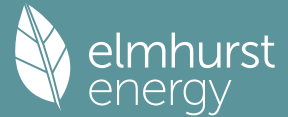


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Property Reference	0530 Frederick Morphill House				Issued on Date	01/08/2024
Assessment Reference	0530 Frederick Morphill L		Prop Type Ref			
Property						
SAP Rating	82 B	DER	3.32	TER	11.49	
Environmental	97 A	% DER < TER				71.11
CO ₂ Emissions (t/year)	0.38	DFEE	22.91	TFEE	44.93	
Compliance Check	See BREL	% DFEE < TFEE				49.00
% DPER < TPER	33.98	DPER	39.75	TPER	60.20	
Assessor Details	Miss Jessica James				Assessor ID	R564-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	57.4500 (1b)	x	3.0000 (2b)	=	172.3500 (1b)	- (3b)
First floor	42.0000 (1c)	x	2.8000 (2c)	=	117.6000 (1c)	- (3c)
Second floor	20.6000 (1d)	x	2.2600 (2d)	=	46.5560 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	336.5060	(5)

2. Ventilation rate

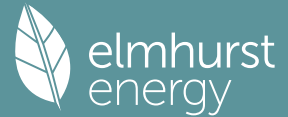
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		0.6000 (17)
Infiltration rate		0.0300 (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) =	0.0255 (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	0.0325	0.0319	0.0312	0.0281	0.0274	0.0242	0.0242	0.0236	0.0255	0.0274	0.0287	0.0300	(22b)
Balanced mechanical ventilation with heat recovery													
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												68.8000	(23c)
Effective ac	0.1885	0.1879	0.1872	0.1841	0.1834	0.1802	0.1802	0.1796	0.1815	0.1834	0.1847	0.1860	(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	
Door			2.3000	1.0000	2.3000			(26)
Windows (Uw = 0.67)			15.5100	0.6525	10.1205			(27)
Opening			1.4000	0.6525	0.9135			(27a)
Heatloss Floor 1			57.4500	0.1000	5.7450			(28a)
Exposed Bike Store			3.4700	0.1600	0.5552			(28b)
EWS 01	38.4900	16.8100	21.6800	0.1400	3.0352			(29a)
EWS 02	29.1300	1.0000	28.1300	0.1800	5.0634			(29a)
RFS 01	40.8000		40.8000	0.1200	4.8960			(30)
RFS 03	12.7000		12.7000	0.1000	1.2700			(30)
RFS 02	6.4000	1.4000	5.0000	0.0900	0.4500			(30)
Total net area of external elements Aum(A, m ²)			188.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.3488			(33)
Party Wall 1			88.5000	0.0000	0.0000			(32)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				100.0000 (35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	8.0000	0.0100	0.0800	
E3 Sill	8.0000	0.0100	0.0800	
E4 Jamb	17.4000	0.0100	0.1740	
E5 Ground floor (normal)	39.2000	0.0100	0.3920	
E20 Exposed floor (normal)	2.4000	0.0100	0.0240	
E6 Intermediate floor within a dwelling	20.7000	0.0100	0.2070	
E15 Flat roof with parapet	51.0800	0.0100	0.5108	
E11 Eaves (insulation at rafter level)	4.0000	0.0100	0.0400	
E13 Gable (insulation at rafter level)	1.6000	0.0100	0.0160	
E16 Corner (normal)	12.0300	0.0100	0.1203	
E17 Corner (inverted - internal area greater than external area)	3.0000	0.0100	0.0300	
E18 Party wall between dwellings	23.2000	0.0100	0.2320	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.9061 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 36.2549 (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	20.9337	20.8630	20.7922	20.4382	20.3674	20.0134	20.0134	19.9426	20.1550	20.3674	20.5090	20.6506 (38)
Average = Sum(39)m / 12 =	57.1886	57.1178	57.0470	56.6931	56.6223	56.2683	56.2683	56.1975	56.4099	56.6223	56.7639	56.9055 (39)
	57.1886	57.1178	57.0470	56.6931	56.6223	56.2683	56.2683	56.1975	56.4099	56.6223	56.7639	56.6754
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.4764	0.4758	0.4752	0.4722	0.4717	0.4687	0.4687	0.4681	0.4699	0.4717	0.4728	0.4740 (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												2.8635 (42)
Hot water usage for mixer showers	72.2314	71.1459	69.5641	66.5377	64.3042	61.8135	60.3978	61.9676	63.6884	66.3627	69.4542	71.9547 (42a)
Hot water usage for baths	31.1851	30.7220	30.0698	28.8672	27.9668	26.9683	26.4290	27.0766	27.7818	28.8502	30.0775	31.0797 (42b)
Hot water usage for other uses	43.9552	42.3568	40.7584	39.1601	37.5617	35.9633	35.9633	37.5617	39.1601	40.7584	42.3568	43.9552 (42c)
Average daily hot water use (litres/day)	35.0101	30.8061	32.3667	27.6319	26.2170	23.0083	22.2756	23.5147	24.1620	27.6768	30.3219	34.5225 (43)
Daily hot water use	147.3717	144.2247	140.3923	134.5650	129.8327	124.7452	122.7901	126.6059	130.6303	135.9713	141.8884	146.9895 (44)
Energy conte	233.4008	205.3740	215.7778	184.2127	174.7798	153.3887	148.5040	156.7646	161.0802	184.5118	202.1461	230.1501 (45)
Energy content (annual)	Total = Sum(45)m =											2250.0906
Distribution loss (46)m = 0.15 x (45)m	35.0101	30.8061	32.3667	27.6319	26.2170	23.0083	22.2756	23.5147	24.1620	27.6768	30.3219	34.5225 (46)
Water storage loss:												210.0000 (47)
Store volume												1.8000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.7800 (49)
Temperature factor from Table 2b												1.4040 (55)
Enter (49) or (54) in (55)												
Total storage loss	43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (56)
If cylinder contains dedicated solar storage	43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	22.5120	54.8576	53.0880	54.8576	54.8576 (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	331.7824	294.2348	314.1594	279.4207	273.1614	218.0207	215.2904	223.5510	225.7122	282.8934	297.3541	328.5317 (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	331.7824	294.2348	314.1594	279.4207	273.1614	218.0207	215.2904	223.5510	225.7122	282.8934	297.3541	328.5317 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											3284.1122 (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)
Heat gains from water heating, kWh/month	121.4918	107.9259	115.6322	103.7211	102.0004	69.0113	67.9875	70.7341	71.5688	105.2362	109.6840	120.4110 (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	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	153.1451	169.5535	153.1451	158.2500	153.1451	158.2500	153.1451	153.1451	158.2500	153.1451	158.2500	153.1451 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	285.2782	288.2385	280.7787	264.8976	244.8505	226.0090	213.4218	210.4615	217.9214	233.8025	253.8496	272.6910 (68)
Pumps, fans	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175 (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)	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403 (71)
Total internal gains	163.2955	160.6040	155.4196	144.0571	137.0973	95.8491	91.3810	95.0728	99.4011	141.4466	152.3389	161.8427 (72)
	667.6715	684.3487	655.2961	633.1573	601.0455	546.0607	523.9006	524.6320	541.5250	594.3468	630.3910	653.6315 (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			

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Northeast	3.7000	11.2829	0.5200	0.8000	0.7700	12.0351 (75)
Southwest	11.8100	36.7938	0.5200	0.8000	0.7700	125.2713 (79)
Southeast	1.4000	26.0000	0.5200	0.8000	1.0000	13.6282 (82)

Solar gains	150.9346	266.1858	386.4171	512.8632	603.2679	610.9721	584.0656	515.1781	430.1918	300.3669	182.4867	128.0420 (83)
Total gains	818.6060	950.5345	1041.7131	1146.0205	1204.3134	1157.0328	1107.9662	1039.8101	971.7168	894.7137	812.8777	781.6734 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.3109	58.3832	58.4556	58.8206	58.8942	59.2646	59.2646	59.3393	59.1159	58.8942	58.7473	58.6011
alpha	4.8874	4.8922	4.8970	4.9214	4.9263	4.9510	4.9510	4.9560	4.9411	4.9263	4.9165	4.9067
util living area	0.8873	0.8163	0.7229	0.5784	0.4330	0.3106	0.2234	0.2484	0.3979	0.6269	0.8184	0.9024 (86)
Living	20.5565	20.6978	20.8136	20.8985	20.9287	20.9362	20.9373	20.9372	20.9331	20.8905	20.7310	20.5199
Non living	20.0131	20.1853	20.3239	20.4244	20.4579	20.4682	20.4692	20.4697	20.4643	20.4175	20.2303	19.9701
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	20.7731	20.6978	20.8136	20.8985	20.9287	20.9362	20.9373	20.9372	20.9331	20.8905	20.7310	20.5871 (87)
Th 2	20.5425	20.5431	20.5436	20.5463	20.5469	20.5496	20.5496	20.5501	20.5485	20.5469	20.5458	20.5447 (88)
util rest of house	0.8780	0.8036	0.7067	0.5593	0.4127	0.2889	0.2005	0.2242	0.3725	0.6040	0.8038	0.8941 (89)
MIT 2	20.3315	20.1853	20.3239	20.4244	20.4579	20.4682	20.4692	20.4697	20.4643	20.4175	20.2303	20.0736 (90)
Living area fraction									fLA = Living area / (4) =			0.3249 (91)
MIT	20.4750	20.3518	20.4830	20.5784	20.6108	20.6202	20.6212	20.6216	20.6166	20.5711	20.3929	20.2404 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4750	20.3518	20.4830	20.5784	20.6108	20.6202	20.6212	20.6216	20.6166	20.5711	20.3929	20.2404 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8766	0.7981	0.7045	0.5607	0.4156	0.2923	0.2042	0.2280	0.3764	0.6052	0.7986	0.8881 (94)
Useful gains	717.5908	758.6045	733.9014	642.5400	500.4929	338.2014	226.1998	237.1214	365.7184	541.5193	649.1823	694.2123 (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	925.0237	882.5740	797.6879	662.0856	504.5509	338.7491	226.2690	237.2423	367.5993	564.5891	754.5591	912.7879 (97)
Space heating kWh	154.3301	83.3075	47.4571	14.0728	3.0191	0.0000	0.0000	0.0000	0.0000	17.1640	75.8713	162.6203 (98a)
Space heating requirement - total per year (kWh/year)												557.8423
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	154.3301	83.3075	47.4571	14.0728	3.0191	0.0000	0.0000	0.0000	0.0000	17.1640	75.8713	162.6203 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												557.8423
Space heating per m2										(98c) / (4) =		4.6467 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	528.9223	416.3856	427.1013	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9920	0.9966	0.9950	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	524.6657	414.9600	424.9510	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1255.9142	1203.3109	1129.4337	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	526.4989	586.5331	524.1351	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			0.6830 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	89.9061	100.1577	89.5025	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												279.5662 (107)

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 %)												203.2231 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Cooling System Energy Efficiency Ratio (see Table 10c)												0.5000 (209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	154.3301	83.3075	47.4571	14.0728	3.0191	0.0000	0.0000	0.0000	0.0000	17.1640	75.8713	162.6203 (98)
Space heating efficiency (main heating system 1)	203.2231	203.2231	203.2231	203.2231	203.2231	0.0000	0.0000	0.0000	0.0000	203.2231	203.2231	203.2231 (210)
Space heating fuel (main heating system)	75.9412	40.9931	23.3522	6.9248	1.4856	0.0000	0.0000	0.0000	0.0000	8.4459	37.3340	80.0206 (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	331.7824	294.2348	314.1594	279.4207	273.1614	218.0207	215.2904	223.5510	225.7122	282.8934	297.3541	328.5317 (64)
Efficiency of water heater												136.5082 (216)

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(217)m	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	(217)
Fuel for water heating, kWh/month	243.0494	215.5437	230.1396	204.6915	200.1062	159.7125	157.7124	163.7638	165.3470	207.2354	217.8287	240.6681	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	179.8122	200.3153	179.0049	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	48.3264	43.6497	48.3264	46.7675	48.3264	46.7675	48.3264	46.7675	48.3264	46.7675	48.3264	46.7675	(231)
Lighting	35.5061	28.4843	25.6470	18.7901	14.5140	11.8581	13.2401	17.2100	22.3541	29.3299	33.1280	36.4929	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.3823	-44.3864	-71.0440	-88.2454	-102.6037	-97.2389	-95.9511	-87.1164	-71.9740	-53.9902	-32.5480	-23.9938	(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	-6.8829	-16.0688	-35.4928	-58.5886	-81.4793	-84.6345	-83.1579	-67.7456	-46.6029	-24.3333	-9.6152	-5.2829	(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												274.4975	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												136.5082	
Water heating fuel used												2405.7982	(219)
Space cooling fuel												559.1325	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3860)													
mechanical ventilation fans (SFP = 1.3860)												569.0047	(230a)
Total electricity for the above, kWh/year												569.0047	(231)
Electricity for lighting (calculated in Appendix L)												286.5546	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1317.3590	(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												2777.6285	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	274.4975	0.1586	43.5260 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2405.7982	0.1415	340.4908 (264)
Space and water heating			384.0168 (265)
Space cooling	559.1325	0.1142	63.8610 (266)
Pumps, fans and electric keep-hot	569.0047	0.1387	78.9280 (267)
Energy for lighting	286.5546	0.1443	41.3587 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-797.4742	0.1327	-105.7862
PV Unit electricity exported	-519.8848	0.1234	-64.1604
Total			-169.9466 (269)
Total CO2, kg/year			398.2179 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3200 (273)

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

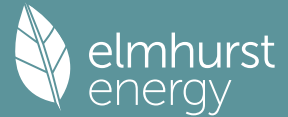
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	274.4975	1.5869	435.6022 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2405.7982	1.5234	3664.9180 (278)
Space and water heating			4100.5202 (279)
Space cooling	559.1325	1.4209	794.4880 (280)
Pumps, fans and electric keep-hot	569.0047	1.5128	860.7903 (281)
Energy for lighting	286.5546	1.5338	439.5271 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-797.4742	1.4901	-1188.3553
PV Unit electricity exported	-519.8848	0.4529	-235.4490
Total			-1423.8043 (283)
Total Primary energy kWh/year			4771.5214 (286)
Dwelling Primary energy Rate (DPER)			39.7500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	57.4500 (1b)	x 3.0000 (2b)	= 172.3500 (1b) - (3b)
First floor	42.0000 (1c)	x 2.8000 (2c)	= 117.6000 (1c) - (3c)

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Second floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 20.6000 (1d) x 2.2600 (2d) = 46.5560 (1d) - (3d)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 336.5060 (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 4 * 10 = 40.0000 (7a)
Number of passive vents 0 * 10 = 0.0000 (7b)
Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1189 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3689 (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) = 0.3135 (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	0.3998	0.3919	0.3841	0.3449	0.3371	0.2979	0.2979	0.2900	0.3135	0.3371	0.3527	0.3684 (22b)
Effective ac	0.5799	0.5768	0.5738	0.5595	0.5568	0.5444	0.5444	0.5421	0.5492	0.5568	0.5622	0.5679 (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
TER Opaque door			2.3000	1.0000	2.3000		(26)
TER Opening Type (Uw = 1.20)			15.5100	1.1450	17.7595		(27)
Opening			1.4000	2.0221	2.8309		(27a)
Heatloss Floor 1			57.4500	0.1300	7.4685		(28a)
Exposed Bike Store			3.4700	0.1300	0.4511		(28b)
EWS 01	38.4900	16.8100	21.6800	0.1800	3.9024		(29a)
EWS 02	29.1300	1.0000	28.1300	0.1800	5.0634		(29a)
RFS 01	40.8000		40.8000	0.1100	4.4880		(30)
RFS 03	12.7000		12.7000	0.1100	1.3970		(30)
RFS 02	6.4000	1.4000	5.0000	0.1100	0.5500		(30)
Total net area of external elements Aum(A, m2)			188.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.2108		(33)
Party Wall 1			88.5000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.0000	0.0500	0.4000
E3 Sill	8.0000	0.0500	0.4000
E4 Jamb	17.4000	0.0500	0.8700
E5 Ground floor (normal)	39.2000	0.1600	6.2720
E20 Exposed floor (normal)	2.4000	0.3200	0.7680
E6 Intermediate floor within a dwelling	20.7000	0.0000	0.0000
E15 Flat roof with parapet	51.0800	0.5600	28.6048
E11 Eaves (insulation at rafter level)	4.0000	0.0400	0.1600
E13 Gable (insulation at rafter level)	1.6000	0.0800	0.1280
E16 Corner (normal)	12.0300	0.0900	1.0827
E17 Corner (inverted - internal area greater than external area)	3.0000	-0.0900	-0.2700
E18 Party wall between dwellings	23.2000	0.0600	1.3920

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 39.8075 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 86.0183 (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	64.3967	64.0521	63.7144	62.1280	61.8312	60.4496	60.4496	60.1938	60.9818	61.8312	62.4317	63.0594 (38)
Heat transfer coeff	150.4150	150.0704	149.7327	148.1464	147.8496	146.4679	146.4679	146.2121	147.0001	147.8496	148.4500	149.0777 (39)
Average = Sum(39)m / 12 =												148.1449

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2529	1.2501	1.2473	1.2340	1.2316	1.2201	1.2201	1.2179	1.2245	1.2316	1.2366	1.2418 (40)
HLP (average)												1.2340
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

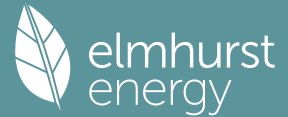
Assumed occupancy 2.8635 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
72.2314	71.1459	69.5641	66.5377	64.3042	61.8135	60.3978	61.9676	63.6884	66.3627	69.4542	71.9547 (42a)	
Hot water usage for baths	31.1851	30.7220	30.0698	28.8672	27.9668	26.9683	26.4290	27.0766	27.7818	28.8502	30.0775	31.0797 (42b)
Hot water usage for other uses	43.9552	42.3568	40.7584	39.1601	37.5617	35.9633	35.9633	37.5617	39.1601	40.7584	42.3568	43.9552 (42c)
Average daily hot water use (litres/day)												135.4677 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	147.3717	144.2247	140.3923	134.5650	129.8327	124.7452	122.7901	126.6059	130.6303	135.9713	141.8884	146.9895 (44)

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Energy content (annual)	233.4008	205.3740	215.7778	184.2127	174.7798	153.3887	148.5040	156.7646	161.0802	184.5118	202.1461	230.1501 (45)
Distribution loss (46)m = 0.15 x (45)m	35.0101	30.8061	32.3667	27.6319	26.2170	23.0083	22.2756	23.5147	24.1620	27.6768	30.3219	34.5225 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9188 (55)
Total storage loss												
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
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 (57)
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 (59)
Total heat required for water heating calculated for each month												
WWHRS	285.1474	252.1129	267.5244	234.2901	226.5264	203.4661	200.2506	208.5112	211.1575	236.2584	252.2234	281.8967 (62)
PV diverter	-33.0212	-29.2042	-30.5810	-25.3223	-23.5994	-20.1942	-18.9288	-20.1289	-20.8937	-24.6314	-27.9043	-32.4097 (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	252.1262	222.9087	236.9434	208.9678	202.9269	183.2719	181.3217	188.3823	190.2638	211.6270	224.3191	249.4870 (64)
12Total per year (kWh/year)												2552.5458 (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	119.0030	105.6780	113.1434	101.3126	99.5115	91.0636	90.7749	93.5215	93.6210	102.7474	107.2755	117.9222 (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	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	153.6033	170.0608	153.6033	158.7234	153.6033	158.7234	153.6033	153.6033	158.7234	153.6033	158.7234	153.6033 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.2782	288.2385	280.7787	264.8976	244.8505	226.0090	213.4218	210.4615	217.9214	233.8025	253.8496	272.6910 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403 (71)
Water heating gains (Table 5)	159.9503	157.2589	152.0744	140.7120	133.7521	126.4773	122.0092	125.7009	130.0292	138.1014	148.9937	158.4975 (72)
Total internal gains	667.7844	684.5108	655.4090	633.2855	601.1584	577.1623	554.9869	555.7183	572.6266	594.4598	630.5193	653.7444 (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	
Northeast				3.7000	11.2829	0.6300		0.7000		0.7700	12.7584 (75)	
Southwest				11.8100	36.7938	0.6300		0.7000		0.7700	132.7996 (79)	
Southeast				1.4000	26.0000	0.6300		0.7000		1.0000	14.4472 (82)	
Solar gains	160.0051	282.1826	409.6392	543.6843	639.5220	647.6892	619.1657	546.1383	456.0446	318.4178	193.4534	135.7368 (83)
Total gains	827.7896	966.6933	1065.0483	1176.9698	1240.6804	1224.8515	1174.1526	1101.8566	1028.6712	912.8776	823.9727	789.4812 (84)

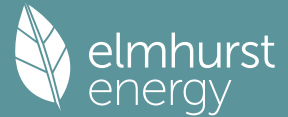
7. Mean internal temperature (heating season)

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	22.1701	22.2210	22.2712	22.5096	22.5548	22.7676	22.7676	22.8074	22.6852	22.5548	22.4636	22.3690
alpha	2.4780	2.4814	2.4847	2.5006	2.5037	2.5178	2.5178	2.5205	2.5123	2.5037	2.4976	2.4913
util living area	0.9562	0.9356	0.9053	0.8444	0.7503	0.6151	0.4867	0.5272	0.7102	0.8687	0.9368	0.9607 (86)
MIT	18.1784	18.5181	19.0166	19.6816	20.2663	20.6949	20.8789	20.8479	20.5302	19.7700	18.8700	18.1255 (87)
Th 2	19.8779	19.8802	19.8824	19.8929	19.8948	19.9040	19.9040	19.9057	19.9005	19.8948	19.8909	19.8867 (88)
util rest of house	0.9496	0.9259	0.8905	0.8187	0.7061	0.5419	0.3849	0.4264	0.6455	0.8417	0.9256	0.9547 (89)
MIT 2	16.6008	17.0298	17.6570	18.4846	19.1834	19.6633	19.8360	19.8147	19.4996	18.6105	17.4866	16.5388 (90)
Living area fraction									fLA = Living area / (4) =			0.3249 (91)
MIT	17.1133	17.5133	18.0987	18.8735	19.5352	19.9984	20.1748	20.1504	19.8344	18.9872	17.9360	17.0543 (92)
Temperature adjustment												0.0000
adjusted MIT	17.1133	17.5133	18.0987	18.8735	19.5352	19.9984	20.1748	20.1504	19.8344	18.9872	17.9360	17.0543 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9258	0.8978	0.8597	0.7902	0.6897	0.5488	0.4116	0.4506	0.6411	0.8138	0.8985	0.9324 (94)
Ext temp.	766.3754	867.9016	915.6420	929.9981	855.6725	672.1679	483.2649	496.4585	659.5227	742.8877	740.3183	736.0986 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1927.3088	1892.8828	1736.7011	1477.5309	1158.4332	790.6994	523.5911	548.3497	842.9643	1240.0377	1608.6081	1916.2843 (97)
Space heating requirement - total per year (kWh/year)	863.7345	688.7874	610.8680	394.2237	225.2540	0.0000	0.0000	0.0000	0.0000	369.8796	625.1686	878.0581 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000

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Space heating kWh	863.7345	688.7874	610.8680	394.2237	225.2540	0.0000	0.0000	0.0000	0.0000	369.8796	625.1686	878.0581 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4655.9737
Space heating per m2												(98c) / (4) = 38.7836 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	863.7345	688.7874	610.8680	394.2237	225.2540	0.0000	0.0000	0.0000	0.0000	369.8796	625.1686	878.0581 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	935.7903	746.2485	661.8288	427.1112	244.0455	0.0000	0.0000	0.0000	0.0000	400.7363	677.3225	951.3089 (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	252.1262	222.9087	236.9434	208.9678	202.9269	183.2719	181.3217	188.3823	190.2638	211.6270	224.3191	249.4870 (64)
Efficiency of water heater (217)m	86.5934	86.4170	86.0866	85.4609	84.2944	79.8000	79.8000	79.8000	79.8000	85.2989	86.2319	79.8000 (216)
Fuel for water heating, kWh/month	291.1611	257.9453	275.2386	244.5187	240.7359	229.6640	227.2202	236.0680	238.4259	248.1004	260.1348	287.9650 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	31.9157	25.6040	23.0535	16.8900	13.0463	10.6590	11.9013	15.4698	20.0937	26.3640	29.7781	32.8028 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-52.1101	-72.6298	-103.1921	-114.5917	-122.3035	-113.6291	-112.1513	-106.4568	-96.2716	-82.3143	-56.9633	-45.1447 (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	-32.0080	-67.0337	-132.7200	-198.6274	-261.9994	-263.0896	-260.0608	-220.5360	-162.0572	-95.7047	-42.6754	-25.3395 (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												5044.3919 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												3037.1777 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												257.5782 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2839.6102 (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												5585.5376 (238)

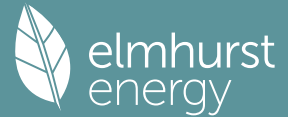
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5044.3919	0.2100	1059.3223 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3037.1777	0.2100	637.8073 (264)
Space and water heating			1697.1296 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	257.5782	0.1443	37.1765 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1077.7584	0.1349	-145.3412
PV Unit electricity exported	-1761.8518	0.1260	-221.9844
Total			-367.3256 (269)
Total CO2, kg/year			1378.9098 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4900 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	5044.3919	1.1300	5700.1629 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3037.1777	1.1300	3432.0108 (278)
Space and water heating			9132.1737 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)

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Energy for lighting	257.5782	1.5338	395.0820 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1077.7584	1.4984	-1614.9311
PV Unit electricity exported	-1761.8518	0.4625	-814.8423
Total			-2429.7735 (283)
Total Primary energy kWh/year			7227.5830 (286)
Target Primary Energy Rate (TPER)			60.2000 (287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	57.4500 (1b)	x	3.0000 (2b)	=	172.3500 (1b)	- (3b)
First floor	42.0000 (1c)	x	2.8000 (2c)	=	117.6000 (1c)	- (3c)
Second floor	20.6000 (1d)	x	2.2600 (2d)	=	46.5560 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0500					(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 336.5060 (5)

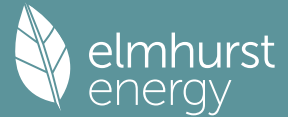
2. Ventilation rate

													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													4 * 10 = 40.0000 (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													Air changes per hour
Pressure test													40.0000 / (5) = 0.1189 (8)
Pressure Test Method													Yes
Measured/design AP50													Blower Door
Infiltration rate													0.6000 (17)
Number of sides sheltered													0.1489 (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) = 0.1265 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.1613	0.1582	0.1550	0.1392	0.1360	0.1202	0.1202	0.1170	0.1265	0.1360	0.1424	0.1487	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5130	0.5125	0.5120	0.5097	0.5093	0.5072	0.5072	0.5069	0.5080	0.5093	0.5101	0.5111	(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	
Door			2.3000	1.0000	2.3000			(26)
Windows (Uw = 0.67)			15.5100	0.6525	10.1205			(27)
Opening			1.4000	0.6525	0.9135			(27a)
Heatloss Floor 1			57.4500	0.1000	5.7450			(28a)
Exposed Bike Store			3.4700	0.1600	0.5552			(28b)
EWS 01	38.4900	16.8100	21.6800	0.1400	3.0352			(29a)
EWS 02	29.1300	1.0000	28.1300	0.1800	5.0634			(29a)
RFS 01	40.8000		40.8000	0.1200	4.8960			(30)
RFS 03	12.7000		12.7000	0.1000	1.2700			(30)
RFS 02	6.4000	1.4000	5.0000	0.0900	0.4500			(30)
Total net area of external elements Aum(A, m2)			188.4400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.3488			(33)
Party Wall 1			88.5000	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								100.0000 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				8.0000	0.0100		0.0800	
E3 Sill				8.0000	0.0100		0.0800	
E4 Jamb				17.4000	0.0100		0.1740	
E5 Ground floor (normal)				39.2000	0.0100		0.3920	
E20 Exposed floor (normal)				2.4000	0.0100		0.0240	
E6 Intermediate floor within a dwelling				20.7000	0.0100		0.2070	
E15 Flat roof with parapet				51.0800	0.0100		0.5108	
E11 Eaves (insulation at rafter level)				4.0000	0.0100		0.0400	
E13 Gable (insulation at rafter level)				1.6000	0.0100		0.0160	
E16 Corner (normal)				12.0300	0.0100		0.1203	
E17 Corner (inverted - internal area greater than external area)				3.0000	0.0100		0.0300	
E18 Party wall between dwellings				23.2000	0.0100		0.2320	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								1.9061 (36)
Point Thermal bridges							(36a) =	0.0000

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Total fabric heat loss (33) + (36) + (36a) = 36.2549 (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	56.9687	56.9126	56.8576	56.5992	56.5509	56.3258	56.3258	56.2842	56.4125	56.5509	56.6487	56.7509	(38)
Heat transfer coeff	93.2236	93.1675	93.1125	92.8541	92.8058	92.5807	92.5807	92.5391	92.6674	92.8058	92.9036	93.0058	(39)
Average = Sum(39)m / 12 =												92.8539	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7765	0.7761	0.7756	0.7735	0.7731	0.7712	0.7712	0.7708	0.7719	0.7731	0.7739	0.7747	(40)
HLP (average)												0.7735	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8635 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

Hot water usage for baths 31.1851 30.7220 30.6098 28.8672 27.9668 26.9683 26.4290 27.0766 27.7818 28.8502 30.0775 31.0797 (42b)

Hot water usage for other uses 43.9552 42.3568 40.7584 39.1601 37.5617 35.9633 35.9633 37.5617 39.1601 40.7584 42.3568 43.9552 (42c)

Average daily hot water use (litres/day) 68.8728 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.1403	73.0788	70.8282	68.0273	65.5285	62.9316	62.3923	64.6383	66.9419	69.6086	72.4343	75.0349	(44)
Energy conte	119.0038	104.0632	108.8603	93.1259	88.2139	77.3818	75.4581	80.0358	82.5460	94.4582	103.1959	117.4864	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
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													
WWHRS	101.1533	88.4537	92.5313	79.1571	74.9818	65.7745	64.1394	68.0304	70.1641	80.2895	87.7165	99.8635	(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	101.1533	88.4537	92.5313	79.1571	74.9818	65.7745	64.1394	68.0304	70.1641	80.2895	87.7165	99.8635	(64)
12Total per year (kWh/year)													
Electric shower(s)	57.8453	51.5407	56.2804	53.7077	54.7155	52.1933	53.9331	54.7155	53.7077	56.2804	55.2221	57.8453	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												657.9873	(64a)
Heat gains from water heating, kWh/month													
	39.7496	34.9986	37.2029	33.2162	32.4243	29.4920	29.5181	30.6865	30.9680	34.1425	35.7347	39.4272	(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	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	153.1451	169.5535	153.1451	158.2500	153.1451	158.2500	153.1451	153.1451	158.2500	153.1451	158.2500	153.1451	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.2782	288.2385	280.7787	264.8976	244.8505	226.0090	213.4218	210.4615	217.9214	233.8025	253.8496	272.6910	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	(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)	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	(71)
Water heating gains (Table 5)	53.4269	52.0812	50.0039	46.1336	43.5811	40.9611	39.6749	41.2453	43.0111	45.8904	49.6315	52.9936	(72)
Total internal gains	557.8029	575.8259	549.8804	535.2338	507.5293	491.1727	472.1945	470.8045	485.1350	498.7907	527.6837	544.7823	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	3.7000	11.2829	0.5200	0.8000	0.7700	12.0351	(75)						
Southwest	11.8100	36.7938	0.5200	0.8000	0.7700	125.2713	(79)						
Southeast	1.4000	26.0000	0.5200	0.8000	1.0000	13.6282	(82)						
Solar gains	150.9346	266.1858	386.4171	512.8632	603.2679	610.9721	584.0656	515.1781	430.1918	300.3669	182.4867	128.0420	(83)
Total gains	708.7375	842.0118	936.2974	1048.0970	1110.7972	1102.1448	1056.2601	985.9826	915.3268	799.1576	710.1704	672.8243	(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	35.7712	35.7928	35.8139	35.9136	35.9323	36.0196	36.0196	36.0358	35.9859	35.9323	35.8944	35.8550	
alpha	3.3847	3.3862	3.3876	3.3942	3.3955	3.4013	3.4013	3.4024	3.3991	3.3955	3.3930	3.3903	
util living area	0.9608	0.9326	0.8890	0.7985	0.6672	0.5054	0.3762	0.4173	0.6202	0.8393	0.9362	0.9664	(86)

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MIT	19.2910	19.6051	19.9895	20.4401	20.7618	20.9306	20.9806	20.9722	20.8598	20.4247	19.7763	19.2188 (87)
Th 2	20.2737	20.2741	20.2745	20.2764	20.2767	20.2784	20.2784	20.2787	20.2777	20.2767	20.2760	20.2753 (88)
util rest of house												
	0.9558	0.9245	0.8758	0.7754	0.6314	0.4561	0.3177	0.3565	0.5710	0.8153	0.9271	0.9622 (89)
MIT 2	18.6900	18.9979	19.3717	19.8005	20.0919	20.2333	20.2687	20.2642	20.1804	19.7951	19.1712	18.6201 (90)
Living area fraction									fLA = Living area / (4) =			0.3249 (91)
MIT	18.8853	19.1952	19.5724	20.0083	20.3095	20.4598	20.5000	20.4942	20.4011	19.9996	19.3678	18.8146 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8853	19.1952	19.5724	20.0083	20.3095	20.4598	20.5000	20.4942	20.4011	19.9996	19.3678	18.8146 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9440	0.9101	0.8612	0.7662	0.6331	0.4688	0.3359	0.3750	0.5798	0.8051	0.9135	0.9512 (94)	
Useful gains	669.0584	766.3287	806.3686	803.0587	703.2279	516.6450	354.8365	369.7274	530.6651	643.3895	648.7061	640.0084 (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	1359.6911	1331.8470	1217.2003	1031.4494	799.0099	542.5067	361.0615	378.8707	583.9041	872.3406	1139.7197	1359.2414 (97)	
Space heating kWh	513.8307	380.0283	305.6587	164.4413	71.2618	0.0000	0.0000	0.0000	0.0000	170.3396	353.5298	535.1094 (98a)	
Space heating requirement - total per year (kWh/year)												2494.1997	
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	513.8307	380.0283	305.6587	164.4413	71.2618	0.0000	0.0000	0.0000	0.0000	170.3396	353.5298	535.1094 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2494.1997	
Space heating per m2												(98c) / (4) =	20.7763 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	870.2589	685.0975	703.2969	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8784	0.9228	0.9034	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	764.4066	632.2156	635.3691	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1200.4266	1150.9570	1074.7642	0.0000	0.0000	0.0000	0.0000 (103)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	313.9344	385.9436	326.9100	0.0000	0.0000	0.0000	0.0000 (104)	
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)	
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	78.4836	96.4859	81.7275	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling requirement												256.6970 (107)	
Energy for space heating												20.7763 (99)	
Energy for space cooling												2.1383 (108)	
Total												22.9146 (109)	
Fabric Energy Efficiency (DFEE)												22.9 (109)	

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

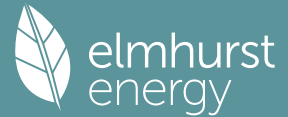
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	57.4500 (1b)	x	3.0000 (2b)	= 172.3500 (1b) - (3b)
First floor	42.0000 (1c)	x	2.8000 (2c)	= 117.6000 (1c) - (3c)
Second floor	20.6000 (1d)	x	2.2600 (2d)	= 46.5560 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0500			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	336.5060 (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	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1189 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3689 (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) =	0.3135 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.3998	0.3919	0.3841	0.3449	0.3371	0.2979	0.2979	0.2900	0.3135	0.3371	0.3527	0.3684 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5799	0.5768	0.5738	0.5595	0.5568	0.5444	0.5444	0.5421	0.5492	0.5568	0.5622	0.5679 (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
TER Opaque door			2.3000	1.0000	2.3000		(26)
TER Opening Type (Uw = 1.20)			15.5100	1.1450	17.7595		(27)
Opening			1.4000	2.0221	2.8309		(27a)
Heatloss Floor 1			57.4500	0.1300	7.4685		(28a)
Exposed Bike Store			3.4700	0.1300	0.4511		(28b)
EWS 01	38.4900	16.8100	21.6800	0.1800	3.9024		(29a)
EWS 02	29.1300	1.0000	28.1300	0.1800	5.0634		(29a)
RFS 01	40.8000		40.8000	0.1100	4.4880		(30)
RFS 03	12.7000		12.7000	0.1100	1.3970		(30)
RFS 02	6.4000	1.4000	5.0000	0.1100	0.5500		(30)
Total net area of external elements Aum(A, m2)			188.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.2108		(33)
Party Wall 1			88.5000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.0000	0.0500	0.4000
E3 Sill	8.0000	0.0500	0.4000
E4 Jamb	17.4000	0.0500	0.8700
E5 Ground floor (normal)	39.2000	0.1600	6.2720
E20 Exposed floor (normal)	2.4000	0.3200	0.7680
E6 Intermediate floor within a dwelling	20.7000	0.0000	0.0000
E15 Flat roof with parapet	51.0800	0.5600	28.6048
E11 Eaves (insulation at rafter level)	4.0000	0.0400	0.1600
E13 Gable (insulation at rafter level)	1.6000	0.0800	0.1280
E16 Corner (normal)	12.0300	0.0900	1.0827
E17 Corner (inverted - internal area greater than external area)	3.0000	-0.0900	-0.2700
E18 Party wall between dwellings	23.2000	0.0600	1.3920

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 39.8075 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 86.0183 (37)

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

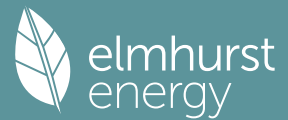
(38)m	Jan 64.3967	Feb 64.0521	Mar 63.7144	Apr 62.1280	May 61.8312	Jun 60.4496	Jul 60.4496	Aug 60.1938	Sep 60.9818	Oct 61.8312	Nov 62.4317	Dec 63.0594 (38)
Heat transfer coeff	150.4150	150.0704	149.7327	148.1464	147.8496	146.4679	146.4679	146.2121	147.0001	147.8496	148.4500	149.0777 (39)
Average = Sum(39)m / 12 =												148.1449

HLP	Jan 1.2529	Feb 1.2501	Mar 1.2473	Apr 1.2340	May 1.2316	Jun 1.2201	Jul 1.2201	Aug 1.2179	Sep 1.2245	Oct 1.2316	Nov 1.2366	Dec 1.2418 (40)
HLP (average)												1.2340
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8635 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	31.1851	30.7220	30.0698	28.8672	27.9668	26.9683	26.4290	27.0766	27.7818	28.8502	30.0775	31.0797 (42b)
Hot water usage for other uses	43.9552	42.3568	40.7584	39.1601	37.5617	35.9633	35.9633	37.5617	39.1601	40.7584	42.3568	43.9552 (42c)
Average daily hot water use (litres/day)												68.8728 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	75.1403	73.0788	70.8282	68.0273	65.5285	62.9316	62.3923	64.6383	66.9419	69.6086	72.4343	75.0349 (44)
Energy content (annual)	119.0038	104.0632	108.8603	93.1259	88.2139	77.3818	75.4581	80.0358	82.5460	94.4582	103.1959	117.4864 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m =											1143.8294
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
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											
	101.1533	88.4537	92.5313	79.1571	74.9818	65.7745	64.1394	68.0304	70.1641	80.2895	87.7165	99.8635 (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	101.1533	88.4537	92.5313	79.1571	74.9818	65.7745	64.1394	68.0304	70.1641	80.2895	87.7165	99.8635 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											972.2550 (64)
												972 (64)

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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	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754	143.1754 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	153.6033	170.0608	153.6033	158.7234	153.6033	158.7234	153.6033	153.6033	158.7234	153.6033	158.7234	153.6033 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	285.2782	288.2385	280.7787	264.8976	244.8505	226.0090	213.4218	210.4615	217.9214	233.8025	253.8496	272.6910 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175	37.3175 (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)	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403 (71)
Water heating gains (Table 5)	53.4269	52.0812	50.0039	46.1336	43.5811	40.9611	39.6749	41.2453	43.0111	45.8904	49.6315	52.9936 (72)
Total internal gains	558.2611	576.3332	550.3385	535.7071	507.9875	491.6461	472.6526	471.2627	485.6084	499.2488	528.1571	545.2404 (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	
Northeast	3.7000		11.2829		0.6300		0.7000		0.7700		12.7584 (75)	
Southwest	11.8100		36.7938		0.6300		0.7000		0.7700		132.7996 (79)	
Southeast	1.4000		26.0000		0.6300		0.7000		1.0000		14.4472 (82)	
Solar gains	160.0051	282.1826	409.6392	543.6843	639.5220	647.6892	619.1657	546.1383	456.0446	318.4178	193.4534	135.7368 (83)
Total gains	718.2662	858.5157	959.9777	1079.3915	1147.5095	1139.3353	1091.8183	1017.4010	941.6530	817.6666	721.6105	680.9772 (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	22.1701	22.2210	22.2712	22.5096	22.5548	22.7676	22.7676	22.8074	22.6852	22.5548	22.4636	22.3690
alpha	2.4780	2.4814	2.4847	2.5006	2.5037	2.5178	2.5178	2.5205	2.5123	2.5037	2.4976	2.4913
util living area	0.9675	0.9492	0.9220	0.8653	0.7759	0.6431	0.5142	0.5582	0.7413	0.8918	0.9516	0.9713 (86)
MIT	18.0198	18.3712	18.8868	19.5828	20.1993	20.6605	20.8623	20.8262	20.4764	19.6645	18.7295	17.9658 (87)
Th 2	19.8779	19.8802	19.8824	19.8929	19.8948	19.9040	19.9040	19.9057	19.9005	19.8948	19.8909	19.8867 (88)
util rest of house	0.9624	0.9412	0.9093	0.8420	0.7337	0.5701	0.4095	0.4550	0.6790	0.8682	0.9427	0.9668 (89)
MIT 2	17.1685	17.5160	18.0241	18.7049	19.2842	19.6928	19.8429	19.8233	19.5472	18.7974	17.8813	17.1206 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.4451	17.7938	18.3044	18.9901	19.5815	20.0072	20.1741	20.1491	19.8491	19.0791	18.1569	17.3952 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.4451	17.7938	18.3044	18.9901	19.5815	20.0072	20.1741	20.1491	19.8491	19.0791	18.1569	17.3952 (93)

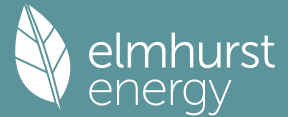
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9466	0.9213	0.8862	0.8190	0.7201	0.5776	0.4371	0.4798	0.6756	0.8463	0.9237	0.9523 (94)
Useful gains	679.9384	790.9460	850.7160	884.0107	826.2658	658.0789	477.1893	488.1746	636.2277	692.0098	666.5798	648.4905 (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	1977.2148	1934.9841	1767.4977	1494.8139	1165.2745	791.9756	523.4874	548.1699	845.1160	1253.6351	1641.3893	1967.1102 (97)
Space heating kWh	965.1736	768.7936	682.0856	439.7783	252.2225	0.0000	0.0000	0.0000	0.0000	417.8493	701.8628	981.0531 (98a)
Space heating requirement - total per year (kWh/year)	5208.8189											
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	965.1736	768.7936	682.0856	439.7783	252.2225	0.0000	0.0000	0.0000	0.0000	417.8493	701.8628	981.0531 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5208.8189											
Space heating per m ²	(98c) / (4) = 43.3887 (99)											

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1376.7986	1083.8627	1111.2118	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6781	0.7486	0.7156	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	933.5808	811.3896	795.1989	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1242.3191	1191.0213	1110.1728	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	222.2916	282.4459	234.3406	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	55.5729	70.6115	58.5852	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	184.7695 (107)											
Energy for space heating	43.3887 (99)											
Energy for space cooling	1.5391 (108)											
Total	44.9278 (109)											
Fabric Energy Efficiency (TFEE)	44.9 (109)											

Full SAP Calculation Printout



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	57.4500 (1b)	x 3.0000 (2b)	= 172.3500 (1b) - (3b)
First floor	42.0000 (1c)	x 2.8000 (2c)	= 117.6000 (1c) - (3c)
Second floor	20.6000 (1d)	x 2.2600 (2d)	= 46.5560 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 336.5060 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	0.6000 (17)
Infiltration rate	0.0300 (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) = 0.0255 (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	0.0325	0.0319	0.0312	0.0281	0.0274	0.0242	0.0242	0.0236	0.0255	0.0274	0.0287	0.0300 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												68.8000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.1885	0.1879	0.1872	0.1841	0.1834	0.1802	0.1802	0.1796	0.1815	0.1834	0.1847	0.1860 (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
Door			2.3000	1.0000	2.3000		(26)
Windows (Uw = 0.67)			15.5100	0.6525	10.1205		(27)
Opening			1.4000	0.6525	0.9135		(27a)
Heatloss Floor 1			57.4500	0.1000	5.7450		(28a)
Exposed Bike Store			3.4700	0.1600	0.5552		(28b)
EWS 01	38.4900	16.8100	21.6800	0.1400	3.0352		(29a)
EWS 02	29.1300	1.0000	28.1300	0.1800	5.0634		(29a)
RFS 01	40.8000		40.8000	0.1200	4.8960		(30)
RFS 03	12.7000		12.7000	0.1000	1.2700		(30)
RFS 02	6.4000	1.4000	5.0000	0.0900	0.4500		(30)
Total net area of external elements Aum(A, m ²)			188.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.3488		(33)
Party Wall 1			88.5000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 100.0000 (35)

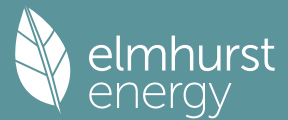
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.0000	0.0100	0.0800
E3 Sill	8.0000	0.0100	0.0800
E4 Jamb	17.4000	0.0100	0.1740
E5 Ground floor (normal)	39.2000	0.0100	0.3920
E20 Exposed floor (normal)	2.4000	0.0100	0.0240
E6 Intermediate floor within a dwelling	20.7000	0.0100	0.2070
E15 Flat roof with parapet	51.0800	0.0100	0.5108
E11 Eaves (insulation at rafter level)	4.0000	0.0100	0.0400
E13 Gable (insulation at rafter level)	1.6000	0.0100	0.0160
E16 Corner (normal)	12.0300	0.0100	0.1203
E17 Corner (inverted - internal area greater than external area)	3.0000	0.0100	0.0300
E18 Party wall between dwellings	23.2000	0.0100	0.2320
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.9061 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	36.2549 (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	20.9337	20.8630	20.7922	20.4382	20.3674	20.0134	20.0134	19.9426	20.1550	20.3674	20.5090	20.6506 (38)
Heat transfer coeff	57.1886	57.1178	57.0470	56.6931	56.6223	56.2683	56.2683	56.1975	56.4099	56.6223	56.7639	56.9055 (39)
Average = Sum(39)m / 12 =												56.6754

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.4764	0.4758	0.4752	0.4722	0.4717	0.4687	0.4687	0.4681	0.4699	0.4717	0.4728	0.4740	(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													2.8635 (42)
Hot water usage for mixer showers													
72.2314	71.1459	69.5641	66.5377	64.3042	61.8135	60.3978	61.9676	63.6884	66.3627	69.4542	71.9547	(42a)	
Hot water usage for baths													
31.1851	30.7220	30.0698	28.8672	27.9668	26.9683	26.4290	27.0766	27.7818	28.8502	30.0775	31.0797	(42b)	
Hot water usage for other uses													
43.9552	42.3568	40.7584	39.1601	37.5617	35.9633	35.9633	37.5617	39.1601	40.7584	42.3568	43.9552	(42c)	
Average daily hot water use (litres/day)													135.4677 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
147.3717	144.2247	140.3923	134.5650	129.8327	124.7452	122.7901	126.6059	130.6303	135.9713	141.8884	146.9895	(44)	
Energy content	233.4008	205.3740	215.7778	184.2127	174.7798	153.3887	148.5040	156.7646	161.0802	184.5118	202.1461	230.1501	(45)
Energy content (annual)										Total = Sum(45)m =		2250.0906	
Distribution loss (46)m = 0.15 x (45)m													
35.0101	30.8061	32.3667	27.6319	26.2170	23.0083	22.2756	23.5147	24.1620	27.6768	30.3219	34.5225	(46)	
Water storage loss:													
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8000 (48)
Temperature factor from Table 2b													0.7800 (49)
Enter (49) or (54) in (55)													1.4040 (55)
Total storage loss													
43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240	(56)	
If cylinder contains dedicated solar storage													
43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240	(57)	
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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													
331.7824	294.2348	314.1594	279.4207	273.1614	218.0207	215.2904	223.5510	225.7122	282.8934	297.3541	328.5317	(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													
331.7824	294.2348	314.1594	279.4207	273.1614	218.0207	215.2904	223.5510	225.7122	282.8934	297.3541	328.5317	(64)	
													3284.1122 (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)
													0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month													
121.4918	107.9259	115.6322	103.7211	102.0004	69.0113	67.9875	70.7341	71.5688	105.2362	109.6840	120.4110	(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	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.5648	36.0293	29.3010	22.1827	16.5818	13.9991	15.1265	19.6620	26.3903	33.5086	39.1094	41.6922	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	425.7884	430.2068	419.0727	395.3695	365.4485	337.3269	318.5400	314.1217	325.2558	348.9590	378.8800	407.0015	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	(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)	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	(71)
Water heating gains (Table 5)	163.2955	160.6040	155.4196	144.0571	137.0973	95.8491	91.3810	95.0728	99.4011	141.4466	152.3389	161.8427	(72)
Total internal gains	741.9634	739.1548	716.1080	673.9240	631.4423	559.4898	537.3623	541.1712	563.3618	636.2288	682.6430	722.8511	(73)

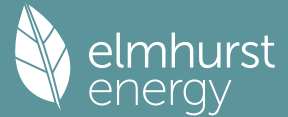
6. Solar gains

[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
Northeast				3.7000	11.2829		0.5200		0.8000		0.7700		12.0351 (75)
Southwest				11.8100	36.7938		0.5200		0.8000		0.7700		125.2713 (79)
Southeast				1.4000	26.0000		0.5200		0.8000		1.0000		13.6282 (82)
Solar gains	150.9346	266.1858	386.4171	512.8632	603.2679	610.9721	584.0656	515.1781	430.1918	300.3669	182.4867	128.0420	(83)
Total gains	892.8979	1005.3406	1102.5250	1186.7873	1234.7102	1170.4619	1121.4279	1056.3492	993.5536	936.5957	865.1297	850.8931	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	58.3109	58.3832	58.4556	58.8206	58.8942	59.2646	59.2646	59.3393	59.1159	58.8942	58.7473	58.6011	
alpha	4.8874	4.8922	4.8970	4.9214	4.9263	4.9510	4.9510	4.9560	4.9411	4.9263	4.9165	4.9067	
util living area	0.8568	0.7913	0.6941	0.5609	0.4228	0.3070	0.2207	0.2445	0.3894	0.6034	0.7906	0.8752	(86)
Living	20.6209	20.7304	20.8337	20.9033	20.9295	20.9362	20.9373	20.9372	20.9335	20.8976	20.7621	20.5853	
Non living	20.0915	20.2241	20.3471	20.4295	20.4587	20.4683	20.4692	20.4697	20.4646	20.4250	20.2669	20.0502	
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	20.8061	20.7304	20.8337	20.9033	20.9295	20.9362	20.9373	20.9372	20.9335	20.8976	20.7621	20.6433	(87)

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Th 2	20.5425	20.5431	20.5436	20.5463	20.5469	20.5496	20.5496	20.5501	20.5485	20.5469	20.5458	20.5447 (88)
util rest of house	0.8461	0.7779	0.6776	0.5421	0.4029	0.2856	0.1981	0.2207	0.3645	0.5808	0.7750	0.8654 (89)
MIT 2	20.3627	20.2241	20.3471	20.4295	20.4587	20.4683	20.4692	20.4697	20.4646	20.4250	20.2669	20.1393 (90)
Living area fraction									fLA = Living area / (4) =			0.3249 (91)
MIT	20.5067	20.3886	20.5052	20.5834	20.6117	20.6203	20.6213	20.6216	20.6169	20.5785	20.4278	20.3030 (92)
Temperature adjustment												0.0000
adjusted MIT	20.5067	20.3886	20.5052	20.5834	20.6117	20.6203	20.6213	20.6216	20.6169	20.5785	20.4278	20.3030 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8452	0.7732	0.6762	0.5437	0.4057	0.2890	0.2017	0.2245	0.3683	0.5824	0.7708	0.8599	(94)
Useful gains	754.7214	777.3388	745.5123	645.2339	500.9468	338.2327	226.2041	237.1310	365.9121	545.4398	666.8849	731.7145	(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	926.8414	884.6755	798.9547	662.3705	504.5985	338.7524	226.2694	237.2433	367.6198	565.0077	756.5369	916.3508	(97)
Space heating kWh	128.0573	72.1303	39.7612	12.3383	2.7168	0.0000	0.0000	0.0000	0.0000	14.5586	64.5495	137.3694	(98a)
Space heating requirement - total per year (kWh/year)												471.4813	
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	128.0573	72.1303	39.7612	12.3383	2.7168	0.0000	0.0000	0.0000	0.0000	14.5586	64.5495	137.3694	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												471.4813	
Space heating per m2										(98c) / (4) =		3.9274	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	528.9223	416.3856	427.1013	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9920	0.9966	0.9950	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	524.6657	414.9600	424.9510	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1255.9142	1203.3109	1129.4337	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	526.4989	586.5331	524.1351	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			0.6830	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	89.9061	100.1577	89.5025	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												279.5662	(107)

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 %)													203.2231 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Cooling System Energy Efficiency Ratio (see Table 10c)													0.5000 (209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	128.0573	72.1303	39.7612	12.3383	2.7168	0.0000	0.0000	0.0000	0.0000	14.5586	64.5495	137.3694	(98)
Space heating efficiency (main heating system 1)	203.2231	203.2231	203.2231	203.2231	203.2231	0.0000	0.0000	0.0000	0.0000	203.2231	203.2231	203.2231	(210)
Space heating fuel (main heating system)	63.0132	35.4931	19.5653	6.0713	1.3369	0.0000	0.0000	0.0000	0.0000	7.1638	31.7629	67.5954	(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	331.7824	294.2348	314.1594	279.4207	273.1614	218.0207	215.2904	223.5510	225.7122	282.8934	297.3541	328.5317	(64)
Efficiency of water heater (217)m	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	(216)
Fuel for water heating, kWh/month	243.0494	215.5437	230.1396	204.6915	200.1062	159.7125	157.7124	163.7638	165.3470	207.2354	217.8287	240.6681	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	179.8122	200.3153	179.0049	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	48.3264	43.6497	48.3264	46.7675	48.3264	46.7675	48.3264	48.3264	46.7675	48.3264	46.7675	48.3264	(231)
Lighting	35.5061	28.4843	25.6470	18.7901	14.5140	11.8581	13.2401	17.2100	22.3541	29.3299	33.1280	36.4929	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-28.3264	-44.3253	-70.9590	-88.2116	-102.5954	-97.2389	-95.9511	-87.1164	-71.9740	-53.9672	-32.5095	-23.9516	(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	-6.9388	-16.1299	-35.5778	-58.6225	-81.4876	-84.6345	-83.1579	-67.7456	-46.6029	-24.3563	-9.6537	-5.3251	(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												232.0018	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												136.5082	

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Water heating fuel used	2405.7982 (219)
Space cooling fuel	559.1325 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3860)	
mechanical ventilation fans (SFP = 1.3860)	569.0047 (230a)
Total electricity for the above, kWh/year	569.0047 (231)
Electricity for lighting (calculated in Appendix L)	286.5546 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1317.3590 (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	2735.1329 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	232.0018	16.4900	38.2571 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2405.7982	16.4900	396.7161 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Space cooling	559.1325	16.4900	92.2009 (248)
Pumps, fans and electric keep-hot	569.0047	16.4900	93.8289 (249)
Energy for lighting	286.5546	16.4900	47.2529 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-797.1263	16.4900	-131.4461
PV Unit electricity exported	-520.2327	5.5900	-29.0810
Total			-160.5271 (252)
Total energy cost			507.7288 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 1.1074 (257)
SAP value	82.0485
SAP rating (Section 12)	82 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	232.0018	0.1585	36.7767 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2405.7982	0.1415	340.4908 (264)
Space and water heating			377.2675 (265)
Space cooling	559.1325	0.1142	63.8610 (266)
Pumps, fans and electric keep-hot	569.0047	0.1387	78.9280 (267)
Energy for lighting	286.5546	0.1443	41.3587 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-797.1263	0.1326	-105.7325
PV Unit electricity exported	-520.2327	0.1234	-64.2221
Total			-169.9546 (269)
Total CO2, kg/year			391.4606 (272)
CO2 emissions per m2			3.2600 (273)
EI value			96.8218
EI rating			97 (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

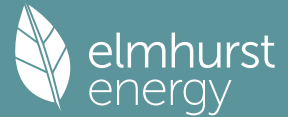
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	57.4500 (1b)	x 3.0000 (2b)	= 172.3500 (1b) - (3b)
First floor	42.0000 (1c)	x 2.8000 (2c)	= 117.6000 (1c) - (3c)
Second floor	20.6000 (1d)	x 2.2600 (2d)	= 46.5560 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	336.5060 (5)

2. Ventilation rate

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	
Pressure test				/ (5) =	0.0000 (8)
Pressure Test Method				Yes	
Measured/design AP50				Blower Door	
Infiltration rate				0.6000	(17)
Number of sides sheltered				0.0300	(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) =			0.0255	(21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500
Adj infilt rate												
	0.0268	0.0255	0.0255	0.0236	0.0236	0.0210	0.0217	0.0204	0.0210	0.0223	0.0223	0.0242
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												68.8000
Effective ac	0.1828	0.1815	0.1815	0.1796	0.1796	0.1770	0.1777	0.1764	0.1770	0.1783	0.1783	0.1802

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
Door			2.3000	1.0000	2.3000		(26)
Windows (Uw = 0.67)			15.5100	0.6525	10.1205		(27)
Opening			1.4000	0.6525	0.9135		(27a)
Heatloss Floor 1			57.4500	0.1000	5.7450		(28a)
Exposed Bike Store			3.4700	0.1600	0.5552		(28b)
EWS 01	38.4900	16.8100	21.6800	0.1400	3.0352		(29a)
EWS 02	29.1300	1.0000	28.1300	0.1800	5.0634		(29a)
RFS 01	40.8000		40.8000	0.1200	4.8960		(30)
RFS 03	12.7000		12.7000	0.1000	1.2700		(30)
RFS 02	6.4000	1.4000	5.0000	0.0900	0.4500		(30)
Total net area of external elements Aum(A, m2)			188.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.3488		(33)
Party Wall 1			88.5000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)

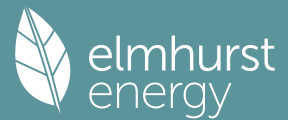
List of Thermal Bridges	Length	Psi-value	Total
K1 Element	8.0000	0.0100	0.0800
E2 Other lintels (including other steel lintels)	8.0000	0.0100	0.0800
E3 Sill	17.4000	0.0100	0.1740
E4 Jamb	39.2000	0.0100	0.3920
E5 Ground floor (normal)	2.4000	0.0100	0.0240
E20 Exposed floor (normal)	20.7000	0.0100	0.2070
E6 Intermediate floor within a dwelling	51.0800	0.0100	0.5108
E15 Flat roof with parapet	4.0000	0.0100	0.0400
E11 Eaves (insulation at rafter level)	1.6000	0.0100	0.0160
E13 Gable (insulation at rafter level)	12.0300	0.0100	0.1203
E16 Corner (normal)	3.0000	0.0100	0.0300
E17 Corner (inverted - internal area greater than external area)	23.2000	0.0100	0.2320
E18 Party wall between dwellings			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.9061 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	36.2549 (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
	20.2966	20.1550	20.1550	19.9426	19.9426	19.6595	19.7303	19.5887	19.6595	19.8011	19.8011	20.0134
Heat transfer coeff	56.5515	56.4099	56.4099	56.1975	56.1975	55.9144	55.9852	55.8436	55.9144	56.0560	56.0560	56.2683
Average = Sum(39)m / 12 =												56.1503
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.4711	0.4699	0.4699	0.4681	0.4681	0.4658	0.4663	0.4652	0.4658	0.4669	0.4669	0.4687
HLP (average)												0.4677
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8635 (42)
Hot water usage for mixer showers	72.2314	71.1459	69.5641	66.5377	64.3042	61.8135	60.3978	61.9676	63.6884	66.3627	69.4542	71.9547
Hot water usage for baths	31.1851	30.7220	30.0698	28.8672	27.9668	26.9683	26.4290	27.0766	27.7818	28.8502	30.0775	31.0797
Hot water usage for other uses	43.9552	42.3568	40.7584	39.1601	37.5617	35.9633	35.9633	37.5617	39.1601	40.7584	42.3568	43.9552
Average daily hot water use (litres/day)												135.4677
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	147.3717	144.2247	140.3923	134.5650	129.8327	124.7452	122.7901	126.6059	130.6303	135.9713	141.8884	146.9895
Energy conte	233.4008	205.3740	215.7778	184.2127	174.7798	153.3887	148.5040	156.7646	161.0802	184.5118	202.1461	230.1501
Energy content (annual)												Total = Sum(45)m =
Distribution loss (46)m = 0.15 x (45)m												2250.0906
	35.0101	30.8061	32.3667	27.6319	26.2170	23.0083	22.2756	23.5147	24.1620	27.6768	30.3219	34.5225
Water storage loss:												
Store volume												210.0000
a) If manufacturer declared loss factor is known (kWh/day):												1.8000
Temperature factor from Table 2b												0.7800

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Enter (49) or (54) in (55)												1.4040 (55)
Total storage loss	43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (56)
If cylinder contains dedicated solar storage	43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (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	331.7824	294.2348	314.1594	279.4207	273.1614	218.0207	215.2904	223.5510	225.7122	282.8934	297.3541	328.5317 (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	331.7824	294.2348	314.1594	279.4207	273.1614	218.0207	215.2904	223.5510	225.7122	282.8934	297.3541	328.5317 (64)
	Total per year (kWh/year) = Sum(64)m =											3284.1122 (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	121.4918	107.9259	115.6322	103.7211	102.0004	69.0113	67.9875	70.7341	71.5688	105.2362	109.6840	120.4110 (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	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.5648	36.0293	29.3010	22.1827	16.5818	13.9991	15.1265	19.6620	26.3903	33.5086	39.1094	41.6922 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	425.7884	430.2068	419.0727	395.3695	365.4485	337.3269	318.5400	314.1217	325.2558	348.9590	378.8800	407.0015 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446 (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)	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403 (71)
Water heating gains (Table 5)	163.2955	160.6040	155.4196	144.0571	137.0973	95.8491	91.3810	95.0728	99.4011	141.4466	152.3389	161.8427 (72)
Total internal gains	741.9634	739.1548	716.1080	673.9240	631.4423	559.4898	537.3623	541.1712	563.3618	636.2288	682.6430	722.8511 (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

Northeast					3.7000	12.9236	0.5200	0.8000			0.7700			13.7851 (75)
Southwest					11.8100	40.4699	0.5200	0.8000			0.7700			137.7872 (79)
Southeast					1.4000	30.0000	0.5200	0.8000			1.0000			15.7248 (82)

Solar gains	167.2971	265.8718	382.5316	525.6921	604.5793	656.1782	620.1367	557.8278	462.4607	320.6657	207.2900			140.5143 (83)
Total gains	909.2605	1005.0266	1098.6396	1199.6162	1236.0215	1215.6680	1157.4990	1098.9990	1025.8226	956.8945	889.9329			863.3654 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.9679	59.1159	59.1159	59.3393	59.3393	59.6398	59.5644	59.7154	59.6398	59.4892	59.4892	59.2646
alpha	4.9312	4.9411	4.9411	4.9560	4.9560	4.9760	4.9710	4.9810	4.9760	4.9659	4.9659	4.9510
util living area												
	0.8267	0.7659	0.6578	0.5100	0.3622	0.2299	0.1499	0.1626	0.3154	0.5375	0.7399	0.8464 (86)
Living	20.6915	20.7724	20.8631	20.9176	20.9343	20.9375	20.9377	20.9378	20.9365	20.9166	20.8204	20.6641
Non living	20.1822	20.2797	20.3862	20.4492	20.4670	20.4723	20.4718	20.4731	20.4715	20.4500	20.3409	20.1514
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	20.8422	20.7724	20.8631	20.9176	20.9343	20.9375	20.9377	20.9378	20.9365	20.9166	20.8204	20.7111 (87)
Th 2	20.5474	20.5485	20.5485	20.5501	20.5501	20.5523	20.5518	20.5529	20.5523	20.5512	20.5512	20.5496 (88)
util rest of house												
	0.8143	0.7514	0.6403	0.4908	0.3421	0.2093	0.1283	0.1399	0.2913	0.5140	0.7222	0.8348 (89)
MIT 2	20.4018	20.2797	20.3862	20.4492	20.4670	20.4723	20.4718	20.4731	20.4715	20.4500	20.3409	20.2231 (90)
Living area fraction									fLA =	Living area / (4) =		
MIT	20.5449	20.4398	20.5411	20.6013	20.6188	20.6234	20.6232	20.6240	20.6225	20.6016	20.4967	20.3817 (91)
Temperature adjustment												0.0000
adjusted MIT	20.5449	20.4398	20.5411	20.6013	20.6188	20.6234	20.6232	20.6240	20.6225	20.6016	20.4967	20.3817 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8143	0.7478	0.6400	0.4930	0.3452	0.2126	0.1317	0.1435	0.2951	0.5167	0.7200	0.8303 (94)
Useful gains	740.3742	751.5567	703.0887	591.4359	426.6923	258.4230	152.4506	157.6953	302.7019	494.4311	640.7530	716.8265 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W												
	873.4323	837.1095	741.2890	601.3881	428.1574	258.5149	152.4561	157.7038	303.1983	504.5938	700.5118	859.8737 (97)
Space heating kWh												
	98.9952	57.4915	28.4211	7.1655	1.0900	0.0000	0.0000	0.0000	0.0000	7.5610	43.0263	106.4271 (98a)
Space heating requirement - total per year (kWh/year)												350.1779
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												0.0000
	98.9952	57.4915	28.4211	7.1655	1.0900	0.0000	0.0000	0.0000	0.0000	7.5610	43.0263	106.4271 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												350.1779
Space heating per m2												
										(98c) / (4) =		2.9169 (99)

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8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	447.3150	341.5095	346.2302	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9968	0.9988	0.9984	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	445.8962	341.1086	345.6807	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1307.2481	1244.2330	1177.8682	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	620.1733	671.9246	619.1475	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	105.9021	114.7393	105.7270	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												326.3684 (107)

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 %)												202.9613 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Cooling System Energy Efficiency Ratio (see Table 10c)												0.5000 (209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	98.9952	57.4915	28.4211	7.1655	1.0900	0.0000	0.0000	0.0000	0.0000	7.5610	43.0263	106.4271 (98)
Space heating efficiency (main heating system 1)	202.9613	202.9613	202.9613	202.9613	202.9613	0.0000	0.0000	0.0000	0.0000	202.9613	202.9613	202.9613 (210)
Space heating fuel (main heating system)	48.7754	28.3263	14.0032	3.5305	0.5371	0.0000	0.0000	0.0000	0.0000	3.7254	21.1993	52.4371 (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	331.7824	294.2348	314.1594	279.4207	273.1614	218.0207	215.2904	223.5510	225.7122	282.8934	297.3541	328.5317 (64)
Efficiency of water heater	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043 (216)
Fuel for water heating, kWh/month	242.7007	215.2345	229.8094	204.3978	199.8191	159.4834	157.4861	163.5288	165.1097	206.9381	217.5162	240.3228 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	211.8043	229.4786	211.4539	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	48.3264	43.6497	48.3264	46.7675	48.3264	46.7675	48.3264	46.7675	48.3264	46.7675	48.3264	48.3264 (231)
Lighting	35.5061	28.4843	25.6470	18.7901	14.5140	11.8581	13.2401	17.2100	22.3541	29.3299	33.1280	36.4929 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-31.4436	-44.8355	-71.0304	-90.2650	-102.9814	-102.1788	-100.1088	-92.4958	-76.5758	-57.5557	-36.7510	-26.3838 (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)	-8.3489	-16.5882	-35.8961	-61.4909	-82.2460	-93.6175	-90.6461	-76.2528	-52.3924	-27.4210	-12.0013	-6.3235 (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												172.5343 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												136.7043
Water heating fuel used												2402.3466 (219)
Space cooling fuel												652.7369 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3860)	
mechanical ventilation fans (SFP = 1.3860)	569.0047 (230a)
Total electricity for the above, kWh/year	569.0047 (231)
Electricity for lighting (calculated in Appendix L)	286.5546 (232)

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

PV generation	-1395.8304 (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	2687.3468 (238)

10a. Fuel costs - using BEDF prices (550)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	172.5343	26.0600	44.9624 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2402.3466	26.0600	626.0515 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Space cooling	652.7369	26.0600	170.1032 (248)

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Pumps, fans and electric keep-hot	569.0047	26.0600	148.2826 (249)
Energy for lighting	286.5546	26.0600	74.6761 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-832.6056	26.0600	-216.9770
PV Unit electricity exported	-563.2247	5.8100	-32.7234
Total			-249.7004 (252)
Total energy cost			814.3756 (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	172.5343	0.1591	27.4558 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2402.3466	0.1415	340.0023 (264)
Space and water heating			367.4581 (265)
Space cooling	652.7369	0.1142	74.5715 (266)
Pumps, fans and electric keep-hot	569.0047	0.1387	78.9280 (267)
Energy for lighting	286.5546	0.1443	41.3587 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-832.6056	0.1326	-110.4209
PV Unit electricity exported	-563.2247	0.1230	-69.2634
Total			-179.6843 (269)
Total CO2, kg/year			382.6319 (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	172.5343	1.5890	274.1599 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2402.3466	1.5234	3659.6599 (278)
Space and water heating			3933.8198 (279)
Space cooling	652.7369	1.4210	927.5593 (280)
Pumps, fans and electric keep-hot	569.0047	1.5128	860.7903 (281)
Energy for lighting	286.5546	1.5338	439.5271 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-832.6056	1.4900	-1240.5995
PV Unit electricity exported	-563.2247	0.4512	-254.1177
Total			-1494.7172 (283)
Total Primary energy kWh/year			4666.9793 (286)

SAP 10 EPC IMPROVEMENTS

0530 Frederick Morphill L

Current energy efficiency rating: B 82
Current environmental impact rating: A 97

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 2.2	-£ 109	-55 kg (14.3%)

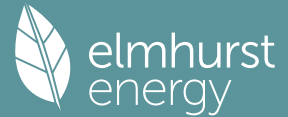
Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£109	0.46 kg/m²	B 84	A 97
Total Savings	£109	0.46 kg/m²		
Potential energy efficiency rating:			B 84	
Potential environmental impact rating:				A 97

Fuel prices for cost data on this page from database revision number 550 TEST (28 Jun 2024)
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	£1064	£950	£115
Space heating	£193	£214	-£21
Space cooling	£170	£170	£0
Water heating	£626	£491	£135
Lighting	£75	£75	£0
Generated (PV)	-£250	-£244	-£5
Total cost of fuels	£814	£706	£110
Total cost of uses	£814	£706	£109
Delivered energy	22 kWh/m²	19 kWh/m²	4 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.3 tonnes	0.1 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	39 kWh/m²	34 kWh/m²	5 kWh/m²

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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	57.4500 (1b)	x 3.0000 (2b)	= 172.3500 (1b) - (3b)
First floor	42.0000 (1c)	x 2.8000 (2c)	= 117.6000 (1c) - (3c)
Second floor	20.6000 (1d)	x 2.2600 (2d)	= 46.5560 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.0500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 336.5060 (5)

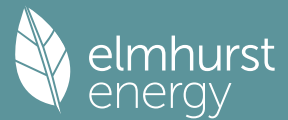
2. Ventilation rate

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		0.6000 (17)
Infiltration rate		0.0300 (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) =	0.0255 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 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	0.0325 0.0319 0.0312 0.0281 0.0274 0.0242 0.0242 0.0236 0.0255 0.0274 0.0287 0.0300	(22b)
Balanced mechanical ventilation with heat recovery		
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		68.8000 (23c)
Effective ac	0.1885 0.1879 0.1872 0.1841 0.1834 0.1802 0.1802 0.1796 0.1815 0.1834 0.1847 0.1860	(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
Door			2.3000	1.0000	2.3000		(26)
Windows (Uw = 0.67)			15.5100	0.6525	10.1205		(27)
Opening			1.4000	0.6525	0.9135		(27a)
Heatloss Floor 1			57.4500	0.1000	5.7450		(28a)
Exposed Bike Store			3.4700	0.1600	0.5552		(28b)
EWS 01	38.4900	16.8100	21.6800	0.1400	3.0352		(29a)
EWS 02	29.1300	1.0000	28.1300	0.1800	5.0634		(29a)
RFS 01	40.8000		40.8000	0.1200	4.8960		(30)
RFS 03	12.7000		12.7000	0.1000	1.2700		(30)
RFS 02	6.4000	1.4000	5.0000	0.0900	0.4500		(30)
Total net area of external elements Aum(A, m ²)			188.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.3488		(31)
Party Wall 1			88.5000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				8.0000	0.0100	0.0800	
E3 Sill				8.0000	0.0100	0.0800	
E4 Jamb				17.4000	0.0100	0.1740	
E5 Ground floor (normal)				39.2000	0.0100	0.3920	
E20 Exposed floor (normal)				2.4000	0.0100	0.0240	
E6 Intermediate floor within a dwelling				20.7000	0.0100	0.2070	
E15 Flat roof with parapet				51.0800	0.0100	0.5108	
E11 Eaves (insulation at rafter level)				4.0000	0.0100	0.0400	
E13 Gable (insulation at rafter level)				1.6000	0.0100	0.0160	
E16 Corner (normal)				12.0300	0.0100	0.1203	
E17 Corner (inverted - internal area greater than external area)				3.0000	0.0100	0.0300	
E18 Party wall between dwellings				23.2000	0.0100	0.2320	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.9061 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	36.2549 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 20.9337 Feb 20.8630 Mar 20.7922 Apr 20.4382 May 20.3674 Jun 20.0134 Jul 20.0134 Aug 19.9426 Sep 20.1550 Oct 20.3674 Nov 20.5090 Dec 20.6506						(38)
Heat transfer coeff	57.1886 57.1178 57.0470 56.6931 56.6223 56.2683 56.2683 56.1975 56.4099 56.6223 56.7639 56.9055						(39)
Average = Sum(39)m / 12 =							56.6754
HLP	Jan 0.4764 Feb 0.4758 Mar 0.4752 Apr 0.4722 May 0.4717 Jun 0.4687 Jul 0.4687 Aug 0.4681 Sep 0.4699 Oct 0.4717 Nov 0.4728 Dec 0.4740						(40)
HLP (average)							0.4721
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												2.8635 (42)
Hot water usage for mixer showers												71.9547 (42a)
Hot water usage for baths												31.0797 (42b)
Hot water usage for other uses												43.9552 (42c)
Average daily hot water use (litres/day)												135.4677 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	147.3717	144.2247	140.3923	134.5650	129.8327	124.7452	122.7901	126.6059	130.6303	135.9713	141.8884	146.9895 (44)
Energy content (annual)	233.4008	205.3740	215.7778	184.2127	174.7798	153.3887	148.5040	156.7646	161.0802	184.5118	202.1461	230.1501 (45)
Distribution loss (46)m = 0.15 x (45)m	35.0101	30.8061	32.3667	27.6319	26.2170	23.0083	22.2756	23.5147	24.1620	27.6768	30.3219	34.5225 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)
Temperature factor from Table 2b												0.7800 (49)
Enter (49) or (54) in (55)												1.4040 (55)
Total storage loss	43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (56)
If cylinder contains dedicated solar storage	43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (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	331.7824	294.2348	314.1594	279.4207	273.1614	218.0207	215.2904	223.5510	225.7122	282.8934	297.3541	328.5317 (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)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												649.6168 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												649.6168
Solar input	-0.0000	-16.1699	-59.7599	-83.8640	-112.3954	-101.3386	-100.9072	-87.2349	-59.0424	-28.9045	-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	331.7824	278.0650	254.3995	195.5567	160.7659	116.6821	114.3832	136.3161	166.6697	253.9889	297.3541	328.5317 (64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m =											2634.4953 (64)
	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	121.4918	107.9259	115.6322	103.7211	102.0004	69.0113	67.9875	70.7341	71.5688	105.2362	109.6840	120.4110 (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	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.5648	36.0293	29.3010	22.1827	16.5818	13.9991	15.1265	19.6620	26.3903	33.5086	39.1094	41.6922 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	425.7884	430.2068	419.0727	395.3695	365.4485	337.3269	318.5400	314.1217	325.2558	348.9590	378.8800	407.0015 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446 (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)	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403 (71)
Water heating gains (Table 5)	163.2955	160.6040	155.4196	144.0571	137.0973	95.8491	91.3810	95.0728	99.4011	141.4466	152.3389	161.8427 (72)
Total internal gains	741.9634	739.1548	716.1080	673.9240	631.4423	559.4898	537.3623	541.1712	563.3618	636.2288	682.6430	722.8511 (73)

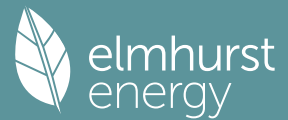
6. Solar gains

[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			
Northeast				3.7000	11.2829	0.5200	0.8000	0.7700	12.0351 (75)			
Southwest				11.8100	36.7938	0.5200	0.8000	0.7700	125.2713 (79)			
Southeast				1.4000	26.0000	0.5200	0.8000	1.0000	13.6282 (82)			
Solar gains	150.9346	266.1858	386.4171	512.8632	603.2679	610.9721	584.0656	515.1781	430.1918	300.3669	182.4867	128.0420 (83)
Total gains	892.8979	1005.3406	1102.5250	1186.7873	1234.7102	1170.4619	1121.4279	1056.3492	993.5536	936.5957	865.1297	850.8931 (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)	

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.3109	58.3832	58.4556	58.8206	58.8942	59.2646	59.2646	59.3393	59.1159	58.8942	58.7473	58.6011
alpha	4.8874	4.8922	4.8970	4.9214	4.9263	4.9510	4.9510	4.9560	4.9411	4.9263	4.9165	4.9067
util living area	0.8568	0.7913	0.6941	0.5609	0.4228	0.3070	0.2207	0.2445	0.3894	0.6034	0.7906	0.8752 (86)
Living	20.6209	20.7304	20.8337	20.9033	20.9295	20.9362	20.9373	20.9372	20.9335	20.8976	20.7621	20.5853
Non living	20.0915	20.2241	20.3471	20.4295	20.4587	20.4683	20.4692	20.4697	20.4646	20.4250	20.2669	20.0502
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	20.8061	20.7304	20.8337	20.9033	20.9295	20.9362	20.9373	20.9372	20.9335	20.8976	20.7621	20.6433 (87)
Th 2	20.5425	20.5431	20.5436	20.5463	20.5469	20.5496	20.5496	20.5501	20.5485	20.5469	20.5458	20.5447 (88)
util rest of house	0.8461	0.7779	0.6776	0.5421	0.4029	0.2856	0.1981	0.2207	0.3645	0.5808	0.7750	0.8654 (89)
MIT 2	20.3627	20.2241	20.3471	20.4295	20.4587	20.4683	20.4692	20.4697	20.4646	20.4250	20.2669	20.1393 (90)
Living area fraction									fLA = Living area /	(4) =		0.3249 (91)
MIT	20.5067	20.3886	20.5052	20.5834	20.6117	20.6203	20.6213	20.6216	20.6169	20.5785	20.4278	20.3030 (92)
Temperature adjustment												0.0000
adjusted MIT	20.5067	20.3886	20.5052	20.5834	20.6117	20.6203	20.6213	20.6216	20.6169	20.5785	20.4278	20.3030 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8452	0.7732	0.6762	0.5437	0.4057	0.2890	0.2017	0.2245	0.3683	0.5824	0.7708	0.8599 (94)
Useful gains	754.7214	777.3388	745.5123	645.2339	500.9468	338.2327	226.2041	237.1310	365.9121	545.4398	666.8849	731.7145 (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	926.8414	884.6755	798.9547	662.3705	504.5985	338.7524	226.2694	237.2433	367.6198	565.0077	756.5369	916.3508 (97)
Space heating kWh	128.0573	72.1303	39.7612	12.3383	2.7168	0.0000	0.0000	0.0000	0.0000	14.5586	64.5495	137.3694 (98a)
Space heating requirement - total per year (kWh/year)												471.4813
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	128.0573	72.1303	39.7612	12.3383	2.7168	0.0000	0.0000	0.0000	0.0000	14.5586	64.5495	137.3694 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												471.4813
Space heating per m2										(98c) / (4) =		3.9274 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	528.9223	416.3856	427.1013	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9920	0.9966	0.9950	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	524.6657	414.9600	424.9510	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1255.9142	1203.3109	1129.4337	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	526.4989	586.5331	524.1351	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area /	(4) =		0.6830 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	89.9061	100.1577	89.5025	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												279.5662 (107)

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 %)												203.2231 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Cooling System Energy Efficiency Ratio (see Table 10c)												0.5000 (209)
Space heating requirement	128.0573	72.1303	39.7612	12.3383	2.7168	0.0000	0.0000	0.0000	0.0000	14.5586	64.5495	137.3694 (98)
Space heating efficiency (main heating system 1)	203.2231	203.2231	203.2231	203.2231	203.2231	0.0000	0.0000	0.0000	0.0000	203.2231	203.2231	203.2231 (210)
Space heating fuel (main heating system)	63.0132	35.4931	19.5653	6.0713	1.3369	0.0000	0.0000	0.0000	0.0000	7.1638	31.7629	67.5954 (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	331.7824	278.0650	254.3995	195.5567	160.7659	116.6821	114.3832	136.3161	166.6697	253.9889	297.3541	328.5317 (64)
Efficiency of water heater												136.5082 (216)
(217)m	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082	136.5082 (217)
Fuel for water heating, kWh/month	243.0494	203.6983	186.3620	143.2563	117.7702	85.4763	83.7922	99.8593	122.0950	186.0613	217.8287	240.6681 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	179.8122	200.3153	179.0049	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	55.1209	49.7867	55.1209	53.3429	55.1209	53.3429	55.1209	53.3429	53.3429	55.1209	53.3429	55.1209 (231)
Lighting	35.5061	28.4843	25.6470	18.7901	14.5140	11.8581	13.2401	17.2100	22.3541	29.3299	33.1280	36.4929 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-28.3559	-44.2611	-70.0936	-85.8966	-98.0409	-92.4362	-91.2206	-83.8399	-70.5207	-53.7038	-32.5549	-23.9748 (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)												

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(233b)m	-6.9092	-16.1941	-36.4431	-60.9375	-86.0421	-89.4373	-87.8884	-71.0221	-48.0563	-24.6197	-9.6083	-5.3019	(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												232.0018	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												136.5082	
Water heating fuel used												1929.9171	(219)
Space cooling fuel												559.1325	(221)

Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3860)													
mechanical ventilation fans (SFP = 1.3860)												569.0047	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												649.0047	(231)
Electricity for lighting (calculated in Appendix L)												286.5546	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1317.3590	(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												2339.2517	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	232.0018	16.4900	38.2571 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1929.9171	16.4900	318.2433 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Space cooling	559.1325	16.4900	92.2009 (248)
Pumps, fans and electric keep-hot	569.0047	16.4900	93.8289 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	286.5546	16.4900	47.2529 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-774.8990	16.4900	-127.7808
PV Unit electricity exported	-542.4600	5.5900	-30.3235
Total			-158.1044 (252)
Total energy cost			444.8708 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.9703 (257)
SAP value		84.2709
SAP rating (Section 12)		84 (258)
SAP band		B

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

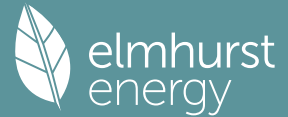
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	232.0018	0.1585	36.7767 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1929.9171	0.1450	279.8168 (264)
Space and water heating			316.5935 (265)
Space cooling	559.1325	0.1142	63.8610 (266)
Pumps, fans and electric keep-hot	569.0047	0.1387	90.0250 (267)
Energy for lighting	286.5546	0.1443	41.3587 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-774.8990	0.1329	-102.9915
PV Unit electricity exported	-542.4600	0.1231	-66.7546
Total			-169.7462 (269)
Total CO2, kg/year			342.0920 (272)
CO2 emissions per m2			2.8500 (273)
EI value			97.2226
EI rating			97 (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	57.4500 (1b)	x 3.0000 (2b)	= 172.3500 (1b) - (3b)

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First floor 42.0000 (1c) x 2.8000 (2c) = 117.6000 (1c) - (3c)
Second floor 20.6000 (1d) x 2.2600 (2d) = 46.5560 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 120.0500 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 336.5060 (5)

2. Ventilation rate

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

Air changes per hour
0.0000 / (5) = 0.0000 (8)
Yes
Blower Door
0.6000 (17)
0.0300 (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) = 0.0255 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.0268	0.0255	0.0255	0.0236	0.0236	0.0210	0.0217	0.0204	0.0210	0.0223	0.0223	0.0242 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												68.8000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.1828	0.1815	0.1815	0.1796	0.1796	0.1770	0.1777	0.1764	0.1770	0.1783	0.1783	0.1802 (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
Door			2.3000	1.0000	2.3000		(26)
Windows (Uw = 0.67)			15.5100	0.6525	10.1205		(27)
Opening			1.4000	0.6525	0.9135		(27a)
Heatloss Floor 1			57.4500	0.1000	5.7450		(28a)
Exposed Bike Store			3.4700	0.1600	0.5552		(28b)
EWS 01	38.4900	16.8100	21.6800	0.1400	3.0352		(29a)
EWS 02	29.1300	1.0000	28.1300	0.1800	5.0634		(29a)
RFS 01	40.8000		40.8000	0.1200	4.8960		(30)
RFS 03	12.7000		12.7000	0.1000	1.2700		(30)
RFS 02	6.4000	1.4000	5.0000	0.0900	0.4500		(30)
Total net area of external elements Aum(A, m2)			188.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.3488		(33)
Party Wall 1			88.5000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.0000	0.0100	0.0800
E3 Sill	8.0000	0.0100	0.0800
E4 Jamb	17.4000	0.0100	0.1740
E5 Ground floor (normal)	39.2000	0.0100	0.3920
E20 Exposed floor (normal)	2.4000	0.0100	0.0240
E6 Intermediate floor within a dwelling	20.7000	0.0100	0.2070
E15 Flat roof with parapet	51.0800	0.0100	0.5108
E11 Eaves (insulation at rafter level)	4.0000	0.0100	0.0400
E13 Gable (insulation at rafter level)	1.6000	0.0100	0.0160
E16 Corner (normal)	12.0300	0.0100	0.1203
E17 Corner (inverted - internal area greater than external area)	3.0000	0.0100	0.0300
E18 Party wall between dwellings	23.2000	0.0100	0.2320

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 1.9061 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.2549 (37)

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

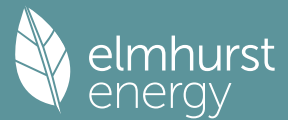
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	20.2966	20.1550	20.1550	19.9426	19.9426	19.6595	19.7303	19.5887	19.6595	19.8011	19.8011	20.0134 (38)
Heat transfer coeff	56.5515	56.4099	56.4099	56.1975	56.1975	55.9144	55.9852	55.8436	55.9144	56.0560	56.0560	56.2683 (39)
Average = Sum(39)m / 12 =												56.1503

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.4711	0.4699	0.4699	0.4681	0.4681	0.4658	0.4663	0.4652	0.4658	0.4669	0.4669	0.4687 (40)
HLP (average)												0.4677
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8635 (42)
Hot water usage for mixer showers 72.2314 71.1459 69.5641 66.5377 64.3042 61.8135 60.3978 61.9676 63.6884 66.3627 69.4542 71.9547 (42a)
Hot water usage for baths 31.1851 30.7220 30.0698 28.8672 27.9668 26.9683 26.4290 27.0766 27.7818 28.8502 30.0775 31.0797 (42b)
Hot water usage for other uses

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Average daily hot water use (litres/day)	43.9552	42.3568	40.7584	39.1601	37.5617	35.9633	35.9633	37.5617	39.1601	40.7584	42.3568	43.9552 (42c) 135.4677 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	147.3717	144.2247	140.3923	134.5650	129.8327	124.7452	122.7901	126.6059	130.6303	135.9713	141.8884	146.9895 (44)
Energy content (annual)	233.4008	205.3740	215.7778	184.2127	174.7798	153.3887	148.5040	156.7646	161.0802	184.5118	202.1461	230.1501 (45)
Distribution loss (46)m = 0.15 x (45)m	35.0101	30.8061	32.3667	27.6319	26.2170	23.0083	22.2756	23.5147	24.1620	27.6768	30.3219	34.5225 (46)
Water storage loss:												210.0000 (47)
Store volume												1.8000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.7800 (49)
Temperature factor from Table 2b												1.4040 (55)
Enter (49) or (54) in (55)												
Total storage loss	43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (56)
If cylinder contains dedicated solar storage	43.5240	39.3120	43.5240	42.1200	43.5240	42.1200	43.5240	43.5240	42.1200	43.5240	42.1200	43.5240 (57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576 (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	331.7824	294.2348	314.1594	279.4207	273.1614	218.0207	215.2904	223.5510	225.7122	282.8934	297.3541	328.5317 (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)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												710.3400 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												710.3400
Solar input	-0.0000	-17.5828	-60.8308	-88.6043	-114.6186	-111.8442	-109.9685	-98.6484	-68.1523	-36.1480	-3.9423	-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	331.7824	276.6521	253.3286	190.8165	158.5428	106.1765	105.3219	124.9026	157.5599	246.7454	293.4118	328.5317 (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)
Heat gains from water heating, kWh/month	121.4918	107.9259	115.6322	103.7211	102.0004	69.0113	67.9875	70.7341	71.5688	105.2362	109.6840	120.4110 (65)
Total per year (kWh/year) = Sum(64)m =												2573.7721 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104	171.8104 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.5648	36.0293	29.3010	22.1827	16.5818	13.9991	15.1265	19.6620	26.3903	33.5086	39.1094	41.6922 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	425.7884	430.2068	419.0727	395.3695	365.4485	337.3269	318.5400	314.1217	325.2558	348.9590	378.8800	407.0015 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446	55.0446 (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)	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403	-114.5403 (71)
Water heating gains (Table 5)	163.2955	160.6040	155.4196	144.0571	137.0973	95.8491	91.3810	95.0728	99.4011	141.4466	152.3389	161.8427 (72)
Total internal gains	741.9634	739.1548	716.1080	673.9240	631.4423	559.4898	537.3623	541.1712	563.3618	636.2288	682.6430	722.8511 (73)

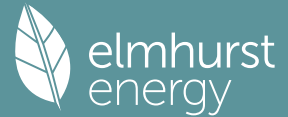
6. Solar gains

[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
Northeast				3.7000	12.9236		0.5200		0.8000		0.7700	13.7851 (75)
Southwest				11.8100	40.4699		0.5200		0.8000		0.7700	137.7872 (79)
Southeast				1.4000	30.0000		0.5200		0.8000		1.0000	15.7248 (82)
Solar gains	167.2971	265.8718	382.5316	525.6921	604.5793	656.1782	620.1367	557.8278	462.4607	320.6657	207.2900	140.5143 (83)
Total gains	909.2605	1005.0266	1098.6396	1199.6162	1236.0215	1215.6680	1157.4990	1098.9990	1025.8226	956.8945	889.9329	863.3654 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.9679	59.1159	59.1159	59.3393	59.3393	59.6398	59.5644	59.7154	59.6398	59.4892	59.4892	59.2646
alpha	4.9312	4.9411	4.9411	4.9560	4.9560	4.9760	4.9710	4.9810	4.9760	4.9659	4.9659	4.9510
util living area	0.8267	0.7659	0.6578	0.5100	0.3622	0.2299	0.1499	0.1626	0.3154	0.5375	0.7399	0.8464 (86)
Living	20.6915	20.7724	20.8631	20.9176	20.9343	20.9375	20.9377	20.9378	20.9365	20.9166	20.8204	20.6641
Non living	20.1822	20.2797	20.3862	20.4492	20.4670	20.4723	20.4718	20.4731	20.4715	20.4500	20.3409	20.1514
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	20.8422	20.7724	20.8631	20.9176	20.9343	20.9375	20.9377	20.9378	20.9365	20.9166	20.8204	20.7111 (87)
Th 2	20.5474	20.5485	20.5485	20.5501	20.5501	20.5523	20.5518	20.5529	20.5523	20.5512	20.5512	20.5496 (88)

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util rest of house	0.8143	0.7514	0.6403	0.4908	0.3421	0.2093	0.1283	0.1399	0.2913	0.5140	0.7222	0.8348 (89)
MIT 2	20.4018	20.2797	20.3862	20.4492	20.4670	20.4723	20.4718	20.4731	20.4715	20.4500	20.3409	20.2231 (90)
Living area fraction									fLA = Living area / (4) =			0.3249 (91)
MIT	20.5449	20.4398	20.5411	20.6013	20.6188	20.6234	20.6232	20.6240	20.6225	20.6016	20.4967	20.3817 (92)
Temperature adjustment												0.0000
adjusted MIT	20.5449	20.4398	20.5411	20.6013	20.6188	20.6234	20.6232	20.6240	20.6225	20.6016	20.4967	20.3817 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8143	0.7478	0.6400	0.4930	0.3452	0.2126	0.1317	0.1435	0.2951	0.5167	0.7200	0.8303	(94)
Useful gains	740.3742	751.5567	703.0887	591.4359	426.6923	258.4230	152.4506	157.6953	302.7019	494.4311	640.7530	716.8265	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	873.4323	837.1095	741.2890	601.3881	428.1574	258.5149	152.4561	157.7038	303.1983	504.5938	700.5118	859.8737	(97)
Space heating kWh	98.9952	57.4915	28.4211	7.1655	1.0900	0.0000	0.0000	0.0000	0.0000	7.5610	43.0263	106.4271	(98a)
Space heating requirement - total per year (kWh/year)												350.1779	
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	98.9952	57.4915	28.4211	7.1655	1.0900	0.0000	0.0000	0.0000	0.0000	7.5610	43.0263	106.4271	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												350.1779	
Space heating per m2										(98c) / (4) =		2.9169	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	447.3150	341.5095	346.2302	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9968	0.9988	0.9984	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	445.8962	341.1086	345.6807	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1307.2481	1244.2330	1177.8682	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	620.1733	671.9246	619.1475	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			0.6830	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	105.9021	114.7393	105.7270	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												326.3684	(107)

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

Fraction of space heat from secondary/supplementary system (Table 11)

Fraction of space heat from main system(s)												0.0000 (201)
Efficiency of main space heating system 1 (in %)												1.0000 (202)
Efficiency of main space heating system 2 (in %)												202.9613 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (207)
Cooling System Energy Efficiency Ratio (see Table 10c)												0.0000 (208)
												0.5000 (209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	98.9952	57.4915	28.4211	7.1655	1.0900	0.0000	0.0000	0.0000	0.0000	7.5610	43.0263	106.4271	(98)
Space heating efficiency (main heating system 1)	202.9613	202.9613	202.9613	202.9613	202.9613	0.0000	0.0000	0.0000	0.0000	202.9613	202.9613	202.9613	(210)
Space heating fuel (main heating system)	48.7754	28.3263	14.0032	3.5305	0.5371	0.0000	0.0000	0.0000	0.0000	3.7254	21.1993	52.4371	(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	331.7824	276.6521	253.3286	190.8165	158.5428	106.1765	105.3219	124.9026	157.5599	246.7454	293.4118	328.5317	(64)
Efficiency of water heater (217)m	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043	136.7043	(216)
Fuel for water heating, kWh/month	242.7007	202.3725	185.3113	139.5833	115.9750	77.6687	77.0436	91.3669	115.2559	180.4957	214.6324	240.3228	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	211.8043	229.4786	211.4539	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	55.1209	49.7867	55.1209	53.3429	55.1209	53.3429	55.1209	55.1209	53.3429	55.1209	53.3429	55.1209	(231)
Lighting	35.5061	28.4843	25.6470	18.7901	14.5140	11.8581	13.2401	17.2100	22.3541	29.3299	33.1280	36.4929	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-31.4796	-44.7569	-70.1325	-87.6780	-98.2807	-96.2907	-94.4654	-88.2878	-74.6533	-57.1490	-36.7830	-26.4118	(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	-8.3130	-16.6668	-36.7940	-64.0779	-86.9468	-99.5056	-96.2895	-80.4608	-54.3149	-27.8277	-11.9693	-6.2955	(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												172.5343	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												136.7043	
Water heating fuel used												1882.7289	(219)

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Space cooling fuel	652.7369 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3860)	
mechanical ventilation fans (SFP = 1.3860)	569.0047 (230a)
pump for solar water heating	80.0000 (230g)
Total electricity for the above, kWh/year	649.0047 (231)
Electricity for lighting (calculated in Appendix L)	286.5546 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1395.8304 (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	2247.7290 (238)

10a. Fuel costs - using BEDF prices (550)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	172.5343	26.0600	44.9624 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1882.7289	26.0600	490.6391 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Space cooling	652.7369	26.0600	170.1032 (248)
Pumps, fans and electric keep-hot	569.0047	26.0600	148.2826 (249)
Pump for solar water heating	80.0000	26.0600	20.8480 (249)
Energy for lighting	286.5546	26.0600	74.6761 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-806.3686	26.0600	-210.1397
PV Unit electricity exported	-589.4618	5.8100	-34.2477
Total			-244.3874 (252)
Total energy cost			705.1242 (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	172.5343	0.1591	27.4558 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1882.7289	0.1455	273.8575 (264)
Space and water heating			301.3133 (265)
Space cooling	652.7369	0.1142	74.5715 (266)
Pumps, fans and electric keep-hot	649.0047	0.1387	90.0250 (267)
Energy for lighting	286.5546	0.1443	41.3587 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-806.3686	0.1329	-107.2016
PV Unit electricity exported	-589.4618	0.1225	-72.2220
Total			-179.4236 (269)
Total CO2, kg/year			327.8448 (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	172.5343	1.5890	274.1599 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1882.7289	1.5381	2895.7713 (278)
Space and water heating			3169.9312 (279)
Space cooling	652.7369	1.4210	927.5593 (280)
Pumps, fans and electric keep-hot	649.0047	1.5128	981.8143 (281)
Energy for lighting	286.5546	1.5338	439.5271 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-806.3686	1.4912	-1202.4853
PV Unit electricity exported	-589.4618	0.4495	-264.9536
Total			-1467.4390 (283)
Total Primary energy kWh/year			4051.3930 (286)