	147.0308	163.8053	174.0263	193.8064	(64)
Efficiency of water heater	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	(216)
Fuel for water heating, kWh/month	102.6861	90.8757	96.6166	85.0234	82.4927	74.4048	73.4401	76.2854	77.0530	85.8438	91.2002	101.5661	(219)
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	12.6651	10.1604	9.1483	6.7025	5.1772	4.2298	4.7228	6.1389	7.9738	10.4620	11.8169	13.0171	(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												452.1972	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.8179	
Water heating fuel used												1037.4879	(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)												102.2149	(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												1591.8999	(238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	452.1972	16.4900	74.5673 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1037.4879	16.4900	171.0818 (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	102.2149	16.4900	16.8552 (250)
Additional standing charges			0.0000 (251)
Total energy cost			262.5043 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1210 (257)
SAP value		81.8283
SAP rating (Section 12)		82 (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	452.1972	0.1553	70.2077 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1037.4879	0.1409	146.1338 (264)
Space and water heating			216.3415 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	102.2149	0.1443	14.7528 (268)
Total CO2, kg/year			231.0942 (272)
CO2 emissions per m2			5.8800 (273)
EI value			96.3266
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

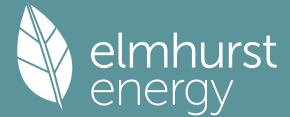
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.3000 (1b)	x 2.5000 (2b)	= 98.2500 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	98.2500 (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) =
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	Yes
Measured/design AP50	Blower Door
Infiltration rate	4.0000 (17)
	0.2000 (18)

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Number of sides sheltered

3 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.7750 (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.1550 (21)$$

	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)			3.3800	1.2357	4.1768			(27)
2 (Uw = 1.30)			3.3800	1.2357	4.1768			(27)
1			2.1000	1.0000	2.1000			(26)
top floor exposed new	20.2500	6.7600	13.4900	0.1800	2.4282	18.0000	242.8200	(29a)
corridor new	14.5000	2.1000	12.4000	0.2400	2.9760	60.0000	744.0000	(29a)
flat roof new	16.9000		16.9000	0.1300	2.1970	9.0000	152.1000	(30)
roof terrace new	22.4000		22.4000	0.1300	2.9120	9.0000	201.6000	(30)
Total net area of external elements Aum(A, m2)			74.0500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.9668			(33)
pw			27.2500	0.0000	0.0000	20.0000	545.0000	(32)
pf			39.3000			30.0000	1179.0000	(32d)
iw			56.5000			9.0000	508.5000	(32c)

Heat capacity Cm = Sum(A x k)

$$(28)...(30) + (32) + (32a)...(32e) = 3573.0200 (34)$$

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

$$90.9165 (35)$$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	3.7000	0.0500	0.1850	
E3 Sill	2.7000	0.0500	0.1350	
E4 Jamb	14.2000	0.0500	0.7100	
E7 Party floor between dwellings (in blocks of flats)	5.8000	0.0700	0.4060	
E14 Flat roof	16.6000	0.0800	1.3280	
E15 Flat roof with parapet	8.1000	0.1500	1.2150	
E16 Corner (normal)	2.5000	0.0900	0.2250	
E18 Party wall between dwellings	7.5000	0.0600	0.4500	
E24 Eaves (insulation at ceiling level - inverted)	2.7000	0.2400	0.6480	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.3020 (36)
Point Thermal bridges				0.0000
Total fabric heat loss			(33) + (36) + (36a) =	26.2688 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	16.2112	(38)
Heat transfer coeff	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	42.4801	(39)
Average = Sum(39)m / 12 =													42.4801

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	1.0809	(40)
HLP (average)													1.0809
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3879 (42)
Hot water usage for mixer showers	47.4892	46.7755	45.7356	43.7458	42.2774	40.6399	39.7091	40.7412	41.8725	43.6308	45.6633	47.3073	(42a)
Hot water usage for baths	20.5451	20.2400	19.8103	19.0181	18.4249	17.7671	17.4118	17.8384	18.3030	19.0069	19.8154	20.4757	(42b)
Hot water usage for other uses	28.8430	27.7942	26.7454	25.6965	24.6477	23.5989	23.5989	24.6477	25.6965	26.7454	27.7942	28.8430	(42c)
Average daily hot water use (litres/day)													89.0530 (43)
Daily hot water use	96.8774	94.8098	92.2913	88.4604	85.3500	82.0058	80.7197	83.2273	85.8721	89.3830	93.2729	96.6260	(44)
Energy conte	153.4301	135.0078	141.8483	121.0979	114.8975	100.8357	97.6235	103.0528	105.8888	121.2919	132.8843	151.2930	(45)
Energy content (annual)													Total = Sum(45)m = 1479.1515
Distribution loss (46)m = 0.15 x (45)m	23.0145	20.2512	21.2772	18.1647	17.2346	15.1254	14.6435	15.4579	15.8833	18.1938	19.9327	22.6939	(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													

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	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												
	195.9435	173.4070	184.3617	162.2399	157.4109	141.9777	140.1369	145.5662	147.0308	163.8053	174.0263	193.8064 (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	195.9435	173.4070	184.3617	162.2399	157.4109	141.9777	140.1369	145.5662	147.0308	163.8053	174.0263	193.8064 (64)
	Total per year (kWh/year) = Sum(64)m =											1979.7125 (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												
	85.0262	75.6095	81.1753	73.1787	72.2141	66.4415	66.4705	68.2758	68.1216	74.3403	77.0976	84.3156 (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	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714	83.2714 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.4696	12.8517	10.4517	7.9126	5.9148	4.9935	5.3957	7.0135	9.4135	11.9526	13.9505	14.8717 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	178.7717	180.6268	175.9520	166.0000	153.4373	141.6302	133.7423	131.8872	136.5620	146.5140	159.0767	170.8838 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150	44.7150 (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)	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143	-55.5143 (71)
Water heating gains (Table 5)	114.2826	112.5141	109.1065	101.6370	97.0620	92.2798	89.3421	91.7685	94.6134	99.9197	107.0801	113.3275 (72)
Total internal gains	379.9960	378.4647	367.9824	348.0218	328.8863	311.3757	300.9522	303.1414	313.0610	330.8585	352.5793	371.5551 (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
West	3.3800	23.8018	0.6300	0.8000	0.7700	28.0989 (80)
West	3.3800	23.8018	0.6300	0.8000	0.7700	28.0989 (80)

Solar gains	56.1978	96.0231	156.7068	231.4253	275.8258	298.4788	281.4370	248.2010	194.0855	122.2264	69.0257	46.4806 (83)
Total gains	436.1938	474.4879	524.6893	579.4471	604.7121	609.8545	582.3893	551.3423	507.1465	453.0848	421.6050	418.0357 (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	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640	23.3640
alpha	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576	2.5576
util living area	0.8533	0.8208	0.7526	0.6416	0.5020	0.3445	0.2359	0.2556	0.4555	0.6762	0.8078	0.8635 (86)
Living	19.2923	19.5330	19.9703	20.4382	20.7719	20.9393	20.9842	20.9803	20.8655	20.4527	19.8081	19.2292
Non living	18.0755	18.3694	18.8981	19.4459	19.8138	19.9761	20.0102	20.0082	19.9146	19.4787	18.7156	17.9990
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	20.1264	19.5330	19.9703	20.4382	20.7719	20.9393	20.9842	20.9803	20.8655	20.4527	19.8081	19.4769 (87)
Th 2	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164	20.0164 (88)
util rest of house	0.8369	0.8013	0.7265	0.6054	0.4535	0.2845	0.1675	0.1841	0.3924	0.6342	0.7838	0.8479 (89)
MIT 2	19.2426	18.3694	18.8981	19.4459	19.8138	19.9761	20.0102	20.0082	19.9146	19.4787	18.7156	18.3626 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.7554	19.0445	19.5202	20.0216	20.3696	20.5349	20.5753	20.5722	20.4663	20.0437	19.3494	19.0091 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.7554	19.0445	19.5202	20.0216	20.3696	20.5349	20.5753	20.5722	20.4663	20.0437	19.3494	19.0091 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8321	0.7795	0.7121	0.6056	0.4714	0.3166	0.2067	0.2249	0.4220	0.6355	0.7653	0.8295 (94)

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Useful gains	362.9749	369.8680	373.6233	350.9014	285.0771	193.0831	120.3574	124.0027	214.0042	287.9244	322.6430	346.7547 (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	622.5613	566.8736	514.8652	429.9649	317.3094	201.1386	122.1413	126.2587	232.2067	362.9388	482.1230	590.8581 (97)
Space heating kWh	193.1322	132.3878	105.0840	56.9257	23.9809	0.0000	0.0000	0.0000	0.0000	55.8108	114.8256	181.6129 (98a)
Space heating requirement - total per year (kWh/year)												863.7599
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	193.1322	132.3878	105.0840	56.9257	23.9809	0.0000	0.0000	0.0000	0.0000	55.8108	114.8256	181.6129 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												863.7599
Space heating per m2										(98c) / (4) =		21.9786 (99)

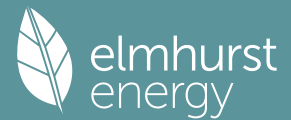
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)												221.3276 (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	193.1322	132.3878	105.0840	56.9257	23.9809	0.0000	0.0000	0.0000	0.0000	55.8108	114.8256	181.6129 (98)
Space heating efficiency (main heating system 1)	221.3276	221.3276	221.3276	221.3276	221.3276	0.0000	0.0000	0.0000	0.0000	221.3276	221.3276	221.3276 (210)
Space heating fuel (main heating system)	87.2608	59.8153	47.4789	25.7201	10.8350	0.0000	0.0000	0.0000	0.0000	25.2164	51.8804	82.0561 (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	195.9435	173.4070	184.3617	162.2399	157.4109	141.9777	140.1369	145.5662	147.0308	163.8053	174.0263	193.8064 (64)
Efficiency of water heater												190.8179 (216)
(217)m	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179	190.8179 (217)
Fuel for water heating, kWh/month	102.6861	90.8757	96.6166	85.0234	82.4927	74.4048	73.4401	76.2854	77.0530	85.8438	91.2002	101.5661 (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	12.6651	10.1604	9.1483	6.7025	5.1772	4.2298	4.7228	6.1389	7.9738	10.4620	11.8169	13.0171 (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												390.2631 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												190.8179
Water heating fuel used												1037.4879 (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)												102.2149 (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												1529.9658 (238)

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

Fuel Fuel price Fuel cost

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	kWh/year	p/kWh	£/year
Space heating - main system 1	390.2631	18.3900	71.7694 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1037.4879	18.3900	190.7940 (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	102.2149	18.3900	18.7973 (250)
Additional standing charges			0.0000 (251)
Total energy cost			281.3607 (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	390.2631	0.1558	60.8050 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1037.4879	0.1409	146.1338 (264)
Space and water heating			206.9387 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	102.2149	0.1443	14.7528 (268)
Total CO2, kg/year			221.6915 (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	390.2631	1.5768	615.3611 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1037.4879	1.5208	1577.8353 (278)
Space and water heating			2193.1964 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	102.2149	1.5338	156.7806 (282)
Total Primary energy kWh/year			2349.9770 (286)