

Full SAP Calculation Printout



Property Reference	UNIT 35				Issued on Date	28/06/2023
Assessment Reference	UNIT 35			Prop Type Ref		
Property	Alexander House, UNIT 35, 205-207 King's Road, RG1 4LS					
SAP Rating	80 C	DER	5.06	TER	13.87	
Environmental	96 A	% DER < TER				63.52
CO ₂ Emissions (t/year)	0.34	DFEE	42.38	TFEE	45.38	
Compliance Check	See BREL	% DFEE < TFEE				6.61
% DPER < TPER	26.93	DPER	53.15	TPER	72.74	
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	71.2000 (1b)	x 2.5000 (2b)	= 178.0000 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.0000 (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)
	2 (19)

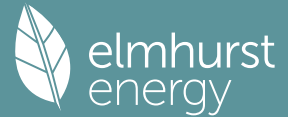
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	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	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
1 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
2 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
3 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
1			2.1000	1.0000	2.1000		(26)

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top floor exposed new	58.7500	19.5000	39.2500	0.1800	7.0650	18.0000	706.5000 (29a)
corridor new	9.7500	2.1000	7.6500	0.2400	1.8360	60.0000	459.0000 (29a)
stair new	14.2500		14.2500	0.2400	3.4200	9.0000	128.2500 (29a)
flat roof new	39.1000		39.1000	0.1300	5.0830	9.0000	351.9000 (30)
roof terrace new	32.1000		32.1000	0.1300	4.1730	9.0000	288.9000 (30)
Total net area of external elements Aum(A, m2)			153.9500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	47.7740			(33)
pw			16.0000	0.0000	0.0000	20.0000	320.0000 (32)
pf			71.2000			30.0000	2136.0000 (32d)
iw			105.5000			9.0000	949.5000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5340.0500 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 75.0007 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.8000	0.0500	0.4400
E3 Sill	7.8000	0.0500	0.3900
E4 Jamb	19.2000	0.0500	0.9600
E7 Party floor between dwellings (in blocks of flats)	6.6000	0.0700	0.4620
E14 Flat roof	15.8000	0.0800	1.2640
E15 Flat roof with parapet	23.5000	0.1500	3.5250
E16 Corner (normal)	10.0000	0.0900	0.9000
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E24 Eaves (insulation at ceiling level - inverted)	7.8000	0.2400	1.8720
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.8880 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 57.6620 (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	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	(38)
Average = Sum(39)m / 12 =	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	(39)
HLP	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	(40)
HLP (average)													1.2224
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2749 (42)
Hot water usage for mixer showers													
Hot water usage for baths	62.3623	61.4251	60.0594	57.4465	55.5182	53.3678	52.1455	53.5008	54.9865	57.2954	59.9645	62.1233	(42a)
Hot water usage for other uses	26.9410	26.5409	25.9775	24.9386	24.1607	23.2981	22.8322	23.3917	24.0009	24.9239	25.9842	26.8500	(42b)
Average daily hot water use (litres/day)	37.9273	36.5481	35.1689	33.7898	32.4106	31.0314	31.0314	32.4106	33.7898	35.1689	36.5481	37.9273	(42c)
												116.9539	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	127.2306	124.5141	121.2059	116.1748	112.0895	107.6973	106.0091	109.3031	112.7772	117.3882	122.4967	126.9006	(44)
Energy content (annual)	201.5022	177.3065	186.2889	159.0376	150.8940	132.4264	128.2088	135.3401	139.0655	159.2947	174.5191	198.6956	(45)
Distribution loss (46)m = 0.15 x (45)m	30.2253	26.5960	27.9433	23.8556	22.6341	19.8640	19.2313	20.3010	20.8598	23.8942	26.1779	29.8043	(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	244.0156	215.7057	228.8023	200.1796	193.4074	173.5684	170.7222	177.8535	180.2075	201.8081	215.6611	241.2090	(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	244.0156	215.7057	228.8023	200.1796	193.4074	173.5684	170.7222	177.8535	180.2075	201.8081	215.6611	241.2090	(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	101.0102	89.6738	95.9518	85.7936	84.1830	76.9454	76.6402	79.0113	79.1529	86.9762	90.9412	100.0770	(65)

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

Metabolic gains (Table 5), Watts

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	(66)
Lighting gains	(calculated in Appendix L, equation L9 or L9a), also see Table 5												
	23.9563	21.2778	17.3042	13.1004	9.7927	8.2674	8.9332	11.6118	15.5853	19.7891	23.0968	24.6221	(67)
Appliances gains	(calculated in Appendix L, equation L13 or L13a), also see Table 5												
	298.6290	301.7278	293.9188	277.2945	256.3092	236.5860	223.4097	220.3109	228.1199	244.7442	265.7295	285.4527	(68)
Cooking gains	(calculated in Appendix L, equation L15 or L15a), also see Table 5												
	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	(71)
Water heating gains (Table 5)													
	135.7664	133.4431	128.9674	119.1578	113.1492	106.8686	103.0110	106.1980	109.9346	116.9035	126.3072	134.5121	(72)
Total internal gains													
	554.7740	552.8710	536.6129	505.9750	475.6734	448.1444	431.7763	434.5430	450.0621	477.8592	511.5558	541.0093	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W			
North				6.5000	10.6334	0.6300	0.8000	0.7700	24.1406	(74)			
South				6.5000	46.7521	0.6300	0.8000	0.7700	106.1397	(78)			
North				6.5000	10.6334	0.6300	0.8000	0.7700	24.1406	(74)			
Solar gains	154.4210	266.0975	378.2139	502.1001	600.0375	614.1497	584.2877	507.1488	419.8152	297.3245	185.3730	131.9642	(83)
Total gains	709.1950	818.9686	914.8268	1008.0751	1075.7110	1062.2941	1016.0640	941.6919	869.8772	775.1837	696.9288	672.9734	(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	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	
alpha	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	
util living area	0.8764	0.8380	0.7822	0.6959	0.5805	0.4520	0.3462	0.3829	0.5494	0.7322	0.8414	0.8872	(86)
Living	18.2761	18.6591	19.2111	19.8488	20.3945	20.7483	20.8981	20.8699	20.5985	19.8947	18.9588	18.1675	
Non living	16.7797	17.2510	17.9273	18.6937	19.3237	19.7036	19.8429	19.8223	19.5631	18.7711	17.6351	16.6457	
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	19.6066	18.6591	19.2111	19.8488	20.3945	20.7483	20.8981	20.8699	20.5985	19.8947	18.9588	18.5637	(87)
Th 2	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	(88)
util rest of house	0.8628	0.8209	0.7593	0.6635	0.5351	0.3897	0.2689	0.3034	0.4874	0.6958	0.8216	0.8746	(89)
MIT 2	18.6526	17.2510	17.9273	18.6937	19.3237	19.7036	19.8429	19.8223	19.5631	18.7711	17.6351	17.2308	(90)
Living area fraction									fLA = Living area / (4) =			0.4537	(91)
MIT	19.0854	17.8898	18.5097	19.2177	19.8095	20.1776	20.3216	20.2975	20.0328	19.2808	18.2356	17.8355	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0854	17.8898	18.5097	19.2177	19.8095	20.1776	20.3216	20.2975	20.0328	19.2808	18.2356	17.8355	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8513	0.7824	0.7252	0.6410	0.5310	0.4060	0.2994	0.3331	0.4953	0.6724	0.7845	0.8450	(94)
Useful gains	603.7682	640.7960	663.4758	646.1661	571.2556	431.3116	304.1620	313.6697	430.8170	521.1951	546.7526	568.6384	(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	1286.8006	1130.5244	1045.2252	897.9697	705.7847	485.4257	323.8966	339.2109	516.3448	755.5091	969.1539	1186.7202	(97)
Space heating kWh	508.1762	329.0975	284.0216	181.2985	100.0896	0.0000	0.0000	0.0000	0.0000	174.3296	304.1289	459.8529	(98a)
Space heating requirement - total per year (kWh/year)												2340.9948	
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	508.1762	329.0975	284.0216	181.2985	100.0896	0.0000	0.0000	0.0000	0.0000	174.3296	304.1289	459.8529	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2340.9948	
Space heating per m2										(98c) / (4) =		32.8791	(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 %)	243.9991 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	508.1762	329.0975	284.0216	181.2985	100.0896	0.0000	0.0000	0.0000	0.0000	174.3296	304.1289	459.8529	(98)
Space heating efficiency (main heating system 1)	243.9991	243.9991	243.9991	243.9991	243.9991	0.0000	0.0000	0.0000	0.0000	243.9991	243.9991	243.9991	(210)
Space heating fuel (main heating system)	208.2697	134.8765	116.4027	74.3030	41.0205	0.0000	0.0000	0.0000	0.0000	71.4468	124.6435	188.4650	(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	244.0156	215.7057	228.8023	200.1796	193.4074	173.5684	170.7222	177.8535	180.2075	201.8081	215.6611	241.2090	(64)
Efficiency of water heater	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	(216)
Fuel for water heating, kWh/month	128.1644	113.2952	120.1740	105.1404	101.5835	91.1634	89.6685	93.4141	94.6505	105.9958	113.2718	126.6904	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	20.9688	16.8219	15.1463	11.0968	8.5715	7.0030	7.8192	10.1637	13.2017	17.3213	19.5644	21.5516	(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												959.4278	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.3926	
Water heating fuel used												1283.2121	(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)												169.2301	(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												2411.8700	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	959.4278	16.4900	158.2096 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1283.2121	16.4900	211.6017 (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	169.2301	16.4900	27.9060 (250)
Additional standing charges			0.0000 (251)
Total energy cost			397.7174 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2322 (257)
SAP value		80.0265
SAP rating (Section 12)		80 (258)
SAP band		C

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	959.4278	0.1549	148.6356 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1283.2121	0.1410	180.9213 (264)
Space and water heating			329.5569 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	169.2301	0.1443	24.4251 (268)
Total CO2, kg/year			353.9820 (272)
CO2 emissions per m2			4.9700 (273)
EI value			95.9179
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	71.2000 (1b)	2.5000 (2b)	178.0000 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 178.0000 (5)

2. Ventilation rate

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

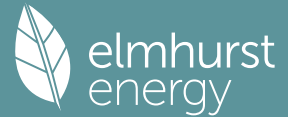
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000 (17)	
Infiltration rate	0.2000 (18)	
Number of sides sheltered	2 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700 (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	0.1827	0.1742	0.1742	0.1615	0.1658	0.1445	0.1445	0.1403	0.1445	0.1615	0.1573	0.1700 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
1 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
2 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
3 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	58.7500	19.5000	39.2500	0.1800	7.0650	18.0000	706.5000 (29a)
corridor new	9.7500	2.1000	7.6500	0.2400	1.8360	60.0000	459.0000 (29a)
stair new	14.2500		14.2500	0.2400	3.4200	9.0000	128.2500 (29a)

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flat roof new	39.1000	39.1000	0.1300	5.0830	9.0000	351.9000 (30)
roof terrace new	32.1000	32.1000	0.1300	4.1730	9.0000	288.9000 (30)
Total net area of external elements Aum(A, m2)		153.9500				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	47.7740			(33)
pw		16.0000	0.0000	0.0000	20.0000	320.0000 (32)
pf		71.2000			30.0000	2136.0000 (32d)
iw		105.5000			9.0000	949.5000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5340.0500 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 75.0007 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.8000	0.0500	0.4400
E3 Sill	7.8000	0.0500	0.3900
E4 Jamb	19.2000	0.0500	0.9600
E7 Party floor between dwellings (in blocks of flats)	6.6000	0.0700	0.4620
E14 Flat roof	15.8000	0.0800	1.2640
E15 Flat roof with parapet	23.5000	0.1500	3.5250
E16 Corner (normal)	10.0000	0.0900	0.9000
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E24 Eaves (insulation at ceiling level - inverted)	7.8000	0.2400	1.8720
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.8880 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss		(33) + (36) + (36a) =	57.6620 (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	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	(38)
Heat transfer coeff	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	(39)
Average = Sum(39)m / 12 =													87.0320
HLP	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	(40)
HLP (average)													1.2224
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2749 (42)
Hot water usage for mixer showers	62.3623	61.4251	60.0594	57.4465	55.5182	53.3678	52.1455	53.5008	54.9865	57.2954	59.9645	62.1233	(42a)
Hot water usage for baths	26.9410	26.5409	25.9775	24.9386	24.1607	23.2981	22.8322	23.3917	24.0009	24.9239	25.9842	26.8500	(42b)
Hot water usage for other uses	37.9273	36.5481	35.1689	33.7898	32.4106	31.0314	31.0314	32.4106	33.7898	35.1689	36.5481	37.9273	(42c)
Average daily hot water use (litres/day)													116.9539 (43)
Daily hot water use	127.2306	124.5141	121.2059	116.1748	112.0895	107.6973	106.0091	109.3031	112.7772	117.3882	122.4967	126.9006	(44)
Energy content (annual)	201.5022	177.3065	186.2889	159.0376	150.8940	132.4264	128.2088	135.3401	139.0655	159.2947	174.5191	198.6956	(45)
Distribution loss (46)m = 0.15 x (45)m	30.2253	26.5960	27.9433	23.8556	22.6341	19.8640	19.2313	20.3010	20.8598	23.8942	26.1779	29.8043	(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)													
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	244.0156	215.7057	228.8023	200.1796	193.4074	173.5684	170.7222	177.8535	180.2075	201.8081	215.6611	241.2090	(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	244.0156	215.7057	228.8023	200.1796	193.4074	173.5684	170.7222	177.8535	180.2075	201.8081	215.6611	241.2090	(64)
Total per year (kWh/year) = Sum(64)m =													2443.1403 (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	101.0102	89.6738	95.9518	85.7936	84.1830	76.9454	76.6402	79.0113	79.1529	86.9762	90.9412	100.0770	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	23.9563	21.2778	17.3042	13.1004	9.7927	8.2674	8.9332	11.6118	15.5853	19.7891	23.0968	24.6221 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	298.6290	301.7278	293.9188	277.2945	256.3092	236.5860	223.4097	220.3109	228.1199	244.7442	265.7295	285.4527 (68)
Pumps, fans	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243 (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)	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961 (71)
Total internal gains	135.7664	133.4431	128.9674	119.1578	113.1492	106.8686	103.0110	106.1980	109.9346	116.9035	126.3072	134.5121 (72)
	554.7740	552.8710	536.6129	505.9750	475.6734	448.1444	431.7763	434.5430	450.0621	477.8592	511.5558	541.0093 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North			6.5000		12.7650		0.6300		0.8000		0.7700		28.9801 (74)
South			6.5000		54.2217		0.6300		0.8000		0.7700		123.0978 (78)
North			6.5000		12.7650		0.6300		0.8000		0.7700		28.9801 (74)
Solar gains	181.0579	273.3558	388.3937	528.5472	619.2956	671.8646	632.3770	560.2292	461.3378	328.5311	214.2348	155.5564	(83)
Total gains	735.8319	826.2268	925.0066	1034.5222	1094.9690	1120.0090	1064.1533	994.7722	911.3998	806.3903	725.7906	696.5657	(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	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437
alpha	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362
util living area	0.8591	0.8236	0.7604	0.6575	0.5242	0.3672	0.2577	0.2814	0.4828	0.6896	0.8152	0.8703 (86)
Living	18.5387	18.8680	19.4273	20.0641	20.5713	20.8647	20.9575	20.9478	20.7309	20.1136	19.2327	18.4540
Non living	17.1072	17.5106	18.1915	18.9465	19.5174	19.8111	19.8852	19.8802	19.6953	19.0261	17.9716	17.0041
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	19.7409	18.8680	19.4273	20.0641	20.5713	20.8647	20.9575	20.9478	20.7309	20.1136	19.2327	18.8101 (87)
Th 2	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022 (88)
util rest of house	0.8433	0.8045	0.7345	0.6208	0.4726	0.2993	0.1763	0.1961	0.4139	0.6473	0.7918	0.8555 (89)
MIT 2	18.7837	17.5106	18.1915	18.9465	19.5174	19.8111	19.8852	19.8802	19.6953	19.0261	17.9716	17.5248 (90)
Living area fraction	19.2179	18.1264	18.7522	19.4535	19.9955	20.2891	20.3716	20.3645	20.1651	19.5194	18.5437	18.1079 (92)
MIT	19.2179	18.1264	18.7522	19.4535	19.9955	20.2891	20.3716	20.3645	20.1651	19.5194	18.5437	18.1079 (93)
Temperature adjustment												0.0000
adjusted MIT	19.2179	18.1264	18.7522	19.4535	19.9955	20.2891	20.3716	20.3645	20.1651	19.5194	18.5437	18.1079 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8322	0.7671	0.7033	0.6043	0.4772	0.3240	0.2118	0.2329	0.4313	0.6308	0.7568	0.8257 (94)
Ext temp.	612.3928	633.7916	650.5465	625.1759	522.5648	362.8490	225.4048	231.7011	393.0417	508.6749	549.2479	575.1374 (95)
Heat loss rate W	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)
Space heating kWh	1228.7120	1081.4930	988.0008	831.4602	617.5369	390.6914	232.5167	240.5990	449.5299	697.9480	917.6375	1132.1010 (97)
Space heating requirement - total per year (kWh/year)	458.5415	300.8553	251.0660	148.5247	70.6593	0.0000	0.0000	0.0000	0.0000	140.8192	265.2405	414.3809 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	458.5415	300.8553	251.0660	148.5247	70.6593	0.0000	0.0000	0.0000	0.0000	140.8192	265.2405	414.3809 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2050.0874
Space heating per m2	(98c) / (4) = 28.7934 (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 %)											243.9991 (206)
Efficiency of main space heating system 2 (in %)											0.0000 (207)
Efficiency of secondary/supplementary heating system, %											0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement											

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458.5415	300.8553	251.0660	148.5247	70.6593	0.0000	0.0000	0.0000	0.0000	140.8192	265.2405	414.3809	(98)
Space heating efficiency (main heating system 1)												
243.9991	243.9991	243.9991	243.9991	243.9991	0.0000	0.0000	0.0000	0.0000	243.9991	243.9991	243.9991	(210)
Space heating fuel (main heating system)												
187.9276	123.3018	102.8963	60.8710	28.9588	0.0000	0.0000	0.0000	0.0000	57.7130	108.7055	169.8289	(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												
244.0156	215.7057	228.8023	200.1796	193.4074	173.5684	170.7222	177.8535	180.2075	201.8081	215.6611	241.2090	(64)
Efficiency of water heater												(216)
(217)m	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	(217)
Fuel for water heating, kWh/month												
128.1644	113.2952	120.1740	105.1404	101.5835	91.1634	89.6685	93.4141	94.6505	105.9958	113.2718	126.6904	(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	(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	(231)
Lighting	20.9688	16.8219	15.1463	11.0968	8.5715	7.0030	7.8192	10.1637	13.2017	17.3213	19.5644	(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	(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	(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	(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	(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	(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	(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	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											840.2030	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											190.3926	
Water heating fuel used											1283.2121	(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)											169.2301	(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											2292.6452	(238)

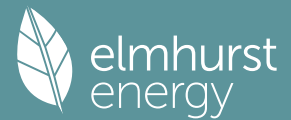
10a. Fuel costs - using BEDF prices (521)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	840.2030	18.3900	154.5133 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1283.2121	18.3900	235.9827 (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	169.2301	18.3900	31.1214 (250)
Additional standing charges			0.0000 (251)
Total energy cost			421.6174 (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	840.2030	0.1554	130.5764 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1283.2121	0.1410	180.9213 (264)
Space and water heating			311.4977 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	169.2301	0.1443	24.4251 (268)
Total CO2, kg/year			335.9228 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	840.2030	1.5753	1323.5847 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1283.2121	1.5213	1952.1993 (278)
Space and water heating			3275.7840 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	169.2301	1.5338	259.5708 (282)
Total Primary energy kWh/year			3535.3549 (286)

SAP 10 EPC IMPROVEMENTS

UNIT 35

Current energy efficiency rating: C 80
Current environmental impact rating: A 96

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

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

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

Potential energy efficiency rating: C 80
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 £422	Potential £422	Saving £0
Electricity			
Space heating	£155	£155	£0
Water heating	£236	£236	£0
Lighting	£31	£31	£0
Total cost of fuels	£422	£422	£0
Total cost of uses	£422	£422	£0
Delivered energy	32 kWh/m²	32 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	50 kWh/m²	50 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

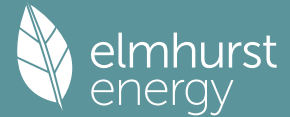
1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	71.2000 (1b)	x 2.5000 (2b)	= 178.0000 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	178.0000 (5)

2. Ventilation rate

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

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000	Air changes per hour	0.0000 (8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			4.0000	(17)
Infiltration rate			0.2000	(18)
Number of sides sheltered			2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500		(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1700		(21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9250	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Mechanical extract ventilation - centralised	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(22b)
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
1 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
2 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
3 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	58.7500	19.5000	39.2500	0.1800	7.0650	18.0000	706.5000 (29a)
corridor new	9.7500	2.1000	7.6500	0.2400	1.8360	60.0000	459.0000 (29a)
stair new	14.2500		14.2500	0.2400	3.4200	9.0000	128.2500 (29a)
flat roof new	39.1000		39.1000	0.1300	5.0830	9.0000	351.9000 (30)
roof terrace new	32.1000		32.1000	0.1300	4.1730	9.0000	288.9000 (30)
Total net area of external elements Aum(A, m2)			153.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.7740		(33)
pw			16.0000	0.0000	0.0000	20.0000	320.0000 (32)
pf			71.2000			30.0000	2136.0000 (32d)
iw			105.5000			9.0000	949.5000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	5340.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		75.0007 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.8000	0.0500	0.4400
E3 Sill	7.8000	0.0500	0.3900
E4 Jamb	19.2000	0.0500	0.9600
E7 Party floor between dwellings (in blocks of flats)	6.6000	0.0700	0.4620
E14 Flat roof	15.8000	0.0800	1.2640
E15 Flat roof with parapet	23.5000	0.1500	3.5250
E16 Corner (normal)	10.0000	0.0900	0.9000
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E24 Eaves (insulation at ceiling level - inverted)	7.8000	0.2400	1.8720
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.8880 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) =		57.6620 (37)

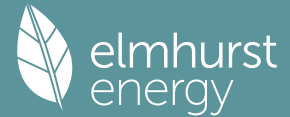
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	(38)
Average = Sum(39)m / 12 =	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2749 (42)
Hot water usage for mixer showers													
	62.3623	61.4251	60.0594	57.4465	55.5182	53.3678	52.1455	53.5008	54.9865	57.2954	59.9645	62.1233	(42a)
Hot water usage for baths													

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Hot water usage for other uses	26.9410	26.5409	25.9775	24.9386	24.1607	23.2981	22.8322	23.3917	24.0009	24.9239	25.9842	26.8500 (42b)
Average daily hot water use (litres/day)	37.9273	36.5481	35.1689	33.7898	32.4106	31.0314	31.0314	32.4106	33.7898	35.1689	36.5481	37.9273 (42c)
												116.9539 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	127.2306	124.5141	121.2059	116.1748	112.0895	107.6973	106.0091	109.3031	112.7772	117.3882	122.4967	126.9006 (44)
Energy content (annual)	201.5022	177.3065	186.2889	159.0376	150.8940	132.4264	128.2088	135.3401	139.0655	159.2947	174.5191	198.6956 (45)
Distribution loss (46)m = 0.15 x (45)m	30.2253	26.5960	27.9433	23.8556	22.6341	19.8640	19.2313	20.3010	20.8598	23.8942	26.1779	29.8043 (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)												
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	244.0156	215.7057	228.8023	200.1796	193.4074	173.5684	170.7222	177.8535	180.2075	201.8081	215.6611	241.2090 (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	244.0156	215.7057	228.8023	200.1796	193.4074	173.5684	170.7222	177.8535	180.2075	201.8081	215.6611	241.2090 (64)
												Total per year (kWh/year) = Sum(64)m = 2443.1403 (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	101.0102	89.6738	95.9518	85.7936	84.1830	76.9454	76.6402	79.0113	79.1529	86.9762	90.9412	100.0770 (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	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.9563	21.2778	17.3042	13.1004	9.7927	8.2674	8.9332	11.6118	15.5853	19.7891	23.0968	24.6221 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	298.6290	301.7278	293.9188	277.2945	256.3092	236.5860	223.4097	220.3109	228.1199	244.7442	265.7295	285.4527 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961 (71)
Water heating gains (Table 5)	135.7664	133.4431	128.9674	119.1578	113.1492	106.8686	103.0110	106.1980	109.9346	116.9035	126.3072	134.5121 (72)
Total internal gains	554.7740	552.8710	536.6129	505.9750	475.6734	448.1444	431.7763	434.5430	450.0621	477.8592	511.5558	541.0093 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			

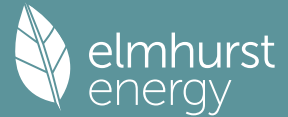
North				6.5000	10.6334	0.6300	0.8000	0.7700	24.1406 (74)			
South				6.5000	46.7521	0.6300	0.8000	0.7700	106.1397 (78)			
North				6.5000	10.6334	0.6300	0.8000	0.7700	24.1406 (74)			

Solar gains	154.4210	266.0975	378.2139	502.1001	600.0375	614.1497	584.2877	507.1488	419.8152	297.3245	185.3730	131.9642 (83)
Total gains	709.1950	818.9686	914.8268	1008.0751	1075.7110	1062.2941	1016.0640	941.6919	869.8772	775.1837	696.9288	672.9734 (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	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437
alpha	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362
util living area	0.8764	0.8380	0.7822	0.6959	0.5805	0.4520	0.3462	0.3829	0.5494	0.7322	0.8414	0.8872 (86)
Living	18.2761	18.6591	19.2111	19.8488	20.3945	20.7483	20.8981	20.8699	20.5985	19.8947	18.9588	18.1675
Non living	16.7797	17.2510	17.9273	18.6937	19.3237	19.7036	19.8429	19.8223	19.5631	18.7711	17.6351	16.6457
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0

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16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.6066	18.6591	19.2111	19.8488	20.3945	20.7483	20.8981	20.8699	20.5985	19.8947	18.9588	18.5637 (87)
Th 2	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022 (88)
util rest of house												
	0.8628	0.8209	0.7593	0.6635	0.5351	0.3897	0.2689	0.3034	0.4874	0.6958	0.8216	0.8746 (89)
MIT 2	18.6526	17.2510	17.9273	18.6937	19.3237	19.7036	19.8429	19.8223	19.5631	18.7711	17.6351	17.2308 (90)
Living area fraction									fLA = Living area / (4) =			0.4537 (91)
MIT	19.0854	17.8898	18.5097	19.2177	19.8095	20.1776	20.3216	20.2975	20.0328	19.2808	18.2356	17.8355 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0854	17.8898	18.5097	19.2177	19.8095	20.1776	20.3216	20.2975	20.0328	19.2808	18.2356	17.8355 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8513	0.7824	0.7252	0.6410	0.5310	0.4060	0.2994	0.3331	0.4953	0.6724	0.7845	0.8450 (94)
Useful gains	603.7682	640.7960	663.4758	646.1661	571.2556	431.3116	304.1620	313.6697	430.8170	521.1951	546.7526	568.6384 (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	1286.8006	1130.5244	1045.2252	897.9697	705.7847	485.4257	323.8966	339.2109	516.3448	755.5091	969.1539	1186.7202 (97)
Space heating kWh	508.1762	329.0975	284.0216	181.2985	100.0896	0.0000	0.0000	0.0000	0.0000	174.3296	304.1289	459.8529 (98a)
Space heating requirement - total per year (kWh/year)												2340.9948
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	508.1762	329.0975	284.0216	181.2985	100.0896	0.0000	0.0000	0.0000	0.0000	174.3296	304.1289	459.8529 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2340.9948
Space heating per m2										(98c) / (4) =		32.8791 (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 %)	243.9991 (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	508.1762	329.0975	284.0216	181.2985	100.0896	0.0000	0.0000	0.0000	0.0000	174.3296	304.1289	459.8529 (98)
Space heating efficiency (main heating system 1)	243.9991	243.9991	243.9991	243.9991	243.9991	0.0000	0.0000	0.0000	0.0000	243.9991	243.9991	243.9991 (210)
Space heating fuel (main heating system)	208.2697	134.8765	116.4027	74.3030	41.0205	0.0000	0.0000	0.0000	0.0000	71.4468	124.6435	188.4650 (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	244.0156	215.7057	228.8023	200.1796	193.4074	173.5684	170.7222	177.8535	180.2075	201.8081	215.6611	241.2090 (64)
Efficiency of water heater (217)m	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926 (216)
Fuel for water heating, kWh/month	128.1644	113.2952	120.1740	105.1404	101.5835	91.1634	89.6685	93.4141	94.6505	105.9958	113.2718	126.6904 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	20.9688	16.8219	15.1463	11.0968	8.5715	7.0030	7.8192	10.1637	13.2017	17.3213	19.5644	21.5516 (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												959.4278 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												190.3926
Water heating fuel used												1283.2121 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

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Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	169.2301 (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	2411.8700 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	959.4278	16.4900	158.2096 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1283.2121	16.4900	211.6017 (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	169.2301	16.4900	27.9060 (250)
Additional standing charges			0.0000 (251)
Total energy cost			397.7174 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.2322 (257)
SAP value	80.0265
SAP rating (Section 12)	80 (258)
SAP band	C

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	959.4278	0.1549	148.6356 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1283.2121	0.1410	180.9213 (264)
Space and water heating			329.5569 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	169.2301	0.1443	24.4251 (268)
Total CO2, kg/year			353.9820 (272)
CO2 emissions per m2			4.9700 (273)
EI value			95.9179
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

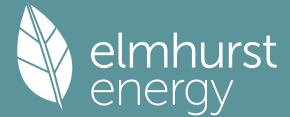
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	71.2000 (1b)	x 2.5000 (2b)	= 178.0000 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 178.0000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)

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Number of flues attached to other heater
 Number of blocked chimneys
 Number of intermittent extract fans
 Number of passive vents
 Number of flueless gas fires

0 * 35 = 0.0000 (6e)
 0 * 20 = 0.0000 (6f)
 0 * 10 = 0.0000 (7a)
 0 * 10 = 0.0000 (7b)
 0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =
 Pressure test
 Pressure Test Method
 Measured/design AP50
 Infiltration rate
 Number of sides sheltered

Air changes per hour
 0.0000 / (5) = 0.0000 (8)
 Yes
 Blower Door
 4.0000 (17)
 0.2000 (18)
 2 (19)

Shelter factor
 Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 0.8500 (20)
 (21) = (18) x (20) = 0.1700 (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	0.1827	0.1742	0.1742	0.1615	0.1658	0.1445	0.1445	0.1403	0.1445	0.1615	0.1573	0.1700	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
1 (Uw = 1.30)			6.5000	1.2357	8.0323			(27)
2 (Uw = 1.30)			6.5000	1.2357	8.0323			(27)
3 (Uw = 1.30)			6.5000	1.2357	8.0323			(27)
1			2.1000	1.0000	2.1000			(26)
top floor exposed new	58.7500	19.5000	39.2500	0.1800	7.0650	18.0000	706.5000	(29a)
corridor new	9.7500	2.1000	7.6500	0.2400	1.8360	60.0000	459.0000	(29a)
stair new	14.2500		14.2500	0.2400	3.4200	9.0000	128.2500	(29a)
flat roof new	39.1000		39.1000	0.1300	5.0830	9.0000	351.9000	(30)
roof terrace new	32.1000		32.1000	0.1300	4.1730	9.0000	288.9000	(30)
Total net area of external elements Aum(A, m2)			153.9500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.7740			(33)
pw			16.0000	0.0000	0.0000	20.0000	320.0000	(32)
pf			71.2000			30.0000	2136.0000	(32d)
iw			105.5000			9.0000	949.5000	(32c)

Heat capacity Cm = Sum(A x k)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
 (28)...(30) + (32) + (32a)...(32e) = 5340.0500 (34)
 75.0007 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.8000	0.0500	0.4400
E3 Sill	7.8000	0.0500	0.3900
E4 Jamb	19.2000	0.0500	0.9600
E7 Party floor between dwellings (in blocks of flats)	6.6000	0.0700	0.4620
E14 Flat roof	15.8000	0.0800	1.2640
E15 Flat roof with parapet	23.5000	0.1500	3.5250
E16 Corner (normal)	10.0000	0.0900	0.9000
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E24 Eaves (insulation at ceiling level - inverted)	7.8000	0.2400	1.8720

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges
 Total fabric heat loss
 (33) + (36) + (36a) = 57.6620 (37)

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

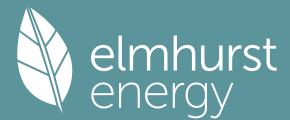
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	29.3700	(38)
Heat transfer coeff	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	87.0320	(39)
Average = Sum(39)m / 12 =													87.0320

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	1.2224	(40)
HLP (average)													1.2224
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2749 (42)
Hot water usage for mixer showers	62.3623	61.4251	60.0594	57.4465	55.5182	53.3678	52.1455	53.5008	54.9865	57.2954	59.9645	62.1233 (42a)	
Hot water usage for baths	26.9410	26.5409	25.9775	24.9386	24.1607	23.2981	22.8322	23.3917	24.0009	24.9239	25.9842	26.8500 (42b)	
Hot water usage for other uses	37.9273	36.5481	35.1689	33.7898	32.4106	31.0314	31.0314	32.4106	33.7898	35.1689	36.5481	37.9273 (42c)	

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Average daily hot water use (litres/day)												116.9539 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	127.2306	124.5141	121.2059	116.1748	112.0895	107.6973	106.0091	109.3031	112.7772	117.3882	122.4967	126.9006 (44)
Energy content (annual)	201.5022	177.3065	186.2889	159.0376	150.8940	132.4264	128.2088	135.3401	139.0655	159.2947	174.5191	198.6956 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m =											1942.5793
	30.2253	26.5960	27.9433	23.8556	22.6341	19.8640	19.2313	20.3010	20.8598	23.8942	26.1779	29.8043 (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	244.0156	215.7057	228.8023	200.1796	193.4074	173.5684	170.7222	177.8535	180.2075	201.8081	215.6611	241.2090 (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	244.0156	215.7057	228.8023	200.1796	193.4074	173.5684	170.7222	177.8535	180.2075	201.8081	215.6611	241.2090 (64)
	Total per year (kWh/year) = Sum(64)m =											2443.1403 (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	101.0102	89.6738	95.9518	85.7936	84.1830	76.9454	76.6402	79.0113	79.1529	86.9762	90.9412	100.0770 (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	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941	136.4941 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.9563	21.2778	17.3042	13.1004	9.7927	8.2674	8.9332	11.6118	15.5853	19.7891	23.0968	24.6221 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	298.6290	301.7278	293.9188	277.2945	256.3092	236.5860	223.4097	220.3109	228.1199	244.7442	265.7295	285.4527 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243	50.9243 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961	-90.9961 (71)
Water heating gains (Table 5)	135.7664	133.4431	128.9674	119.1578	113.1492	106.8686	103.0110	106.1980	109.9346	116.9035	126.3072	134.5121 (72)
Total internal gains	554.7740	552.8710	536.6129	505.9750	475.6734	448.1444	431.7763	434.5430	450.0621	477.8592	511.5558	541.0093 (73)

6. Solar gains

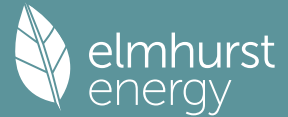
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	6.5000	12.7650	0.6300	0.8000	0.7700	28.9801 (74)
South	6.5000	54.2217	0.6300	0.8000	0.7700	123.0978 (78)
North	6.5000	12.7650	0.6300	0.8000	0.7700	28.9801 (74)

Solar gains	181.0579	273.3558	388.3937	528.5472	619.2956	671.8646	632.3770	560.2292	461.3378	328.5311	214.2348	155.5564 (83)
Total gains	735.8319	826.2268	925.0066	1034.5222	1094.9690	1120.0090	1064.1533	994.7722	911.3998	806.3903	725.7906	696.5657 (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	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437	17.0437
alpha	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362	2.1362
util living area	0.8591	0.8236	0.7604	0.6575	0.5242	0.3672	0.2577	0.2814	0.4828	0.6896	0.8152	0.8703 (86)
Living	18.5387	18.8680	19.4273	20.0641	20.5713	20.8647	20.9575	20.9478	20.7309	20.1136	19.2327	18.4540
Non living	17.1072	17.5106	18.1915	18.9465	19.5174	19.8111	19.8852	19.8802	19.6953	19.0261	17.9716	17.0041
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	19.7409	18.8680	19.4273	20.0641	20.5713	20.8647	20.9575	20.9478	20.7309	20.1136	19.2327	18.8101 (87)
Th 2	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022	19.9022 (88)

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util rest of house												
MIT 2	0.8433	0.8045	0.7345	0.6208	0.4726	0.2993	0.1763	0.1961	0.4139	0.6473	0.7918	0.8555 (89)
Living area fraction	18.7837	17.5106	18.1915	18.9465	19.5174	19.8111	19.8852	19.8802	19.6953	19.0261	17.9716	17.5248 (90)
MIT	19.2179	18.1264	18.7522	19.4535	19.9955	20.2891	20.3716	20.3645	20.1651	19.5194	18.5437	18.1079 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2179	18.1264	18.7522	19.4535	19.9955	20.2891	20.3716	20.3645	20.1651	19.5194	18.5437	18.1079 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8322	0.7671	0.7033	0.6043	0.4772	0.3240	0.2118	0.2329	0.4313	0.6308	0.7568	0.8257 (94)
Useful gains	612.3928	633.7916	650.5465	625.1759	522.5648	362.8490	225.4048	231.7011	393.0417	508.6749	549.2479	575.1374 (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	1228.7120	1081.4930	988.0008	831.4602	617.5369	390.6914	232.5167	240.5990	449.5299	697.9480	917.6375	1132.1010 (97)
Space heating kWh	458.5415	300.8553	251.0660	148.5247	70.6593	0.0000	0.0000	0.0000	0.0000	140.8192	265.2405	414.3809 (98a)
Space heating requirement - total per year (kWh/year)												2050.0874
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	458.5415	300.8553	251.0660	148.5247	70.6593	0.0000	0.0000	0.0000	0.0000	140.8192	265.2405	414.3809 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2050.0874
Space heating per m2										(98c) / (4) =		28.7934 (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 %)	243.9991 (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	458.5415	300.8553	251.0660	148.5247	70.6593	0.0000	0.0000	0.0000	0.0000	140.8192	265.2405	414.3809 (98)
Space heating efficiency (main heating system 1)	243.9991	243.9991	243.9991	243.9991	243.9991	0.0000	0.0000	0.0000	0.0000	243.9991	243.9991	243.9991 (210)
Space heating fuel (main heating system)	187.9276	123.3018	102.8963	60.8710	28.9588	0.0000	0.0000	0.0000	0.0000	57.7130	108.7055	169.8289 (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	244.0156	215.7057	228.8023	200.1796	193.4074	173.5684	170.7222	177.8535	180.2075	201.8081	215.6611	241.2090 (64)
Efficiency of water heater	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926	190.3926 (216)
Fuel for water heating, kWh/month	128.1644	113.2952	120.1740	105.1404	101.5835	91.1634	89.6685	93.4141	94.6505	105.9958	113.2718	126.6904 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	20.9688	16.8219	15.1463	11.0968	8.5715	7.0030	7.8192	10.1637	13.2017	17.3213	19.5644	21.5516 (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												840.2030 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												190.3926
Water heating fuel used												1283.2121 (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)	169.2301 (232)

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Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2292.6452 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	840.2030	18.3900	154.5133 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1283.2121	18.3900	235.9827 (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	169.2301	18.3900	31.1214 (250)
Additional standing charges			0.0000 (251)
Total energy cost			421.6174 (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	840.2030	0.1554	130.5764 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1283.2121	0.1410	180.9213 (264)
Space and water heating			311.4977 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	169.2301	0.1443	24.4251 (268)
Total CO2, kg/year			335.9228 (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	840.2030	1.5753	1323.5847 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1283.2121	1.5213	1952.1993 (278)
Space and water heating			3275.7840 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	169.2301	1.5338	259.5708 (282)
Total Primary energy kWh/year			3535.3549 (286)