

Full SAP Calculation Printout



Property Reference	UNIT 36				Issued on Date	28/06/2023
Assessment Reference	UNIT 36		Prop Type Ref			
Property	Alexander House, UNIT 36, 205-207 King's Road, RG1 4LS					
SAP Rating	81 B	DER	5.19	TER	13.44	
Environmental	96 A	% DER < TER				61.38
CO ₂ Emissions (t/year)	0.27	DFEE	37.10	TFEE	37.32	
Compliance Check	See BREL	% DFEE < TFEE				0.61
% DPER < TPER	22.50	DPER	54.67	TPER	70.54	
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	56.5000 (1b)	x 2.5000 (2b)	= 141.2500 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.5000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 141.2500 (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)

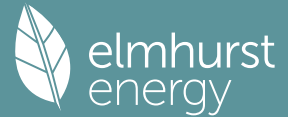
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1550 (21)

	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)			6.5000	1.2357	8.0323		(27)
2 (Uw = 1.30)			4.1000	1.2357	5.0665		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	32.2500	6.5000	25.7500	0.1800	4.6350	18.0000	463.5000 (29a)

Full SAP Calculation Printout



corridor new	25.5000	2.1000	23.4000	0.2400	5.6160	60.0000	1404.0000 (29a)
exposed new	11.2500	4.1000	7.1500	0.2500	1.7875	60.0000	429.0000 (29a)
flat roof new	22.7000		22.7000	0.1300	2.9510	9.0000	204.3000 (30)
roof terrace new	21.4000		21.4000	0.1300	2.7820	9.0000	192.6000 (30)
pitched new	12.4000		12.4000	0.1100	1.3640	9.0000	111.6000 (30)
Total net area of external elements Aum(A, m2)			125.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	34.3344			(33)
pw			26.2500	0.0000	0.0000	20.0000	525.0000 (32)
pf			55.2000			30.0000	1656.0000 (32d)
iw			49.5000			9.0000	445.5000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5431.5000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 96.1327 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.3000	0.0500	0.3150
E3 Sill	5.3000	0.0500	0.2650
E4 Jamb	12.2400	0.0500	0.6120
E20 Exposed floor (normal)	3.4000	0.3200	1.0880
E7 Party floor between dwellings (in blocks of flats)	12.9000	0.0700	0.9030
E14 Flat roof	19.8000	0.0800	1.5840
E15 Flat roof with parapet	7.4000	0.1500	1.1100
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E24 Eaves (insulation at ceiling level - inverted)	2.8000	0.2400	0.6720
E12 Gable (insulation at ceiling level)	4.4000	0.2400	1.0560
E10 Eaves (insulation at ceiling level)	5.2000	0.0600	0.3120

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.5920 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 42.9264 (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	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	(38)
Heat transfer coeff	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	(39)
Average = Sum(39)m / 12 =													66.2326

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.8812 (42)
Hot water usage for mixer showers	55.7603	54.9223	53.7013	51.3649	49.6408	47.7180	46.6251	47.8370	49.1654	51.2298	53.6164	55.5467	(42a)
Hot water usage for baths	24.1020	23.7440	23.2400	22.3106	21.6146	20.8430	20.4261	20.9267	21.4717	22.2974	23.2459	24.0205	(42b)
Hot water usage for other uses	33.8949	32.6624	31.4298	30.1973	28.9647	27.7322	27.7322	28.9647	30.1973	31.4298	32.6624	33.8949	(42c)
Average daily hot water use (litres/day)													104.5690 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	113.7572	111.3288	108.3711	103.8728	100.2202	96.2932	94.7835	97.7284	100.8343	104.9571	109.5247	113.4621	(44)
Energy conte	180.1636	158.5307	166.5623	142.1966	134.9156	118.4037	114.6324	121.0082	124.3388	142.4257	156.0380	177.6542	(45)
Energy content (annual)										Total = Sum(45)m =			1736.8698

Distribution loss (46)m = 0.15 x (45)m 27.0245 23.7796 24.9843 21.3295 20.2373 17.7606 17.1949 18.1512 18.6508 21.3639 23.4057 26.6481 (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 18.6300 (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 18.6300 (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 22.5120 (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 0.0000 (61)

Total heat required for water heating calculated for each month 222.6770 196.9299 209.0757 183.3386 177.4290 159.5457 157.1458 163.5216 165.4808 184.9391 197.1800 220.1676 (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 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 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 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 0.0000 (63d)

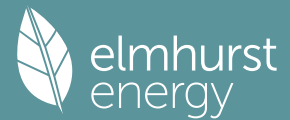
Output from w/h 222.6770 196.9299 209.0757 183.3386 177.4290 159.5457 157.1458 163.5216 165.4808 184.9391 197.1800 220.1676 (64)

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 93.9151 83.4308 89.3927 80.1940 78.8702 72.2828 72.1260 74.2459 74.2563 81.3673 84.7962 93.0807 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.6696	17.4704	14.2079	10.7563	8.0405	6.7881	7.3348	9.5340	12.7965	16.2481	18.9640	20.2163 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.8387	247.3793	240.9769	227.3470	210.1417	193.9712	183.1682	180.6276	187.0300	200.6599	217.8652	234.0357 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681 (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)	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462 (71)
Water heating gains (Table 5)	126.2300	124.1530	120.1514	111.3805	106.0083	100.3928	96.9435	99.7929	103.1337	109.3646	117.7725	125.1085 (72)
Total internal gains	476.5295	474.7939	461.1275	435.2750	409.9816	386.9432	373.2377	375.7457	388.7513	412.0638	440.3928	465.1518 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
South	6.5000		46.7521		0.6300		0.8000		0.7700		106.1397 (78)	
South	4.1000		46.7521		0.6300		0.8000		0.7700		66.9497 (78)	
Solar gains	173.0894	283.4758	361.0979	408.1190	425.2853	409.2792	399.8907	388.3493	377.2094	305.7553	205.1699	149.5652 (83)
Total gains	649.6189	758.2697	822.2254	843.3940	835.2669	796.2224	773.1284	764.0949	765.9607	717.8190	645.5628	614.7169 (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	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796
alpha	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186
util living area	0.8724	0.8248	0.7689	0.6973	0.6007	0.4753	0.3562	0.3741	0.5184	0.7009	0.8286	0.8854 (86)
Living	19.0225	19.3835	19.7970	20.2179	20.5813	20.8333	20.9411	20.9310	20.7802	20.3192	19.5859	18.9159
Non living	17.6882	18.1284	18.6304	19.1329	19.5495	19.8150	19.9100	19.9025	19.7649	19.2632	18.3893	17.5575
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	19.9884	19.3835	19.7970	20.2179	20.5813	20.8333	20.9411	20.9310	20.7802	20.3192	19.5859	19.2075 (87)
Th 2	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423 (88)
util rest of house	0.8573	0.8054	0.7437	0.6632	0.5536	0.4104	0.2775	0.2960	0.4560	0.6609	0.8062	0.8715 (89)
MIT 2	19.0436	18.1284	18.6304	19.1329	19.5495	19.8150	19.9100	19.9025	19.7649	19.2632	18.3893	17.9872 (90)
Living area fraction	19.6005	18.8681	19.3180	19.7724	20.1576	20.4152	20.5177	20.5087	20.3633	19.8856	19.0946	0.5894 (91)
MIT	19.6005	18.8681	19.3180	19.7724	20.1576	20.4152	20.5177	20.5087	20.3633	19.8856	19.0946	18.7064 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6005	18.8681	19.3180	19.7724	20.1576	20.4152	20.5177	20.5087	20.3633	19.8856	19.0946	18.7064 (93)

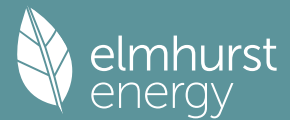
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8519	0.7829	0.7272	0.6573	0.5637	0.4403	0.3211	0.3387	0.4817	0.6586	0.7856	0.8524 (94)
Useful gains	553.4066	593.6245	597.8881	554.3539	470.8097	350.5411	248.2144	258.7665	368.9495	472.7565	507.1264	523.9660 (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	1013.3890	925.1447	848.9664	720.1072	560.1697	385.1549	259.4793	272.1300	414.8357	615.0064	794.4330	960.7965 (97)
Space heating kWh	342.2269	222.7816	186.8022	119.3424	66.4838	0.0000	0.0000	0.0000	0.0000	105.8339	206.8607	325.0019 (98a)
Space heating requirement - total per year (kWh/year)												1575.3335
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	342.2269	222.7816	186.8022	119.3424	66.4838	0.0000	0.0000	0.0000	0.0000	105.8339	206.8607	325.0019 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1575.3335
Space heating per m ²										(98c) / (4) =		27.8820 (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 %)	239.0163 (206)

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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	342.2269	222.7816	186.8022	119.3424	66.4838	0.0000	0.0000	0.0000	0.0000	105.8339	206.8607	325.0019	(98)
Space heating efficiency (main heating system 1)	239.0163	239.0163	239.0163	239.0163	239.0163	0.0000	0.0000	0.0000	0.0000	239.0163	239.0163	239.0163	(210)
Space heating fuel (main heating system)	143.1814	93.2077	78.1546	49.9306	27.8156	0.0000	0.0000	0.0000	0.0000	44.2790	86.5467	135.9748	(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	222.6770	196.9299	209.0757	183.3386	177.4290	159.5457	157.1458	163.5216	165.4808	184.9391	197.1800	220.1676	(64)
Efficiency of water heater	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	(216)
Fuel for water heating, kWh/month	116.5130	103.0411	109.3962	95.9297	92.8375	83.4803	82.2246	85.5606	86.5858	96.7671	103.1719	115.2000	(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	17.2167	13.8119	12.4361	9.1112	7.0378	5.7499	6.4201	8.3451	10.8394	14.2219	16.0636	17.6952	(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													659.0905 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													191.1178
Water heating fuel used													1170.7077 (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)													138.9489 (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													1968.7471 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	659.0905	16.4900	108.6840 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1170.7077	16.4900	193.0497 (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	138.9489	16.4900	22.9127 (250)
Additional standing charges			0.0000 (251)
Total energy cost			324.6464 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.1515 (257)
SAP value	81.3349
SAP rating (Section 12)	81 (258)
SAP band	B

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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	659.0905	0.1552	102.2756 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1170.7077	0.1409	164.9960 (264)
Space and water heating			267.2716 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	138.9489	0.1443	20.0546 (268)
Total CO2, kg/year			287.3262 (272)
CO2 emissions per m2			5.0900 (273)
EI value			96.2067
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	56.5000 (1b)	x 2.5000 (2b)	= 141.2500 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.2500 (5)

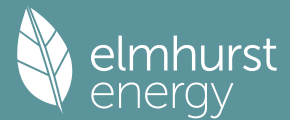
2. Ventilation rate

	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)
Wind speed	Jan 4.3000 Feb 4.1000 Mar 4.1000 Apr 3.8000 May 3.9000 Jun 3.4000 Jul 3.4000 Aug 3.3000 Sep 3.4000 Oct 3.8000 Nov 3.7000 Dec 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)			4.1000	1.2357	5.0665		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	32.2500	6.5000	25.7500	0.1800	4.6350	18.0000	463.5000 (29a)
corridor new	25.5000	2.1000	23.4000	0.2400	5.6160	60.0000	1404.0000 (29a)

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exposed new	11.2500	4.1000	7.1500	0.2500	1.7875	60.0000	429.0000 (29a)
flat roof new	22.7000		22.7000	0.1300	2.9510	9.0000	204.3000 (30)
roof terrace new	21.4000		21.4000	0.1300	2.7820	9.0000	192.6000 (30)
pitched new	12.4000		12.4000	0.1100	1.3640	9.0000	111.6000 (30)
Total net area of external elements Aum(A, m2)			125.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	34.3344			(33)
pw			26.2500	0.0000	0.0000	20.0000	525.0000 (32)
pf			55.2000			30.0000	1656.0000 (32d)
iw			49.5000			9.0000	445.5000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5431.5000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 96.1327 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.3000	0.0500	0.3150
E3 Sill	5.3000	0.0500	0.2650
E4 Jamb	12.2400	0.0500	0.6120
E20 Exposed floor (normal)	3.4000	0.3200	1.0880
E7 Party floor between dwellings (in blocks of flats)	12.9000	0.0700	0.9030
E14 Flat roof	19.8000	0.0800	1.5840
E15 Flat roof with parapet	7.4000	0.1500	1.1100
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E24 Eaves (insulation at ceiling level - inverted)	2.8000	0.2400	0.6720
E12 Gable (insulation at ceiling level)	4.4000	0.2400	1.0560
E10 Eaves (insulation at ceiling level)	5.2000	0.0600	0.3120

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.5920 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 42.9264 (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	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	(38)
Heat transfer coeff	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	(39)
Average = Sum(39)m / 12 =													66.2326

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	(40)
HLP (average)													1.1723
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.8812 (42)
Hot water usage for mixer showers	55.7603	54.9223	53.7013	51.3649	49.6408	47.7180	46.6251	47.8370	49.1654	51.2298	53.6164	55.5467	(42a)
Hot water usage for baths	24.1020	23.7440	23.2400	22.3106	21.6146	20.8430	20.4261	20.9267	21.4717	22.2974	23.2459	24.0205	(42b)
Hot water usage for other uses	33.8949	32.6624	31.4298	30.1973	28.9647	27.7322	27.7322	28.9647	30.1973	31.4298	32.6624	33.8949	(42c)
Average daily hot water use (litres/day)													104.5690 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.7572	111.3288	108.3711	103.8728	100.2202	96.2932	94.7835	97.7284	100.8343	104.9571	109.5247	113.4621	(44)
Energy conte	180.1636	158.5307	166.5623	142.1966	134.9156	118.4037	114.6324	121.0082	124.3388	142.4257	156.0380	177.6542	(45)
Energy content (annual)										Total = Sum(45)m =			1736.8698
Distribution loss (46)m = 0.15 x (45)m	27.0245	23.7796	24.9843	21.3295	20.2373	17.7606	17.1949	18.1512	18.6508	21.3639	23.4057	26.6481	(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	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	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	222.6770	196.9299	209.0757	183.3386	177.4290	159.5457	157.1458	163.5216	165.4808	184.9391	197.1800	220.1676	(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	222.6770	196.9299	209.0757	183.3386	177.4290	159.5457	157.1458	163.5216	165.4808	184.9391	197.1800	220.1676	(64)
Total per year (kWh/year) = Sum(64)m =													2237.4308 (64a)

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	93.9151	83.4308	89.3927	80.1940	78.8702	72.2828	72.1260	74.2459	74.2563	81.3673	84.7962	93.0807	(65)
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5. Internal gains (see Table 5 and 5a)

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693 (66)
Lighting gains	(calculated in Appendix L, equation L9 or L9a), also see Table 5											
	19.6696	17.4704	14.2079	10.7563	8.0405	6.7881	7.3348	9.5340	12.7965	16.2481	18.9640	20.2163 (67)
Appliances gains	(calculated in Appendix L, equation L13 or L13a), also see Table 5											
	244.8387	247.3793	240.9769	227.3470	210.1417	193.9712	183.1682	180.6276	187.0300	200.6599	217.8652	234.0357 (68)
Cooking gains	(calculated in Appendix L, equation L15 or L15a), also see Table 5											
	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681 (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)	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462 (71)
Water heating gains (Table 5)	126.2300	124.1530	120.1514	111.3805	106.0083	100.3928	96.9435	99.7929	103.1337	109.3646	117.7725	125.1085 (72)
Total internal gains	476.5295	474.7939	461.1275	435.2750	409.9816	386.9432	373.2377	375.7457	388.7513	412.0638	440.3928	465.1518 (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				
South			6.5000	54.2217	0.6300	0.8000	0.7700	123.0978 (78)				
South			4.1000	54.2217	0.6300	0.8000	0.7700	77.6463 (78)				
Solar gains	200.7441	286.4682	361.6938	416.7107	426.2880	435.8934	420.8483	416.0556	403.0991	331.2875	234.1941	174.6293 (83)
Total gains	677.2736	761.2621	822.8213	851.9857	836.2696	822.8367	794.0860	791.8013	791.8504	743.3512	674.5869	639.7810 (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	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796
alpha	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186
util living area	0.8511	0.8092	0.7474	0.6613	0.5464	0.3901	0.2674	0.2757	0.4536	0.6540	0.7968	0.8647 (86)
Living	19.2524	19.5433	19.9522	20.3703	20.7083	20.9141	20.9772	20.9748	20.8598	20.4755	19.8139	19.1673
Non living	17.9729	18.3255	18.8182	19.3097	19.6865	19.8870	19.9339	19.9326	19.8401	19.4395	18.6654	17.8703
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	20.1060	19.5433	19.9522	20.3703	20.7083	20.9141	20.9772	20.9748	20.8598	20.4755	19.8139	19.4237 (87)
Th 2	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423 (88)
util rest of house	0.8334	0.7877	0.7192	0.6229	0.4927	0.3191	0.1848	0.1933	0.3860	0.6084	0.7702	0.8481 (89)
MIT 2	19.1572	18.3255	18.8182	19.3097	19.6865	19.8870	19.9339	19.9326	19.8401	19.4395	18.6654	18.2437 (90)
Living area fraction									fLA = Living area / (4) =			0.5894 (91)
MIT	19.7164	19.0433	19.4866	19.9348	20.2887	20.4924	20.5488	20.5468	20.4411	20.0501	19.3423	18.9391 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7164	19.0433	19.4866	19.9348	20.2887	20.4924	20.5488	20.5468	20.4411	20.0501	19.3423	18.9391 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8293	0.7670	0.7059	0.6226	0.5110	0.3568	0.2327	0.2410	0.4187	0.6134	0.7532	0.8299 (94)
Useful gains	561.6379	583.8509	580.8300	530.4252	427.3046	293.5759	184.8055	190.8228	331.5295	455.9475	508.0815	530.9468 (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	968.0807	883.7613	800.5253	664.6314	489.3746	310.7871	188.6846	195.1766	360.3751	566.2935	751.2287	916.6029 (97)
Space heating kWh	302.3934	201.5398	163.4534	96.6284	46.1801	0.0000	0.0000	0.0000	0.0000	82.0974	175.0660	286.9281 (98a)
Space heating requirement - total per year (kWh/year)												1354.2867
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	302.3934	201.5398	163.4534	96.6284	46.1801	0.0000	0.0000	0.0000	0.0000	82.0974	175.0660	286.9281 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1354.2867
Space heating per m ²										(98c) / (4) =		23.9697 (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 %)	239.0163 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)

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Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	302.3934	201.5398	163.4534	96.6284	46.1801	0.0000	0.0000	0.0000	0.0000	82.0974	175.0660	286.9281 (98)
Space heating efficiency (main heating system 1)	239.0163	239.0163	239.0163	239.0163	239.0163	0.0000	0.0000	0.0000	0.0000	239.0163	239.0163	239.0163 (210)
Space heating fuel (main heating system)	126.5158	84.3205	68.3859	40.4276	19.3209	0.0000	0.0000	0.0000	0.0000	34.3481	73.2444	120.0454 (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	222.6770	196.9299	209.0757	183.3386	177.4290	159.5457	157.1458	163.5216	165.4808	184.9391	197.1800	220.1676 (64)
Efficiency of water heater	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178 (216)
Fuel for water heating, kWh/month	116.5130	103.0411	109.3962	95.9297	92.8375	83.4803	82.2246	85.5606	86.5858	96.7671	103.1719	115.2000 (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 (219)
(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	17.2167	13.8119	12.4361	9.1112	7.0378	5.7499	6.4201	8.3451	10.8394	14.2219	16.0636	17.6952 (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												566.6086 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												191.1178
Water heating fuel used												1170.7077 (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)												138.9489 (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												1876.2652 (238)

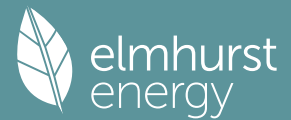
10a. Fuel costs - using BEDF prices (521)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	566.6086	18.3900	104.1993 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1170.7077	18.3900	215.2931 (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	138.9489	18.3900	25.5527 (250)
Additional standing charges			0.0000 (251)
Total energy cost			345.0452 (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	566.6086	0.1557	88.2066 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1170.7077	0.1409	164.9960 (264)
Space and water heating			253.2026 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	138.9489	0.1443	20.0546 (268)

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Total CO₂, kg/year

273.2572 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	566.6086	1.5763	893.1415 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1170.7077	1.5211	1780.8053 (278)
Space and water heating			2673.9468 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	138.9489	1.5338	213.1244 (282)
Total Primary energy kWh/year			2887.0712 (286)

SAP 10 EPC IMPROVEMENTS

UNIT 36

Current energy efficiency rating: B 81
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	CO ₂ change
---------------------------------	------------	-------------	------------------------

Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings £0	0.00 kg/m ²	

Potential energy efficiency rating: B 81
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	Potential	Saving
Electricity	£345	£345	£0
Space heating	£104	£104	£0
Water heating	£215	£215	£0
Lighting	£26	£26	£0
Total cost of fuels	£345	£345	£0
Total cost of uses	£345	£345	£0
Delivered energy	33 kWh/m ²	33 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO ₂ emissions per m ²	5 kg/m ²	5 kg/m ²	0 kg/m ²
Primary energy	51 kWh/m ²	51 kWh/m ²	0 kWh/m ²

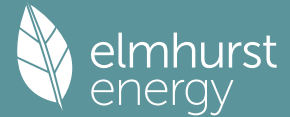
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	56.5000 (1b)	x 2.5000 (2b)	= 141.2500 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.5000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 141.2500 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		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	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)			6.5000	1.2357	8.0323			(27)
2 (Uw = 1.30)			4.1000	1.2357	5.0665			(27)
1			2.1000	1.0000	2.1000			(26)
top floor exposed new	32.2500	6.5000	25.7500	0.1800	4.6350	18.0000	463.5000	(29a)
corridor new	25.5000	2.1000	23.4000	0.2400	5.6160	60.0000	1404.0000	(29a)
exposed new	11.2500	4.1000	7.1500	0.2500	1.7875	60.0000	429.0000	(29a)
flat roof new	22.7000		22.7000	0.1300	2.9510	9.0000	204.3000	(30)
roof terrace new	21.4000		21.4000	0.1300	2.7820	9.0000	192.6000	(30)
pitched new	12.4000		12.4000	0.1100	1.3640	9.0000	111.6000	(30)
Total net area of external elements Aum(A, m2)			125.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.3344			(33)
pw			26.2500	0.0000	0.0000	20.0000	525.0000	(32)
pf			55.2000			30.0000	1656.0000	(32d)
iw			49.5000			9.0000	445.5000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5431.5000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		96.1327	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.3000	0.0500	0.3150
E3 Sill	5.3000	0.0500	0.2650
E4 Jamb	12.2400	0.0500	0.6120
E20 Exposed floor (normal)	3.4000	0.3200	1.0880
E7 Party floor between dwellings (in blocks of flats)	12.9000	0.0700	0.9030
E14 Flat roof	19.8000	0.0800	1.5840
E15 Flat roof with parapet	7.4000	0.1500	1.1100
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E24 Eaves (insulation at ceiling level - inverted)	2.8000	0.2400	0.6720
E12 Gable (insulation at ceiling level)	4.4000	0.2400	1.0560
E10 Eaves (insulation at ceiling level)	5.2000	0.0600	0.3120

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.5920	(36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	42.9264	(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	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	(39)
Average = Sum(39)m / 12 =	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8812 (42)
Hot water usage for mixer showers												55.5467 (42a)
Hot water usage for baths												24.0205 (42b)
Hot water usage for other uses												33.8949 (42c)
Average daily hot water use (litres/day)												104.5690 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.7572	111.3288	108.3711	103.8728	100.2202	96.2932	94.7835	97.7284	100.8343	104.9571	109.5247	113.4621 (44)
Energy content (annual)	180.1636	158.5307	166.5623	142.1966	134.9156	118.4037	114.6324	121.0082	124.3388	142.4257	156.0380	177.6542 (45)
Distribution loss (46)m = 0.15 x (45)m												1736.8698
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												
Primary 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 (57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
WWHRS	222.6770	196.9299	209.0757	183.3386	177.4290	159.5457	157.1458	163.5216	165.4808	184.9391	197.1800	220.1676 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	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)
	222.6770	196.9299	209.0757	183.3386	177.4290	159.5457	157.1458	163.5216	165.4808	184.9391	197.1800	220.1676 (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	93.9151	83.4308	89.3927	80.1940	78.8702	72.2828	72.1260	74.2459	74.2563	81.3673	84.7962	93.0807 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	19.6696	17.4704	14.2079	10.7563	8.0405	6.7881	7.3348	9.5340	12.7965	16.2481	18.9640	20.2163 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	244.8387	247.3793	240.9769	227.3470	210.1417	193.9712	183.1682	180.6276	187.0300	200.6599	217.8652	234.0357 (68)
Pumps, fans	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681 (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)	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462 (71)
Total internal gains	126.2300	124.1530	120.1514	111.3805	106.0083	100.3928	96.9435	99.7929	103.1337	109.3646	117.7725	125.1085 (72)
	476.5295	474.7939	461.1275	435.2750	409.9816	386.9432	373.2377	375.7457	388.7513	412.0638	440.3928	465.1518 (73)

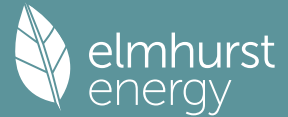
6. Solar gains

[Jan]				Area	Solar flux	g	FF	Access	Gains			
				m2	Table 6a	Specific data	Specific data	factor	W			
					W/m2	or Table 6b	or Table 6c	Table 6d				
South				6.5000	46.7521	0.6300	0.8000	0.7700	106.1397 (78)			
South				4.1000	46.7521	0.6300	0.8000	0.7700	66.9497 (78)			
Solar gains	173.0894	283.4758	361.0979	408.1190	425.2853	409.2792	399.8907	388.3493	377.2094	305.7553	205.1699	149.5652 (83)
Total gains	649.6189	758.2697	822.2254	843.3940	835.2669	796.2224	773.1284	764.0949	765.9607	717.8190	645.5628	614.7169 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796
util living area	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186

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	0.8724	0.8248	0.7689	0.6973	0.6007	0.4753	0.3562	0.3741	0.5184	0.7009	0.8286	0.8854 (86)
Living	19.0225	19.3835	19.7970	20.2179	20.5813	20.8333	20.9411	20.9310	20.7802	20.3192	19.5859	18.9159
Non living	17.6882	18.1284	18.6304	19.1329	19.5495	19.8150	19.9100	19.9025	19.7649	19.2632	18.3893	17.5575
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	19.9884	19.3835	19.7970	20.2179	20.5813	20.8333	20.9411	20.9310	20.7802	20.3192	19.5859	19.2075 (87)
Th 2	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423 (88)
util rest of house	0.8573	0.8054	0.7437	0.6632	0.5536	0.4104	0.2775	0.2960	0.4560	0.6609	0.8062	0.8715 (89)
MIT 2	19.0436	18.1284	18.6304	19.1329	19.5495	19.8150	19.9100	19.9025	19.7649	19.2632	18.3893	17.9872 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.6005	18.8681	19.3180	19.7724	20.1576	20.4152	20.5177	20.5087	20.3633	19.8856	19.0946	0.5894 (91)
Temperature adjustment												18.7064 (92)
adjusted MIT	19.6005	18.8681	19.3180	19.7724	20.1576	20.4152	20.5177	20.5087	20.3633	19.8856	19.0946	0.0000 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8519	0.7829	0.7272	0.6573	0.5637	0.4403	0.3211	0.3387	0.4817	0.6586	0.7856	0.8524 (94)
Useful gains	553.4066	593.6245	597.8881	554.3539	470.8097	350.5411	248.2144	258.7665	368.9495	472.7565	507.1264	523.9660 (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	1013.3890	925.1447	848.9664	720.1072	560.1697	385.1549	259.4793	272.1300	414.8357	615.0064	794.4330	960.7965 (97)
Space heating kWh	342.2269	222.7816	186.8022	119.3424	66.4838	0.0000	0.0000	0.0000	0.0000	105.8339	206.8607	325.0019 (98a)
Space heating requirement - total per year (kWh/year)												1575.3335
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	342.2269	222.7816	186.8022	119.3424	66.4838	0.0000	0.0000	0.0000	0.0000	105.8339	206.8607	325.0019 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1575.3335
Space heating per m2										(98c) / (4) =		27.8820 (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 %)												239.0163 (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	342.2269	222.7816	186.8022	119.3424	66.4838	0.0000	0.0000	0.0000	0.0000	105.8339	206.8607	325.0019 (98)
Space heating efficiency (main heating system 1)	239.0163	239.0163	239.0163	239.0163	239.0163	0.0000	0.0000	0.0000	0.0000	239.0163	239.0163	239.0163 (210)
Space heating fuel (main heating system)	143.1814	93.2077	78.1546	49.9306	27.8156	0.0000	0.0000	0.0000	0.0000	44.2790	86.5467	135.9748 (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	222.6770	196.9299	209.0757	183.3386	177.4290	159.5457	157.1458	163.5216	165.4808	184.9391	197.1800	220.1676 (64)
Efficiency of water heater												191.1178 (216)
(217)m	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178 (217)
Fuel for water heating, kWh/month	116.5130	103.0411	109.3962	95.9297	92.8375	83.4803	82.2246	85.5606	86.5858	96.7671	103.1719	115.2000 (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	17.2167	13.8119	12.4361	9.1112	7.0378	5.7499	6.4201	8.3451	10.8394	14.2219	16.0636	17.6952 (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												659.0905 (211)
Space heating fuel - main system 2												0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	191.1178
Water heating fuel used	1170.7077 (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)	138.9489 (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	1968.7471 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	659.0905	16.4900	108.6840 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1170.7077	16.4900	193.0497 (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	138.9489	16.4900	22.9127 (250)
Additional standing charges			0.0000 (251)
Total energy cost			324.6464 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1515 (257)
SAP value		81.3349
SAP rating (Section 12)		81 (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	659.0905	0.1552	102.2756 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1170.7077	0.1409	164.9960 (264)
Space and water heating			267.2716 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	138.9489	0.1443	20.0546 (268)
Total CO2, kg/year			287.3262 (272)
CO2 emissions per m2			5.0900 (273)
EI value			96.2067
EI rating			96 (274)
EI band			A

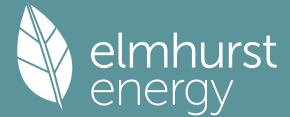
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	56.5000 (1b)	x 2.5000 (2b)	= 141.2500 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.2500 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		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	
	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)			4.1000	1.2357	5.0665		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	32.2500	6.5000	25.7500	0.1800	4.6350	18.0000	463.5000 (29a)
corridor new	25.5000	2.1000	23.4000	0.2400	5.6160	60.0000	1404.0000 (29a)
exposed new	11.2500	4.1000	7.1500	0.2500	1.7875	60.0000	429.0000 (29a)
flat roof new	22.7000		22.7000	0.1300	2.9510	9.0000	204.3000 (30)
roof terrace new	21.4000		21.4000	0.1300	2.7820	9.0000	192.6000 (30)
pitched new	12.4000		12.4000	0.1100	1.3640	9.0000	111.6000 (30)
Total net area of external elements Aum(A, m2)			125.5000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.3344		(33)
pw			26.2500	0.0000	0.0000	20.0000	525.0000 (32)
pf			55.2000			30.0000	1656.0000 (32d)
iw			49.5000			9.0000	445.5000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5431.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		96.1327 (35)

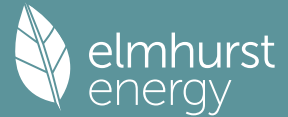
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.3000	0.0500	0.3150
E3 Sill	5.3000	0.0500	0.2650
E4 Jamb	12.2400	0.0500	0.6120
E20 Exposed floor (normal)	3.4000	0.3200	1.0880
E7 Party floor between dwellings (in blocks of flats)	12.9000	0.0700	0.9030
E14 Flat roof	19.8000	0.0800	1.5840
E15 Flat roof with parapet	7.4000	0.1500	1.1100
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E24 Eaves (insulation at ceiling level - inverted)	2.8000	0.2400	0.6720
E12 Gable (insulation at ceiling level)	4.4000	0.2400	1.0560
E10 Eaves (insulation at ceiling level)	5.2000	0.0600	0.3120
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.5920 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 42.9264 (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	
	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	23.3063	(38)
Heat transfer coeff	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	66.2326	(39)
Average = Sum(39)m / 12 =													66.2326
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	1.1723	(40)
HLP (average)													1.1723
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8812 (42)
Hot water usage for mixer showers	55.7603	54.9223	53.7013	51.3649	49.6408	47.7180	46.6251	47.8370	49.1654	51.2298	53.6164	55.5467 (42a)
Hot water usage for baths	24.1020	23.7440	23.2400	22.3106	21.6146	20.8430	20.4261	20.9267	21.4717	22.2974	23.2459	24.0205 (42b)
Hot water usage for other uses	33.8949	32.6624	31.4298	30.1973	28.9647	27.7322	27.7322	28.9647	30.1973	31.4298	32.6624	33.8949 (42c)
Average daily hot water use (litres/day)												104.5690 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	113.7572	111.3288	108.3711	103.8728	100.2202	96.2932	94.7835	97.7284	100.8343	104.9571	109.5247	113.4621 (44)
Distribution loss (46)m = 0.15 x (45)m	180.1636	158.5307	166.5623	142.1966	134.9156	118.4037	114.6324	121.0082	124.3388	142.4257	156.0380	177.6542 (45)
Total storage loss	27.0245	23.7796	24.9843	21.3295	20.2373	17.7606	17.1949	18.1512	18.6508	21.3639	23.4057	26.6481 (46)
Water storage loss:												150.0000 (47)
Store volume												1.1500 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6210 (55)
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	222.6770	196.9299	209.0757	183.3386	177.4290	159.5457	157.1458	163.5216	165.4808	184.9391	197.1800	220.1676 (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	222.6770	196.9299	209.0757	183.3386	177.4290	159.5457	157.1458	163.5216	165.4808	184.9391	197.1800	220.1676 (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	93.9151	83.4308	89.3927	80.1940	78.8702	72.2828	72.1260	74.2459	74.2563	81.3673	84.7962	93.0807 (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	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693	112.8693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.6696	17.4704	14.2079	10.7563	8.0405	6.7881	7.3348	9.5340	12.7965	16.2481	18.9640	20.2163 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	244.8387	247.3793	240.9769	227.3470	210.1417	193.9712	183.1682	180.6276	187.0300	200.6599	217.8652	234.0357 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681	48.1681 (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)	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462	-75.2462 (71)
Water heating gains (Table 5)	126.2300	124.1530	120.1514	111.3805	106.0083	100.3928	96.9435	99.7929	103.1337	109.3646	117.7725	125.1085 (72)
Total internal gains	476.5295	474.7939	461.1275	435.2750	409.9816	386.9432	373.2377	375.7457	388.7513	412.0638	440.3928	465.1518 (73)

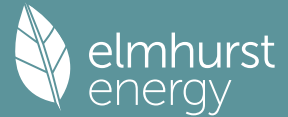
6. Solar gains

[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			
South				6.5000	54.2217	0.6300	0.8000	0.7700	123.0978 (78)			
South				4.1000	54.2217	0.6300	0.8000	0.7700	77.6463 (78)			
Solar gains	200.7441	286.4682	361.6938	416.7107	426.2880	435.8934	420.8483	416.0556	403.0991	331.2875	234.1941	174.6293 (83)
Total gains	677.2736	761.2621	822.8213	851.9857	836.2696	822.8367	794.0860	791.8013	791.8504	743.3512	674.5869	639.7810 (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	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796	22.7796
alpha	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186	2.5186
util living area	0.8511	0.8092	0.7474	0.6613	0.5464	0.3901	0.2674	0.2757	0.4536	0.6540	0.7968	0.8647 (86)

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Living	19.2524	19.5433	19.9522	20.3703	20.7083	20.9141	20.9772	20.9748	20.8598	20.4755	19.8139	19.1673
Non living	17.9729	18.3255	18.8182	19.3097	19.6865	19.8870	19.9339	19.9326	19.8401	19.4395	18.6654	17.8703
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	20.1060	19.5433	19.9522	20.3703	20.7083	20.9141	20.9772	20.9748	20.8598	20.4755	19.8139	19.4237 (87)
Th 2	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423	19.9423 (88)
util rest of house												
	0.8334	0.7877	0.7192	0.6229	0.4927	0.3191	0.1848	0.1933	0.3860	0.6084	0.7702	0.8481 (89)
MIT 2	19.1572	18.3255	18.8182	19.3097	19.6865	19.8870	19.9339	19.9326	19.8401	19.4395	18.6654	18.2437 (90)
Living area fraction									fLA = Living area / (4) =			0.5894 (91)
MIT	19.7164	19.0433	19.4866	19.9348	20.2887	20.4924	20.5488	20.5468	20.4411	20.0501	19.3423	18.9391 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7164	19.0433	19.4866	19.9348	20.2887	20.4924	20.5488	20.5468	20.4411	20.0501	19.3423	18.9391 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8293	0.7670	0.7059	0.6226	0.5110	0.3568	0.2327	0.2410	0.4187	0.6134	0.7532	0.8299 (94)
Useful gains	561.6379	583.8509	580.8300	530.4252	427.3046	293.5759	184.8055	190.8228	331.5295	455.9475	508.0815	530.9468 (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	968.0807	883.7613	800.5253	664.6314	489.3746	310.7871	188.6846	195.1766	360.3751	566.2935	751.2287	916.6029 (97)
Space heating kWh	302.3934	201.5398	163.4534	96.6284	46.1801	0.0000	0.0000	0.0000	0.0000	82.0974	175.0660	286.9281 (98a)
Space heating requirement - total per year (kWh/year)												1354.2867
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	302.3934	201.5398	163.4534	96.6284	46.1801	0.0000	0.0000	0.0000	0.0000	82.0974	175.0660	286.9281 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1354.2867
Space heating per m2										(98c) / (4) =		23.9697 (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 %)												239.0163 (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	302.3934	201.5398	163.4534	96.6284	46.1801	0.0000	0.0000	0.0000	0.0000	82.0974	175.0660	286.9281 (98)
Space heating efficiency (main heating system 1)	239.0163	239.0163	239.0163	239.0163	239.0163	0.0000	0.0000	0.0000	0.0000	239.0163	239.0163	239.0163 (210)
Space heating fuel (main heating system)	126.5158	84.3205	68.3859	40.4276	19.3209	0.0000	0.0000	0.0000	0.0000	34.3481	73.2444	120.0454 (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	222.6770	196.9299	209.0757	183.3386	177.4290	159.5457	157.1458	163.5216	165.4808	184.9391	197.1800	220.1676 (64)
Efficiency of water heater (217)m	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178	191.1178 (216)
Fuel for water heating, kWh/month	116.5130	103.0411	109.3962	95.9297	92.8375	83.4803	82.2246	85.5606	86.5858	96.7671	103.1719	115.2000 (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	17.2167	13.8119	12.4361	9.1112	7.0378	5.7499	6.4201	8.3451	10.8394	14.2219	16.0636	17.6952 (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												566.6086 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	191.1178
Water heating fuel used	1170.7077 (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)	138.9489 (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	1876.2652 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	566.6086	18.3900	104.1993 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1170.7077	18.3900	215.2931 (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	138.9489	18.3900	25.5527 (250)
Additional standing charges			0.0000 (251)
Total energy cost			345.0452 (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	566.6086	0.1557	88.2066 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1170.7077	0.1409	164.9960 (264)
Space and water heating			253.2026 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	138.9489	0.1443	20.0546 (268)
Total CO2, kg/year			273.2572 (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	566.6086	1.5763	893.1415 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1170.7077	1.5211	1780.8053 (278)
Space and water heating			2673.9468 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	138.9489	1.5338	213.1244 (282)
Total Primary energy kWh/year			2887.0712 (286)