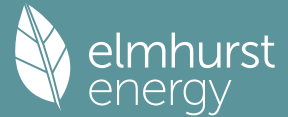


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Property Reference	0530 Frederick Morphill House				Issued on Date	01/08/2024
Assessment Reference	0530 Frederick Morphill R		Prop Type Ref			
Property						
SAP Rating	82 B	DER	3.45	TER	12.07	
Environmental	97 A	% DER < TER				71.42
CO ₂ Emissions (t/year)	0.38	DFEE	23.57	TFEE	47.40	
Compliance Check	See BREL	% DFEE < TFEE				50.28
% DPER < TPER	34.53	DPER	41.46	TPER	63.32	
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	57.5000 (1b)	x	3.0000 (2b)	=	172.5000 (1b)	- (3b)
First floor	37.1000 (1c)	x	2.8000 (2c)	=	103.8800 (1c)	- (3c)
Second floor	20.1000 (1d)	x	2.2600 (2d)	=	45.4260 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.7000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	321.8060	(5)

2. Ventilation rate

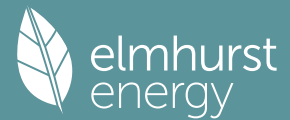
		m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)	
Number of open flues	0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =	0.0000 (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	1.2000	2.7600			(26)
Windows (Uw = 0.67)			15.5100	0.6525	10.1205			(27)
Opening			1.4000	0.6525	0.9135			(27a)
Heatloss Floor 1			57.5000	0.1000	5.7500			(28a)
Exposed Bike Store			0.6000	0.1600	0.0960			(28b)
EWS 01	41.9000	16.8100	25.0900	0.1400	3.5126			(29a)
EWS 02	29.3500	1.0000	28.3500	0.1800	5.1030			(29a)
RFS 01	41.0000		41.0000	0.1200	4.9200			(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)			189.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.8956			(33)
Party Wall 1			147.8000	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)	39.4700	0.0100	0.3947
E20 Exposed floor (normal)	2.4000	0.0100	0.0240
E6 Intermediate floor within a dwelling	21.4800	0.0100	0.2148
E15 Flat roof with parapet	56.7300	0.0100	0.5673
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)	5.8000	0.0100	0.0580
E18 Party wall between dwellings	23.2000	0.0100	0.2320

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

2.0011 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 36.8967 (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	20.0193	19.9516	19.8839	19.5454	19.4777	19.1392	19.1392	19.0715	19.2746	19.4777	19.6131	19.7485
Heat transfer coeff	56.9160	56.8483	56.7806	56.4421	56.3744	56.0359	56.0359	55.9682	56.1713	56.3744	56.5098	56.6452
Average = Sum(39)m / 12 =												56.4251

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.4962	0.4956	0.4950	0.4921	0.4915	0.4885	0.4885	0.4880	0.4897	0.4915	0.4927	0.4939
HLP (average)												0.4919
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8403 (42)
Hot water usage for mixer showers	71.8421	70.7624	69.1892	66.1790	63.9576	61.4803	60.0722	61.6336	63.3451	66.0050	69.0798	71.5668 (42a)
Hot water usage for baths	31.0177	30.5570	29.9083	28.7122	27.8166	26.8235	26.2871	26.9312	27.6326	28.6953	29.9160	30.9128 (42b)
Hot water usage for other uses	43.7174	42.1276	40.5379	38.9482	37.3585	35.7687	35.7687	37.3585	38.9482	40.5379	42.1276	43.7174 (42c)
Average daily hot water use (litres/day)												134.7373 (43)
Daily hot water use	146.5771	143.4471	139.6354	133.8394	129.1327	124.0726	122.1281	125.9233	129.9259	135.2381	141.1234	146.1970 (44)
Energy conte	232.1423	204.2667	214.6144	183.2195	173.8374	152.5617	147.7033	155.9193	160.2116	183.5169	201.0561	228.9091 (45)
Energy content (annual)										Total = Sum(45)m =		2237.9583
Distribution loss (46)m = 0.15 x (45)m	34.8213	30.6400	32.1922	27.4829	26.0756	22.8843	22.1555	23.3879	24.0317	27.5275	30.1584	34.3364 (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	330.5239	293.1275	312.9960	278.4275	272.2190	217.1937	214.4897	222.7057	224.8436	281.8985	296.2641	327.2907 (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	330.5239	293.1275	312.9960	278.4275	272.2190	217.1937	214.4897	222.7057	224.8436	281.8985	296.2641	327.2907 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3271.9799 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	121.0734	107.5577	115.2454	103.3909	101.6870	68.7364	67.7213	70.4531	71.2800	104.9054	109.3216	119.9984 (65)

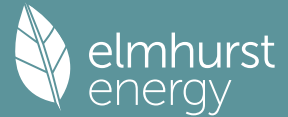
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.8866	163.7316	147.8866	152.8161	147.8866	152.8161	147.8866	147.8866	152.8161	147.8866	152.8161	147.8866 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	278.1432	281.0295	273.7562	258.2723	238.7266	220.3564	208.0840	205.1977	212.4710	227.9549	247.5006	265.8708 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014 (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)	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114 (71)
Water heating gains (Table 5)	162.7330	160.0561	154.8997	143.5984	136.6761	95.4672	91.0232	94.6950	99.0000	141.0019	151.8355	161.2881 (72)
Total internal gains	654.3671	670.4215	642.1468	620.2911	588.8936	534.2440	512.5981	513.3836	529.8914	582.4477	617.7566	640.6498 (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
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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	805.3017	936.6073	1028.5638	1133.1544	1192.1615	1145.2161	1096.6637	1028.5617	960.0831	882.8146	800.2432	768.6918 (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	55.9792	56.0459	56.1127	56.4492	56.5170	56.8584	56.8584	56.9272	56.7214	56.5170	56.3816	56.2468
alpha	4.7319	4.7364	4.7408	4.7633	4.7678	4.7906	4.7906	4.7951	4.7814	4.7678	4.7588	4.7498
util living area	0.8863	0.8160	0.7234	0.5800	0.4348	0.3123	0.2247	0.2501	0.4005	0.6291	0.8186	0.9014 (86)
Living	20.5265	20.6743	20.7980	20.8906	20.9249	20.9337	20.9351	20.9350	20.9300	20.8817	20.7097	20.4883
Non living	19.9597	20.1399	20.2879	20.3973	20.4353	20.4470	20.4482	20.4487	20.4425	20.3896	20.1878	19.9147
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	20.7578	20.6743	20.7980	20.8906	20.9249	20.9337	20.9351	20.9350	20.9300	20.8817	20.7097	20.5598 (87)
Th 2	20.5243	20.5248	20.5254	20.5281	20.5286	20.5313	20.5313	20.5319	20.5303	20.5286	20.5276	20.5265 (88)
util rest of house	0.8769	0.8031	0.7067	0.5603	0.4137	0.2897	0.2008	0.2247	0.3740	0.6055	0.8037	0.8929 (89)
MIT 2	20.2992	20.1399	20.2879	20.3973	20.4353	20.4470	20.4482	20.4487	20.4425	20.3896	20.1878	20.0250 (90)
Living area fraction									fLA = Living area / (4) =			0.3400 (91)
MIT	20.4551	20.3216	20.4613	20.5650	20.6017	20.6125	20.6138	20.6141	20.6083	20.5569	20.3653	20.2068 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4551	20.3216	20.4613	20.5650	20.6017	20.6125	20.6138	20.6141	20.6083	20.5569	20.3653	20.2068 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8754	0.7973	0.7044	0.5619	0.4170	0.2936	0.2050	0.2292	0.3784	0.6070	0.7983	0.8867 (94)
Useful gains	704.9965	746.7663	724.5697	636.6744	497.1032	336.2388	224.8257	235.6981	363.3309	535.8478	638.8294	681.5786 (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	919.4855	876.6925	792.7331	658.3970	501.8304	336.9165	224.9162	235.8539	365.5772	561.3146	749.6183	906.7094 (97)
Space heating kWh	159.5798	87.3104	50.7135	15.6403	3.5171	0.0000	0.0000	0.0000	0.0000	18.9473	79.7680	167.4973 (98a)
Space heating requirement - total per year (kWh/year)												582.9736
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	159.5798	87.3104	50.7135	15.6403	3.5171	0.0000	0.0000	0.0000	0.0000	18.9473	79.7680	167.4973 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												582.9736
Space heating per m2										(98c) / (4) =		5.0826 (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	526.7371	414.6654	425.3580	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9906	0.9959	0.9940	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	521.7865	412.9542	422.8061	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1245.9878	1193.8398	1119.8974	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	521.4249	580.9788	518.6360	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			0.7149 (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	93.1928	103.8367	92.6943	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												289.7237 (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 %)												203.0989 (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	159.5798	87.3104	50.7135	15.6403	3.5171	0.0000	0.0000	0.0000	0.0000	18.9473	79.7680	167.4973 (98)
Space heating efficiency (main heating system 1)	203.0989	203.0989	203.0989	203.0989	203.0989	0.0000	0.0000	0.0000	0.0000	203.0989	203.0989	203.0989 (210)
Space heating fuel (main heating system)	78.5725	42.9891	24.9699	7.7008	1.7317	0.0000	0.0000	0.0000	0.0000	9.3291	39.2754	82.4708 (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	330.5239	293.1275	312.9960	278.4275	272.2190	217.1937	214.4897	222.7057	224.8436	281.8985	296.2641	327.2907 (64)
Efficiency of water heater												136.6012 (216)

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(217)m	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	(217)
Fuel for water heating, kWh/month	241.9627	214.5864	229.1313	203.8251	199.2801	158.9984	157.0189	163.0335	164.5986	206.3661	216.8826	239.5958	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	186.3855	207.6733	185.3886	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	46.2153	41.7429	46.2153	44.7245	46.2153	44.7245	46.2153	44.7245	46.2153	44.7245	46.2153	46.2153	(231)
Lighting	34.2869	27.5063	24.7663	18.1449	14.0156	11.4509	12.7855	16.6191	21.5866	28.3228	31.9905	35.2399	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.3402	-44.2846	-70.8127	-87.8470	-102.0427	-96.6285	-95.3484	-86.6141	-71.6122	-53.8149	-32.4851	-23.9612	(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	-6.9250	-16.1706	-35.7240	-58.9870	-82.0403	-85.2450	-83.7606	-68.2479	-46.9647	-24.5086	-9.6781	-5.3155	(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												287.0393	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												136.6012	
Water heating fuel used												2395.2796	(219)
Space cooling fuel												579.4475	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3860)													
mechanical ventilation fans (SFP = 1.3860)												544.1482	(230a)
Total electricity for the above, kWh/year												544.1482	(231)
Electricity for lighting (calculated in Appendix L)												276.7152	(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												2765.2709	(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	287.0393	0.1584	45.4779 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2395.2796	0.1415	339.0017 (264)
Space and water heating			384.4795 (265)
Space cooling	579.4475	0.1142	66.1815 (266)
Pumps, fans and electric keep-hot	544.1482	0.1387	75.4801 (267)
Energy for lighting	276.7152	0.1443	39.9386 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-793.7917	0.1327	-105.3174
PV Unit electricity exported	-523.5673	0.1234	-64.6097
Total			-169.9271 (269)
Total CO2, kg/year			396.1526 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4500 (273)

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

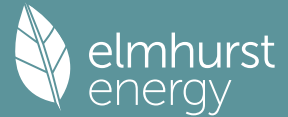
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	287.0393	1.5864	455.3701 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2395.2796	1.5234	3648.8927 (278)
Space and water heating			4104.2628 (279)
Space cooling	579.4475	1.4209	823.3551 (280)
Pumps, fans and electric keep-hot	544.1482	1.5128	823.1874 (281)
Energy for lighting	276.7152	1.5338	424.4351 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-793.7917	1.4902	-1182.9421
PV Unit electricity exported	-523.5673	0.4528	-237.0974
Total			-1420.0394 (283)
Total Primary energy kWh/year			4755.2009 (286)
Dwelling Primary energy Rate (DPER)			41.4600 (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	57.5000 (1b)	x 3.0000 (2b)	= 172.5000 (1b) - (3b)
First floor	37.1000 (1c)	x 2.8000 (2c)	= 103.8800 (1c) - (3c)

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Second floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 114.7000 20.1000 (1d) x 2.2600 (2d) = 45.4260 (1d) - (3d)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 321.8060 (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)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1243 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3743 (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) = 0.3182 (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	0.4056	0.3977	0.3897	0.3500	0.3420	0.3022	0.3022	0.2943	0.3182	0.3420	0.3579	0.3738 (22b)
Effective ac	0.5823	0.5791	0.5759	0.5612	0.5585	0.5457	0.5457	0.5433	0.5506	0.5585	0.5641	0.5699 (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			57.5000	0.1300	7.4750		(28a)
Exposed Bike Store			0.6000	0.1300	0.0780		(28b)
EWS 01	41.9000	16.8100	25.0900	0.1800	4.5162		(29a)
EWS 02	29.3500	1.0000	28.3500	0.1800	5.1030		(29a)
RFS 01	41.0000		41.0000	0.1100	4.5100		(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)			189.4500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.5196		(33)
Party Wall 1			147.8000	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)	39.4700	0.1600	6.3152
E20 Exposed floor (normal)	2.4000	0.3200	0.7680
E6 Intermediate floor within a dwelling	21.4800	0.0000	0.0000
E15 Flat roof with parapet	56.7300	0.5600	31.7688
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)	5.8000	-0.0900	-0.5220
E18 Party wall between dwellings	23.2000	0.0600	1.3920

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 42.7627 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 89.2823 (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	61.8352	61.4959	61.1634	59.6013	59.3091	57.9486	57.9486	57.6967	58.4727	59.3091	59.9003	60.5184 (38)
Heat transfer coeff	151.1175	150.7782	150.4457	148.8837	148.5914	147.2310	147.2310	146.9790	147.7550	148.5914	149.1826	149.8007 (39)
Average = Sum(39)m / 12 =												148.8823

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3175	1.3145	1.3116	1.2980	1.2955	1.2836	1.2836	1.2814	1.2882	1.2955	1.3006	1.3060 (40)
HLP (average)												1.2980
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8403 (42)

Hot water usage for mixer showers 71.8421 70.7624 69.1892 66.1790 63.9576 61.4803 60.0722 61.6336 63.3451 66.0050 69.0798 71.5668 (42a)

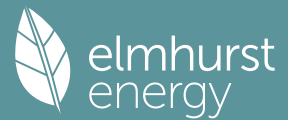
Hot water usage for baths 31.0177 30.5570 29.9083 28.7122 27.8166 26.8235 26.2871 26.9312 27.6326 28.6953 29.9160 30.9128 (42b)

Hot water usage for other uses 43.7174 42.1276 40.5379 38.9482 37.3585 35.7687 35.7687 37.3585 38.9482 40.5379 42.1276 43.7174 (42c)

Average daily hot water use (litres/day) 134.7373 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	146.5771	143.4471	139.6354	133.8394	129.1327	124.0726	122.1281	125.9233	129.9259	135.2381	141.1234	146.1970 (44)

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Energy content (annual)	232.1423	204.2667	214.6144	183.2195	173.8374	152.5617	147.7033	155.9193	160.2116	183.5169	201.0561	228.9091 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2237.9583
34.8213	30.6400	32.1922	27.4829	26.0756	22.8843	22.1555	23.3879	24.0317	27.5275	30.1584	34.3364 (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												
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)	
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 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month												
283.8889	251.0056	266.3610	233.2968	225.5840	202.6390	199.4499	207.6659	210.2890	235.2635	251.1335	280.6557 (62)	
WWHRS	-32.8432	-29.0468	-30.4161	-25.1858	-23.4722	-20.0853	-18.8268	-20.0204	-20.7811	-24.4986	-27.7539	-32.2350 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h												
251.0457	221.9588	235.9448	208.1111	202.1118	182.5537	180.6231	187.6455	189.5079	210.7649	223.3796	248.4207 (64)	
12Total per year (kWh/year)												2542.0675 (64)
Electric shower(s)												2542 (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												
118.5846	105.3098	112.7566	100.9824	99.1982	90.7886	90.5086	93.2404	93.3322	102.4166	106.9130	117.5096 (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	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
148.3164	164.2074	148.3164	153.2602	148.3164	153.2602	148.3164	148.3164	153.2602	148.3164	153.2602	148.3164	148.3164 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
278.1432	281.0295	273.7562	258.2723	238.7266	220.3564	208.0840	205.1977	212.4710	227.9549	247.5006	265.8708	265.8708 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014 (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)													
-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114 (71)	
Water heating gains (Table 5)													
159.3879	156.7110	151.5545	140.2533	133.3309	126.0953	121.6514	125.3232	129.6281	137.6568	148.4903	157.9429	157.9429 (72)	
Total internal gains	654.4517	670.5521	642.2314	620.3901	588.9782	565.3162	543.6560	544.4415	560.9636	582.5323	617.8555	640.7344 (73)	

6. Solar gains

[Jan]				Area	Solar flux	g		FF		Access	Gains	
				m2	Table 6a	or Table 6b		or Table 6c		factor	W	
					W/m2					Table 6d		
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	814.4569	952.7347	1051.8706	1164.0744	1228.5002	1213.0054	1162.8217	1090.5798	1017.0083	900.9501	811.3089	776.4712 (84)

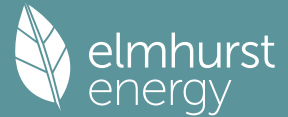
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	21.0837	21.1311	21.1778	21.4000	21.4421	21.6402	21.6402	21.6773	21.5635	21.4421	21.3571	21.2690	
alpha	2.4056	2.4087	2.4119	2.4267	2.4295	2.4427	2.4427	2.4452	2.4376	2.4295	2.4238	2.4179	
util living area	0.9544	0.9334	0.9028	0.8420	0.7488	0.6157	0.4889	0.5293	0.7100	0.8666	0.9348	0.9590 (86)	
MIT	18.0656	18.4127	18.9261	19.6110	20.2181	20.6680	20.8652	20.8319	20.4953	19.7059	18.7776	18.0112 (87)	
Th 2	19.8271	19.8295	19.8317	19.8424	19.8444	19.8537	19.8537	19.8554	19.8501	19.8444	19.8403	19.8361 (88)	
util rest of house	0.9474	0.9232	0.8873	0.8154	0.7031	0.5399	0.3828	0.4243	0.6430	0.8385	0.9230	0.9526 (89)	
MIT 2	16.4315	16.8694	17.5150	18.3668	19.0919	19.5951	19.7798	19.7570	19.4242	18.5017	17.3431	16.3675 (90)	
Living area fraction									fLA = Living area / (4) =				0.3400 (91)
MIT	16.9871	17.3942	17.9948	18.7898	19.4748	19.9599	20.1489	20.1225	19.7884	18.9111	17.8308	16.9264 (92)	
Temperature adjustment												0.0000	
adjusted MIT	16.9871	17.3942	17.9948	18.7898	19.4748	19.9599	20.1489	20.1225	19.7884	18.9111	17.8308	16.9264 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9224	0.8939	0.8554	0.7859	0.6863	0.5476	0.4119	0.4507	0.6389	0.8098	0.8948	0.9292 (94)	
Useful gains	751.2950	851.6916	899.7519	914.8386	843.1678	664.2282	478.9622	491.4776	649.8145	729.5755	725.9237	721.4678 (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	1917.2422	1883.8483	1729.3364	1472.4335	1155.2712	789.1489	522.5029	547.1227	840.4854	1234.9652	1600.8565	1906.4174 (97)	
Space heating kWh	867.4647	693.6093	617.2109	401.4684	232.2049	0.0000	0.0000	0.0000	0.0000	376.0099	629.9516	881.6025 (98a)	
Space heating requirement - total per year (kWh/year)												4699.5222	
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	867.4647	693.6093	617.2109	401.4684	232.2049	0.0000	0.0000	0.0000	0.0000	376.0099	629.9516	881.6025 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4699.5222
Space heating per m2												(98c) / (4) = 40.9723 (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	867.4647	693.6093	617.2109	401.4684	232.2049	0.0000	0.0000	0.0000	0.0000	376.0099	629.9516	881.6025 (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)	939.8317	751.4727	668.7009	434.9603	251.5763	0.0000	0.0000	0.0000	0.0000	407.3780	682.5044	955.1490 (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	251.0457	221.9588	235.9448	208.1111	202.1118	182.5537	180.6231	187.6455	189.5079	210.7649	223.3796	248.4207 (64)
Efficiency of water heater (217)m	86.6077	86.4367	86.1141	85.5076	84.3719	79.8000	79.8000	79.8000	79.8000	85.3427	86.2535	79.8000 (216)
Fuel for water heating, kWh/month	289.8654	256.7877	273.9911	243.3831	239.5488	228.7640	226.3447	235.1447	237.4786	246.9629	258.9802	286.6892 (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	30.8172	24.7227	22.2601	16.3087	12.5973	10.2921	11.4917	14.9373	19.4021	25.4566	28.7532	31.6737 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-51.8302	-72.0769	-102.1838	-113.2240	-120.6459	-112.0262	-110.5713	-105.0513	-95.1503	-81.5706	-56.5998	-44.9218 (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	-32.3612	-67.7082	-133.9337	-200.2677	-263.9914	-265.0204	-261.9648	-222.2261	-163.4033	-96.6033	-43.1256	-25.6238 (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												5091.5733 (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												3023.9405 (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)												248.7125 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2842.0816 (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												5608.1448 (238)

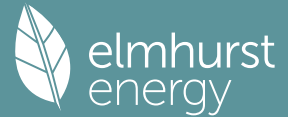
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5091.5733	0.2100	1069.2304 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3023.9405	0.2100	635.0275 (264)
Space and water heating			1704.2579 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	248.7125	0.1443	35.8969 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1065.8521	0.1349	-143.7841
PV Unit electricity exported	-1776.2295	0.1260	-223.8433
Total			-367.6274 (269)
Total CO2, kg/year			1384.4567 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0700 (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	5091.5733	1.1300	5753.4779 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3023.9405	1.1300	3417.0527 (278)
Space and water heating			9170.5306 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)

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Energy for lighting	248.7125	1.5338	381.4836 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1065.8521	1.4986	-1597.2726
PV Unit electricity exported	-1776.2295	0.4626	-821.6680
Total			-2418.9406 (283)
Total Primary energy kWh/year			7263.1744 (286)
Target Primary Energy Rate (TPER)			63.3200 (287)

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	57.5000 (1b)	x	3.0000 (2b)	=	172.5000 (1b)	- (3b)
First floor	37.1000 (1c)	x	2.8000 (2c)	=	103.8800 (1c)	- (3c)
Second floor	20.1000 (1d)	x	2.2600 (2d)	=	45.4260 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.7000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	321.8060	(5)

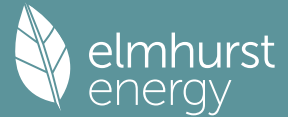
2. Ventilation rate

	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	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1243 (8)											
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	0.6000 (17)											
Infiltration rate	0.1543 (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) = 0.1312 (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)
	0.1672	0.1639	0.1607	0.1443	0.1410	0.1246	0.1246	0.1213	0.1312	0.1410	0.1475	0.1541 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.5140	0.5134	0.5129	0.5104	0.5099	0.5078	0.5078	0.5074	0.5086	0.5099	0.5109	0.5119 (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	1.2000	2.7600			(26)
Windows (Uw = 0.67)			15.5100	0.6525	10.1205			(27)
Opening			1.4000	0.6525	0.9135			(27a)
Heatloss Floor 1			57.5000	0.1000	5.7500			(28a)
Exposed Bike Store			0.6000	0.1600	0.0960			(28b)
EWS 01	41.9000	16.8100	25.0900	0.1400	3.5126			(29a)
EWS 02	29.3500	1.0000	28.3500	0.1800	5.1030			(29a)
RFS 01	41.0000		41.0000	0.1200	4.9200			(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)			189.4500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.8956			(33)
Party Wall 1			147.8000	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)				39.4700	0.0100		0.3947	
E20 Exposed floor (normal)				2.4000	0.0100		0.0240	
E6 Intermediate floor within a dwelling				21.4800	0.0100		0.2148	
E15 Flat roof with parapet				56.7300	0.0100		0.5673	
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)				5.8000	0.0100		0.0580	
E18 Party wall between dwellings				23.2000	0.0100		0.2320	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.0011	(36)
Point Thermal bridges							(36a) = 0.0000	

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Total fabric heat loss (33) + (36) + (36a) = 36.8967 (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	54.5828	54.5251	54.4686	54.2031	54.1535	53.9223	53.9223	53.8795	54.0113	54.1535	54.2540	54.3590 (38)
Heat transfer coeff	91.4795	91.4218	91.3653	91.0998	91.0502	90.8190	90.8190	90.7762	90.9080	91.0502	91.1506	91.2557 (39)
Average = Sum(39)m / 12 =												91.0996

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7976	0.7971	0.7966	0.7942	0.7938	0.7918	0.7918	0.7914	0.7926	0.7938	0.7947	0.7956 (40)
HLP (average)												0.7942
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8403 (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 31.0177 30.5570 29.9083 28.7122 27.8166 26.8235 26.2871 26.9312 27.6326 28.6953 29.9160 30.9128 (42b)

Hot water usage for other uses 43.7174 42.1276 40.5379 38.9482 37.3585 35.7687 35.7687 37.3585 38.9482 40.5379 42.1276 43.7174 (42c)

Average daily hot water use (litres/day) 68.5013 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	74.7350	72.6846	70.4462	67.6604	65.1751	62.5923	62.0558	64.2897	66.5808	69.2332	72.0436	74.6302 (44)
Energy conte	118.3620	103.5020	108.2732	92.6237	87.7382	76.9645	75.0512	79.6041	82.1008	93.9488	102.6394	116.8528 (45)
Energy content (annual)												1137.6606
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 (59)
Total heat required for water heating calculated for each month												
WWHRS	100.6077	87.9767	92.0322	78.7302	74.5775	65.4198	63.7935	67.6635	69.7857	79.8565	87.2435	99.3249 (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												
Total per year (kWh/year)	100.6077	87.9767	92.0322	78.7302	74.5775	65.4198	63.7935	67.6635	69.7857	79.8565	87.2435	99.3249 (64)
Electric shower(s)												967.0115 (64)
57.5335 51.2628 55.9771 53.4182 54.4206 51.9120 53.6424 54.4206 53.4182 55.9771 54.9245 57.5335 (64a)												654.4404 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month	39.5353	34.8099	37.0023	33.0371	32.2495	29.3329	29.3590	30.5210	30.8010	33.9584	35.5420	39.2146 (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	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.8866	163.7316	147.8866	152.8161	147.8866	152.8161	147.8866	147.8866	152.8161	147.8866	152.8161	147.8866 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	278.1432	281.0295	273.7562	258.2723	238.7266	220.3564	208.0840	205.1977	212.4710	227.9549	247.5006	265.8708 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014 (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)	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114 (71)
Water heating gains (Table 5)	53.1389	51.8004	49.7343	45.8849	43.3461	40.7402	39.4610	41.0229	42.7791	45.6430	49.3639	52.7078 (72)
Total internal gains	544.7730	562.1658	536.9814	522.5776	495.5636	479.5170	461.0358	459.7115	473.6706	487.0888	515.2849	532.0695 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	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	695.7075	828.3516	923.3984	1035.4408	1098.8315	1090.4891	1045.1014	974.8895	903.8623	787.4557	697.7716	660.1114 (84)

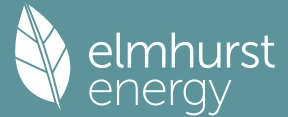
7. Mean internal temperature (heating season)

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	34.8287	34.8507	34.8722	34.9738	34.9929	35.0820	35.0820	35.0985	35.0476	34.9929	34.9543	34.9141
alpha	3.3219	3.3234	3.3248	3.3316	3.3329	3.3388	3.3388	3.3399	3.3365	3.3329	3.3303	3.3276
util living area	0.9587	0.9294	0.8845	0.7926	0.6610	0.5004	0.3727	0.4135	0.6150	0.8345	0.9333	0.9646 (86)

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MIT	19.2568	19.5780	19.9707	20.4289	20.7557	20.9279	20.9795	20.9707	20.8552	20.4122	19.7516	19.1833 (87)
Th 2	20.2555	20.2559	20.2563	20.2583	20.2587	20.2604	20.2604	20.2608	20.2598	20.2587	20.2579	20.2571 (88)
util rest of house	0.9535	0.9209	0.8707	0.7689	0.6245	0.4504	0.3133	0.3518	0.5650	0.8097	0.9238	0.9600 (89)
MIT 2	18.6429	18.9574	19.3389	19.7745	20.0699	20.2139	20.2503	20.2456	20.1597	19.7683	19.1332	18.5718 (90)
Living area fraction									fLA = Living area / (4) =			0.3400 (91)
MIT	18.8516	19.1684	19.5538	19.9970	20.3031	20.4567	20.4982	20.4922	20.3962	19.9872	19.3435	18.7797 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8516	19.1684	19.5538	19.9970	20.3031	20.4567	20.4982	20.4922	20.3962	19.9872	19.3435	18.7797 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9411	0.9061	0.8559	0.7598	0.6267	0.4640	0.3327	0.3715	0.5746	0.7997	0.9098	0.9486	(94)
Useful gains	654.7566	750.5875	790.3751	786.7713	688.6819	505.9538	347.6704	362.1673	519.3532	629.7012	634.7980	626.1907	(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	1331.1754	1304.4464	1192.6597	1010.9333	783.3112	531.8953	354.0351	371.4723	572.3740	854.7090	1116.0028	1330.4804	(97)
Space heating kWh	503.2555	372.1932	299.2998	161.3966	70.4042	0.0000	0.0000	0.0000	0.0000	167.4058	346.4675	523.9916	(98a)
Space heating requirement - total per year (kWh/year)												2444.4142	
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	503.2555	372.1932	299.2998	161.3966	70.4042	0.0000	0.0000	0.0000	0.0000	167.4058	346.4675	523.9916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2444.4142	
Space heating per m2												21.3114	(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	853.6984	672.0605	689.8989	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8780	0.9221	0.9027	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	749.5509	619.6787	622.7583	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1190.6819	1141.6520	1065.4122	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	317.6143	388.3481	329.3344	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	79.4036	97.0870	82.3336	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												258.8242	(107)
Energy for space heating												21.3114	(99)
Energy for space cooling												2.2565	(108)
Total												23.5679	(109)
Fabric Energy Efficiency (DFEE)												23.6	(109)

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

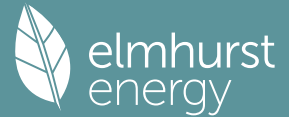
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	57.5000 (1b)	x 3.0000 (2b)	= 172.5000 (1b) - (3b)	
First floor	37.1000 (1c)	x 2.8000 (2c)	= 103.8800 (1c) - (3c)	
Second floor	20.1000 (1d)	x 2.2600 (2d)	= 45.4260 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.7000			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 321.8060 (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) =	0.1243 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3743 (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) =	0.3182 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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													
	0.4056	0.3977	0.3897	0.3500	0.3420	0.3022	0.3022	0.2943	0.3182	0.3420	0.3579	0.3738	(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	0.5823	0.5791	0.5759	0.5612	0.5585	0.5457	0.5457	0.5433	0.5506	0.5585	0.5641	0.5699	(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			57.5000	0.1300	7.4750			(28a)
Exposed Bike Store			0.6000	0.1300	0.0780			(28b)
EWS 01	41.9000	16.8100	25.0900	0.1800	4.5162			(29a)
EWS 02	29.3500	1.0000	28.3500	0.1800	5.1030			(29a)
RFS 01	41.0000		41.0000	0.1100	4.5100			(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)			189.4500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	46.5196		(33)
Party Wall 1			147.8000	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)	39.4700	0.1600	6.3152
E20 Exposed floor (normal)	2.4000	0.3200	0.7680
E6 Intermediate floor within a dwelling	21.4800	0.0000	0.0000
E15 Flat roof with parapet	56.7300	0.5600	31.7688
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)	5.8000	-0.0900	-0.5220
E18 Party wall between dwellings	23.2000	0.0600	1.3920

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

42.7627 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 89.2823 (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	
	61.8352	61.4959	61.1634	59.6013	59.3091	57.9486	57.9486	57.6967	58.4727	59.3091	59.9003	60.5184	(38)
Heat transfer coeff	151.1175	150.7782	150.4457	148.8837	148.5914	147.2310	147.2310	146.9790	147.7550	148.5914	149.1826	149.8007	(39)
Average = Sum(39)m / 12 =												148.8823	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.3175	1.3145	1.3116	1.2980	1.2955	1.2836	1.2836	1.2814	1.2882	1.2955	1.3006	1.3060	(40)
HLP (average)												1.2980	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8403 (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													
	31.0177	30.5570	29.9083	28.7122	27.8166	26.8235	26.2871	26.9312	27.6326	28.6953	29.9160	30.9128	(42b)
Hot water usage for other uses													
	43.7174	42.1276	40.5379	38.9482	37.3585	35.7687	35.7687	37.3585	38.9482	40.5379	42.1276	43.7174	(42c)
Average daily hot water use (litres/day)												68.5013	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	74.7350	72.6846	70.4462	67.6604	65.1751	62.5923	62.0558	64.2897	66.5808	69.2332	72.0436	74.6302	(44)
Energy conte	118.3620	103.5020	108.2732	92.6237	87.7382	76.9645	75.0512	79.6041	82.1008	93.9488	102.6394	116.8528	(45)
Energy content (annual)										Total = Sum(45)m =		1137.6606	

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)
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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)
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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)
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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)
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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)
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Total heat required for water heating calculated for each month

	100.6077	87.9767	92.0322	78.7302	74.5775	65.4198	63.7935	67.6635	69.7857	79.8565	87.2435	99.3249	(62)
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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)
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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)
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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)
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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)
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Output from w/h

	100.6077	87.9767	92.0322	78.7302	74.5775	65.4198	63.7935	67.6635	69.7857	79.8565	87.2435	99.3249	(64)
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Total per year (kWh/year) = Sum(64)m =

												967.0115	(64)
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12Total per year (kWh/year)

Electric shower(s)	57.5335	51.2628	55.9771	53.4182	54.4206	51.9120	53.6424	54.4206	53.4182	55.9771	54.9245	57.5335	(64a)
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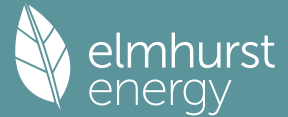
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =

												654.4404	(64a)
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Heat gains from water heating, kWh/month

	39.5353	34.8099	37.0023	33.0371	32.2495	29.3329	29.3590	30.5210	30.8010	33.9584	35.5420	39.2146	(65)
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143	142.0143 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	148.3164	164.2074	148.3164	153.2602	148.3164	153.2602	148.3164	148.3164	153.2602	148.3164	153.2602	148.3164 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	278.1432	281.0295	273.7562	258.2723	238.7266	220.3564	208.0840	205.1977	212.4710	227.9549	247.5006	265.8708 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014	37.2014 (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)	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114 (71)
Water heating gains (Table 5)	53.1389	51.8004	49.7343	45.8849	43.3461	40.7402	39.4610	41.0229	42.7791	45.6430	49.3639	52.7078 (72)
Total internal gains	545.2027	562.6416	537.4112	523.0216	495.9933	479.9611	461.4656	460.1412	474.1146	487.5186	515.7290	532.4992 (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	705.2079	844.8241	947.0504	1066.7060	1135.5153	1127.6503	1080.6313	1006.2795	930.1593	805.9363	709.1824	668.2360 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	21.0837	21.1311	21.1778	21.4000	21.4421	21.6402	21.6402	21.6773	21.5635	21.4421	21.3571	21.2690
alpha	2.4056	2.4087	2.4119	2.4267	2.4295	2.4427	2.4427	2.4452	2.4376	2.4295	2.4238	2.4179
util living area	0.9660	0.9473	0.9197	0.8629	0.7742	0.6435	0.5164	0.5601	0.7408	0.8898	0.9499	0.9699 (86)
MIT	17.9041	18.2630	18.7937	19.5100	20.1490	20.6319	20.8475	20.8087	20.4394	19.5982	18.6344	17.8484 (87)
Th 2	19.8271	19.8295	19.8317	19.8424	19.8444	19.8537	19.8537	19.8554	19.8501	19.8444	19.8403	19.8361 (88)
util rest of house	0.9605	0.9389	0.9064	0.8387	0.7306	0.5679	0.4073	0.4528	0.6763	0.8652	0.9405	0.9651 (89)
MIT 2	17.0226	17.3774	17.9001	18.6002	19.2002	19.6275	19.7875	19.7666	19.4760	18.6996	17.7558	16.9731 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.3223	17.6785	18.2040	18.9095	19.5228	19.9690	20.1479	20.1210	19.8036	19.0051	18.0546	17.2707 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.3223	17.6785	18.2040	18.9095	19.5228	19.9690	20.1479	20.1210	19.8036	19.0051	18.0546	17.2707 (93)

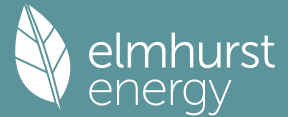
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9440	0.9180	0.8823	0.8149	0.7167	0.5763	0.4373	0.4798	0.6733	0.8426	0.9206	0.9498 (94)
Useful gains	665.6834	775.5397	835.5383	869.2379	813.7715	649.8468	472.5844	482.8485	626.3169	679.0674	652.8834	634.6707 (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	1967.8979	1926.7215	1760.8112	1490.2559	1162.4083	790.4902	522.3668	546.9040	842.7311	1248.9321	1634.2343	1958.0056 (97)
Space heating kWh	968.8476	773.5941	688.4030	447.1330	259.3858	0.0000	0.0000	0.0000	0.0000	423.9793	706.5727	984.5612 (98a)
Space heating requirement - total per year (kWh/year)	5252.4767											
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	968.8476	773.5941	688.4030	447.1330	259.3858	0.0000	0.0000	0.0000	0.0000	423.9793	706.5727	984.5612 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	5252.4767											
Space heating per m ²	(98c) / (4) = 45.7932 (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	1383.9710	1089.5091	1117.0405	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6674	0.7377	0.7045	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	923.6619	803.7840	786.9858	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1232.5719	1181.7136	1100.8173	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	222.4152	281.1796	233.4906	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 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	55.6038	70.2949	58.3727	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	184.2714 (107)											
Energy for space heating	45.7932 (99)											
Energy for space cooling	1.6066 (108)											
Total	47.3997 (109)											
Fabric Energy Efficiency (TFEE)	47.4 (109)											

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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	57.5000 (1b)	x 3.0000 (2b)	= 172.5000 (1b) - (3b)
First floor	37.1000 (1c)	x 2.8000 (2c)	= 103.8800 (1c) - (3c)
Second floor	20.1000 (1d)	x 2.2600 (2d)	= 45.4260 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 321.8060 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	Air changes per hour 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	1.2000	2.7600		(26)
Windows (Uw = 0.67)			15.5100	0.6525	10.1205		(27)
Opening			1.4000	0.6525	0.9135		(27a)
Heatloss Floor 1			57.5000	0.1000	5.7500		(28a)
Exposed Bike Store			0.6000	0.1600	0.0960		(28b)
EWS 01	41.9000	16.8100	25.0900	0.1400	3.5126		(29a)
EWS 02	29.3500	1.0000	28.3500	0.1800	5.1030		(29a)
RFS 01	41.0000		41.0000	0.1200	4.9200		(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)			189.4500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.8956		(33)
Party Wall 1			147.8000	0.0000	0.0000		(32)

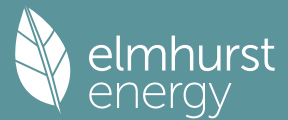
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K

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	39.4700	0.0100	0.3947
E5 Ground floor (normal)	2.4000	0.0100	0.0240
E20 Exposed floor (normal)	21.4800	0.0100	0.2148
E6 Intermediate floor within a dwelling	56.7300	0.0100	0.5673
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)	5.8000	0.0100	0.0580
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)			2.0011 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	36.8967 (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	20.0193	19.9516	19.8839	19.5454	19.4777	19.1392	19.1392	19.0715	19.2746	19.4777	19.6131	19.7485 (38)
Heat transfer coeff	56.9160	56.8483	56.7806	56.4421	56.3744	56.0359	56.0359	55.9682	56.1713	56.3744	56.5098	56.6452 (39)
Average = Sum(39)m / 12 =												56.4251

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.4962	0.4956	0.4950	0.4921	0.4915	0.4885	0.4885	0.4880	0.4897	0.4915	0.4927	0.4939	(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													2.8403 (42)
Hot water usage for mixer showers													
71.8421	70.7624	69.1892	66.1790	63.9576	61.4803	60.0722	61.6336	63.3451	66.0050	69.0798	71.5668	(42a)	
Hot water usage for baths													
31.0177	30.5570	29.9083	28.7122	27.8166	26.8235	26.2871	26.9312	27.6326	28.6953	29.9160	30.9128	(42b)	
Hot water usage for other uses													
43.7174	42.1276	40.5379	38.9482	37.3585	35.7687	35.7687	37.3585	38.9482	40.5379	42.1276	43.7174	(42c)	
Average daily hot water use (litres/day)												134.7373	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.5771	143.4471	139.6354	133.8394	129.1327	124.0726	122.1281	125.9233	129.9259	135.2381	141.1234	146.1970	(44)
Energy content	232.1423	204.2667	214.6144	183.2195	173.8374	152.5617	147.7033	155.9193	160.2116	183.5169	201.0561	228.9091	(45)
Energy content (annual)										Total = Sum(45)m =		2237.9583	
Distribution loss (46)m = 0.15 x (45)m													
34.8213	30.6400	32.1922	27.4829	26.0756	22.8843	22.1555	23.3879	24.0317	27.5275	30.1584	34.3364	(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													
330.5239	293.1275	312.9960	278.4275	272.2190	217.1937	214.4897	222.7057	224.8436	281.8985	296.2641	327.2907	(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	330.5239	293.1275	312.9960	278.4275	272.2190	217.1937	214.4897	222.7057	224.8436	281.8985	296.2641	327.2907	(64)
												3271.9799	(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													
121.0734	107.5577	115.2454	103.3909	101.6870	68.7364	67.7213	70.4531	71.2800	104.9054	109.3216	119.9984	(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	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.1719	34.7921	28.2949	21.4210	16.0125	13.5184	14.6071	18.9869	25.4841	32.3580	37.7665	40.2606 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	415.1391	419.4470	408.5914	385.4810	356.3083	328.8901	310.5731	306.2653	317.1209	340.2312	369.4039	396.8221 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820 (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)	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114 (71)
Water heating gains (Table 5)	162.7330	160.0561	154.8997	143.5984	136.6761	95.4672	91.0232	94.6950	99.0000	141.0019	151.8355	161.2881 (72)
Total internal gains	728.7318	725.9830	703.4736	662.1882	620.6846	549.5634	527.8911	531.6349	553.2927	625.2789	670.6937	710.0585 (73)

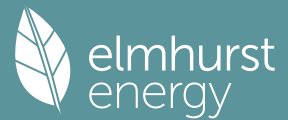
6. Solar gains

[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	879.6664	992.1688	1089.8907	1175.0514	1223.9525	1160.5355	1111.9567	1046.8129	983.4845	925.6458	853.1804	838.1005	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	55.9792	56.0459	56.1127	56.4492	56.5170	56.8584	56.8584	56.9272	56.7214	56.5170	56.3816	56.2468	
alpha	4.7319	4.7364	4.7408	4.7633	4.7678	4.7906	4.7906	4.7951	4.7814	4.7678	4.7588	4.7498	
util living area	0.8559	0.7908	0.6943	0.5620	0.4240	0.3083	0.2216	0.2457	0.3913	0.6050	0.7905	0.8741	(86)
Living	20.5940	20.7093	20.8199	20.8961	20.9259	20.9338	20.9351	20.9350	20.9305	20.8897	20.7433	20.5568	
Non living	20.0419	20.1816	20.3132	20.4032	20.4363	20.4471	20.4483	20.4488	20.4430	20.3982	20.2272	19.9986	
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	20.7923	20.7093	20.8199	20.8961	20.9259	20.9338	20.9351	20.9350	20.9305	20.8897	20.7433	20.6188	(87)

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Th 2	20.5243	20.5248	20.5254	20.5281	20.5286	20.5313	20.5313	20.5319	20.5303	20.5286	20.5276	20.5265 (88)
util rest of house	0.8450	0.7771	0.6774	0.5426	0.4033	0.2859	0.1980	0.2208	0.3653	0.5817	0.7746	0.8641 (89)
MIT 2	20.3320	20.1816	20.3132	20.4032	20.4363	20.4471	20.4483	20.4488	20.4430	20.3982	20.2272	20.0937 (90)
Living area fraction									fLA = Living area / (4) =			0.3400 (91)
MIT	20.4885	20.3610	20.4854	20.5708	20.6028	20.6126	20.6138	20.6141	20.6087	20.5653	20.4027	20.2723 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4885	20.3610	20.4854	20.5708	20.6028	20.6126	20.6138	20.6141	20.6087	20.5653	20.4027	20.2723 (93)

8. Space heating requirement

Utilisation	Jan 0.8441	Feb 0.7722	Mar 0.6760	Apr 0.5444	May 0.4066	Jun 0.2898	Jul 0.2022	Aug 0.2252	Sep 0.3697	Oct 0.5835	Nov 0.7703	Dec 0.8584 (94)
Useful gains	742.5245	766.1519	736.7506	639.6661	497.6415	336.2818	224.8319	235.7114	363.5724	540.1537	657.1877	719.4375 (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	921.3832	878.9325	794.1016	658.7224	501.8884	336.9212	224.9169	235.8554	365.6035	561.7877	751.7318	910.4161 (97)
Space heating kWh	133.0709	75.7885	42.6692	13.7206	3.1597	0.0000	0.0000	0.0000	0.0000	16.0957	68.0717	142.0880 (98a)
Space heating requirement - total per year (kWh/year)												494.6644
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	133.0709	75.7885	42.6692	13.7206	3.1597	0.0000	0.0000	0.0000	0.0000	16.0957	68.0717	142.0880 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												494.6644
Space heating per m2										(98c) / (4) =		4.3127 (99)

8c. Space cooling requirement

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

Ext. temp.	Jan 4.3000	Feb 4.9000	Mar 6.5000	Apr 8.9000	May 11.7000	Jun 14.6000	Jul 16.6000	Aug 16.4000	Sep 14.1000	Oct 10.6000	Nov 7.1000	Dec 4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	526.7371	414.6654	425.3580	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9906	0.9959	0.9940	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	521.7865	412.9542	422.8061	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1245.9878	1193.8398	1119.8974	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	521.4249	580.9788	518.6360	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			0.7149 (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	93.1928	103.8367	92.6943	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												289.7237 (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 %)												203.0989 (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	133.0709	75.7885	42.6692	13.7206	3.1597	0.0000	0.0000	0.0000	0.0000	16.0957	68.0717	142.0880 (98)
Space heating efficiency (main heating system 1)	203.0989	203.0989	203.0989	203.0989	203.0989	0.0000	0.0000	0.0000	0.0000	203.0989	203.0989	203.0989 (210)
Space heating fuel (main heating system)	65.5203	37.3161	21.0091	6.7556	1.5558	0.0000	0.0000	0.0000	0.0000	7.9251	33.5165	69.9600 (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	330.5239	293.1275	312.9960	278.4275	272.2190	217.1937	214.4897	222.7057	224.8436	281.8985	296.2641	327.2907 (64)
Efficiency of water heater (217)m	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012 (216)
Fuel for water heating, kWh/month	241.9627	214.5864	229.1313	203.8251	199.2801	158.9984	157.0189	163.0335	164.5986	206.3661	216.8826	239.5958 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	186.3855	207.6733	185.3886	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	46.2153	41.7429	46.2153	44.7245	46.2153	44.7245	46.2153	46.2153	44.7245	46.2153	44.7245	46.2153 (231)
Lighting	34.2869	27.5063	24.7663	18.1449	14.0156	11.4509	12.7855	16.6191	28.3228	31.9905	35.2399	35.2399 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-28.2828	-44.2203	-70.7220	-87.8087	-102.0327	-96.6285	-95.3484	-86.6141	-71.6122	-53.7891	-32.4444	-23.9179 (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	-6.9824	-16.2349	-35.8148	-59.0253	-82.0503	-85.2450	-83.7606	-68.2479	-46.9647	-24.5344	-9.7188	-5.3588 (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												243.5584 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												136.6012

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Water heating fuel used	2395.2796	(219)
Space cooling fuel	579.4475	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3860)		
mechanical ventilation fans (SFP = 1.3860)	544.1482	(230a)
Total electricity for the above, kWh/year	544.1482	(231)
Electricity for lighting (calculated in Appendix L)	276.7152	(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	2721.7899	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	243.5584	16.4900	40.1628 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2395.2796	16.4900	394.9816 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Space cooling	579.4475	16.4900	95.5509 (248)
Pumps, fans and electric keep-hot	544.1482	16.4900	89.7300 (249)
Energy for lighting	276.7152	16.4900	45.6303 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-793.4211	16.4900	-130.8351
PV Unit electricity exported	-523.9379	5.5900	-29.2881
Total			-160.1233 (252)
Total energy cost			505.9324 (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] = 1.1405 (257)
SAP value	81.5127
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	243.5584	0.1584	38.5785 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2395.2796	0.1415	339.0017 (264)
Space and water heating			377.5801 (265)
Space cooling	579.4475	0.1142	66.1815 (266)
Pumps, fans and electric keep-hot	544.1482	0.1387	75.4801 (267)
Energy for lighting	276.7152	0.1443	39.9386 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-793.4211	0.1327	-105.2604
PV Unit electricity exported	-523.9379	0.1234	-64.6752
Total			-169.9355 (269)
Total CO2, kg/year			389.2448 (272)
CO2 emissions per m2			3.3900 (273)
EI value			96.7340
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	57.5000 (1b)	x 3.0000 (2b)	= 172.5000 (1b) - (3b)
First floor	37.1000 (1c)	x 2.8000 (2c)	= 103.8800 (1c) - (3c)
Second floor	20.1000 (1d)	x 2.2600 (2d)	= 45.4260 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 321.8060 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
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Number of open flues
Number of chimneys / flues attached to closed fire
Number of flues attached to solid fuel boiler
Number of flues attached to other heater
Number of blocked chimneys
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered
Blower Door
Yes
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												
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	0.1828	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	1.2000	2.7600		(26)
Windows (Uw = 0.67)			15.5100	0.6525	10.1205		(27)
Opening			1.4000	0.6525	0.9135		(27a)
Heatloss Floor 1			57.5000	0.1000	5.7500		(28a)
Exposed Bike Store			0.6000	0.1600	0.0960		(28b)
EWS 01	41.9000	16.8100	25.0900	0.1400	3.5126		(29a)
EWS 02	29.3500	1.0000	28.3500	0.1800	5.1030		(29a)
RFS 01	41.0000		41.0000	0.1200	4.9200		(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)			189.4500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.8956		(33)
Party Wall 1			147.8000	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)	39.4700	0.0100	0.3947
E20 Exposed floor (normal)	2.4000	0.0100	0.0240
E6 Intermediate floor within a dwelling	21.4800	0.0100	0.2148
E15 Flat roof with parapet	56.7300	0.0100	0.5673
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)	5.8000	0.0100	0.0580
E18 Party wall between dwellings	23.2000	0.0100	0.2320

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.0011 (36)

Point Thermal Bridges

Total fabric heat loss (33) + (36) + (36a) = 36.8967 (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	19.4100	19.2746	19.2746	19.0715	19.0715	18.8007	18.8684	18.7330	18.8007	18.9361	18.9361	19.1392 (38)
Heat transfer coeff	56.3067	56.1713	56.1713	55.9682	55.9682	55.6974	55.7651	55.6297	55.6974	55.8328	55.8328	56.0359 (39)
Average = Sum(39)m / 12 =												55.9230

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.4909	0.4897	0.4897	0.4880	0.4880	0.4856	0.4862	0.4850	0.4856	0.4868	0.4868	0.4885 (40)
HLP (average)												0.4876
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8403 (42)

Hot water usage for mixer showers
71.8421 70.7624 69.1892 66.1790 63.9576 61.4803 60.0722 61.6336 63.3451 66.0050 69.0798 71.5668 (42a)

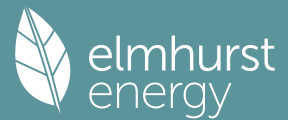
Hot water usage for baths
31.0177 30.5570 29.9083 28.7122 27.8166 26.8235 26.2871 26.9312 27.6326 28.6953 29.9160 30.9128 (42b)

Hot water usage for other uses
43.7174 42.1276 40.5379 38.9482 37.3585 35.7687 35.7687 37.3585 38.9482 40.5379 42.1276 43.7174 (42c)

Average daily hot water use (litres/day) 134.7373 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	146.5771	143.4471	139.6354	133.8394	129.1327	124.0726	122.1281	125.9233	129.9259	135.2381	141.1234	146.1970 (44)
Energy conte	232.1423	204.2667	214.6144	183.2195	173.8374	152.5617	147.7033	155.9193	160.2116	183.5169	201.0561	228.9091 (45)
Energy content (annual)										Total = Sum(45)m =		2237.9583
Distribution loss (46)m = 0.15 x (45)m												
34.8213 30.6400 32.1922 27.4829 26.0756 22.8843 22.1555 23.3879 24.0317 27.5275 30.1584 34.3364 (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)

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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	330.5239	293.1275	312.9960	278.4275	272.2190	217.1937	214.4897	222.7057	224.8436	281.8985	296.2641	327.2907 (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	330.5239	293.1275	312.9960	278.4275	272.2190	217.1937	214.4897	222.7057	224.8436	281.8985	296.2641	327.2907 (64)
	Total per year (kWh/year) = Sum(64)m =											3271.9799 (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	121.0734	107.5577	115.2454	103.3909	101.6870	68.7364	67.7213	70.4531	71.2800	104.9054	109.3216	119.9984 (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	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.1719	34.7921	28.2949	21.4210	16.0125	13.5184	14.6071	18.9869	25.4841	32.3580	37.7665	40.2606 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	415.1391	419.4470	408.5914	385.4810	356.3083	328.8901	310.5731	306.2653	317.1209	340.2312	369.4039	396.8221 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820 (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)	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114 (71)
Water heating gains (Table 5)	162.7330	160.0561	154.8997	143.5984	136.6761	95.4672	91.0232	94.6950	99.0000	141.0019	151.8355	161.2881 (72)
Total internal gains	728.7318	725.9830	703.4736	662.1882	620.6846	549.5634	527.8911	531.6349	553.2927	625.2789	670.6937	710.0585 (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	896.0289	991.8547	1086.0052	1187.8803	1225.2639	1205.7416	1148.0278	1089.4627	1015.7534	945.9445	877.9836			850.5728 (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	56.5850	56.7214	56.7214	56.9272	56.9272	57.2040	57.1345	57.2736	57.2040	57.0653	57.0653	56.8584
alpha	4.7723	4.7814	4.7814	4.7951	4.7951	4.8136	4.8090	4.8182	4.8136	4.8044	4.8044	4.7906
util living area	0.8264	0.7661	0.6588	0.5116	0.3636	0.2308	0.1506	0.1634	0.3172	0.5398	0.7408	0.8459 (86)
Living	20.6677	20.7534	20.8514	20.9120	20.9315	20.9354	20.9356	20.9357	20.9341	20.9109	20.8050	20.6388
Non living	20.1363	20.2397	20.3548	20.4246	20.4454	20.4513	20.4509	20.4521	20.4503	20.4255	20.3054	20.1037
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	20.8300	20.7534	20.8514	20.9120	20.9315	20.9354	20.9356	20.9357	20.9341	20.9109	20.8050	20.6893 (87)
Th 2	20.5292	20.5303	20.5303	20.5319	20.5319	20.5341	20.5335	20.5346	20.5341	20.5330	20.5330	20.5313 (88)
util rest of house	0.8137	0.7512	0.6408	0.4917	0.3427	0.2094	0.1279	0.1396	0.2919	0.5155	0.7227	0.8341 (89)
MIT 2	20.3726	20.2397	20.3548	20.4246	20.4454	20.4513	20.4509	20.4521	20.4503	20.4255	20.3054	20.1808 (90)
Living area fraction									fLA = Living area / (4) =			0.3400 (91)
MIT	20.5281	20.4143	20.5236	20.5903	20.6106	20.6159	20.6157	20.6165	20.6148	20.5905	20.4753	20.3537 (92)
Temperature adjustment												0.0000
adjusted MIT	20.5281	20.4143	20.5236	20.5903	20.6106	20.6159	20.6157	20.6165	20.6148	20.5905	20.4753	20.3537 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	729.1107	741.3715	695.6089	587.0275	424.1982	256.9734	151.4333	156.6719	300.9756	490.4537	632.4929	705.4032 (94)
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	868.7046	832.1401	737.1716	598.3188	425.9540	257.0924	151.4411	156.6837	301.5897	501.9664	696.5286	854.7538 (97)
Space heating kWh	103.8578	60.9965	30.9227	8.1297	1.3063	0.0000	0.0000	0.0000	0.0000	8.5654	46.1057	111.1168 (98a)
Space heating requirement - total per year (kWh/year)												371.0009
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	103.8578	60.9965	30.9227	8.1297	1.3063	0.0000	0.0000	0.0000	0.0000	8.5654	46.1057	111.1168 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												371.0009
Space heating per m2										(98c) / (4) =		3.2345 (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	0.0000	0.0000	0.0000	0.0000	0.0000	445.5789	340.1669	344.9039	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9962	0.9985	0.9980	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	443.8690	339.6663	344.2230	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1297.3217	1234.7618	1168.3319	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	614.4859	665.9511	613.1370	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			0.7149 (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	109.8253	119.0235	109.5842	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												338.4330 (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 %)												202.8467 (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	103.8578	60.9965	30.9227	8.1297	1.3063	0.0000	0.0000	0.0000	0.0000	8.5654	46.1057	111.1168 (98)
Space heating efficiency (main heating system 1)	202.8467	202.8467	202.8467	202.8467	202.8467	0.0000	0.0000	0.0000	0.0000	202.8467	202.8467	202.8467 (210)
Space heating fuel (main heating system)	51.2002	30.0702	15.2444	4.0078	0.6440	0.0000	0.0000	0.0000	0.0000	4.2226	22.7294	54.7787 (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	330.5239	293.1275	312.9960	278.4275	272.2190	217.1937	214.4897	222.7057	224.8436	281.8985	296.2641	327.2907 (64)
Efficiency of water heater	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906 (216)
Fuel for water heating, kWh/month	241.6277	214.2892	228.8140	203.5429	199.0042	158.7783	156.8015	162.8078	164.3707	206.0803	216.5823	239.2641 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	219.6506	238.0470	219.1684	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	46.2153	41.7429	46.2153	44.7245	46.2153	44.7245	46.2153	44.7245	44.7245	46.2153	44.7245	46.2153 (223)
Lighting	34.2869	27.5063	24.7663	18.1449	14.0156	11.4509	12.7855	16.6191	21.5866	28.3228	31.9905	35.2399 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-31.3901	-44.7257	-70.7849	-89.8343	-102.4074	-101.5129	-99.4597	-91.9388	-76.1742	-57.3505	-36.6677	-26.3431 (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)	-8.4024	-16.6980	-36.1416	-61.9216	-82.8200	-94.2833	-91.2952	-76.8098	-52.7941	-27.6262	-12.0846	-6.3641 (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												182.8972 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												136.7906
Water heating fuel used												2391.9630 (219)
Space cooling fuel												676.8660 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3860)												
mechanical ventilation fans (SFP = 1.3860)												544.1482 (230a)
Total electricity for the above, kWh/year												544.1482 (231)
Electricity for lighting (calculated in Appendix L)												276.7152 (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												2676.7593 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	182.8972	26.0600	47.6630 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2391.9630	26.0600	623.3456 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Space cooling	676.8660	26.0600	176.3913 (248)

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Pumps, fans and electric keep-hot	544.1482	26.0600	141.8050 (249)
Energy for lighting	276.7152	26.0600	72.1120 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-828.5894	26.0600	-215.9304
PV Unit electricity exported	-567.2410	5.8100	-32.9567
Total			-248.8871 (252)
Total energy cost			812.4298 (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	182.8972	0.1590	29.0827 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2391.9630	0.1415	338.5323 (264)
Space and water heating			367.6150 (265)
Space cooling	676.8660	0.1142	77.3282 (266)
Pumps, fans and electric keep-hot	544.1482	0.1387	75.4801 (267)
Energy for lighting	276.7152	0.1443	39.9386 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-828.5894	0.1326	-109.9093
PV Unit electricity exported	-567.2410	0.1230	-69.7544
Total			-179.6636 (269)
Total CO2, kg/year			380.6981 (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	182.8972	1.5886	290.5454 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2391.9630	1.5234	3643.8403 (278)
Space and water heating			3934.3857 (279)
Space cooling	676.8660	1.4210	961.8478 (280)
Pumps, fans and electric keep-hot	544.1482	1.5128	823.1874 (281)
Energy for lighting	276.7152	1.5338	424.4351 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-828.5894	1.4901	-1234.6941
PV Unit electricity exported	-567.2410	0.4512	-255.9188
Total			-1490.6129 (283)
Total Primary energy kWh/year			4653.2430 (286)

SAP 10 EPC IMPROVEMENTS

0530 Frederick Morphyll R

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	+ 2.3	-£ 109	-55 kg (14.4%)

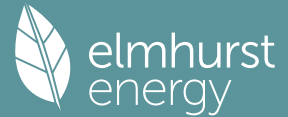
Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£109	0.48 kg/m²	B 84	A 97
Total Savings	£109	0.48 kg/m²		
Potential energy efficiency rating:			B 84	
Potential environmental impact rating:				A 97

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	£1061	£947	£114
Space heating	£189	£210	-£21
Space cooling	£176	£176	£0
Water heating	£623	£488	£135
Lighting	£72	£72	£0
Generated (PV)	-£249	-£243	-£5
Total cost of fuels	£812	£704	£109
Total cost of uses	£811	£703	£109
Delivered energy	23 kWh/m²	20 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	41 kWh/m²	35 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	57.5000 (1b)	x 3.0000 (2b)	= 172.5000 (1b) - (3b)
First floor	37.1000 (1c)	x 2.8000 (2c)	= 103.8800 (1c) - (3c)
Second floor	20.1000 (1d)	x 2.2600 (2d)	= 45.4260 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	114.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 321.8060 (5)

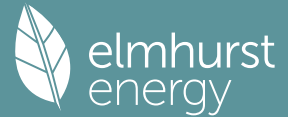
2. Ventilation rate

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	1.2000	2.7600		(26)
Windows (Uw = 0.67)			15.5100	0.6525	10.1205		(27)
Opening			1.4000	0.6525	0.9135		(27a)
Heatloss Floor 1			57.5000	0.1000	5.7500		(28a)
Exposed Bike Store			0.6000	0.1600	0.0960		(28b)
EWS 01	41.9000	16.8100	25.0900	0.1400	3.5126		(29a)
EWS 02	29.3500	1.0000	28.3500	0.1800	5.1030		(29a)
RFS 01	41.0000		41.0000	0.1200	4.9200		(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)			189.4500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.8956		(31)
Party Wall 1			147.8000	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)				39.4700	0.0100	0.3947	
E20 Exposed floor (normal)				2.4000	0.0100	0.0240	
E6 Intermediate floor within a dwelling				21.4800	0.0100	0.2148	
E15 Flat roof with parapet				56.7300	0.0100	0.5673	
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)				5.8000	0.0100	0.0580	
E18 Party wall between dwellings				23.2000	0.0100	0.2320	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.0011 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	36.8967 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 20.0193 Feb 19.9516 Mar 19.8839 Apr 19.5454 May 19.4777 Jun 19.1392 Jul 19.1392 Aug 19.0715 Sep 19.2746 Oct 19.4777 Nov 19.6131 Dec 19.7485						(38)
Heat transfer coeff	56.9160 56.8483 56.7806 56.4421 56.3744 56.0359 56.0359 55.9682 56.1713 56.3744 56.5098 56.6452						(39)
Average = Sum(39)m / 12 =							56.4251
HLP	Jan 0.4962 Feb 0.4956 Mar 0.4950 Apr 0.4921 May 0.4915 Jun 0.4885 Jul 0.4885 Aug 0.4880 Sep 0.4897 Oct 0.4915 Nov 0.4927 Dec 0.4939						(40)
HLP (average)							0.4919
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												2.8403 (42)
Hot water usage for mixer showers	71.8421	70.7624	69.1892	66.1790	63.9576	61.4803	60.0722	61.6336	63.3451	66.0050	69.0798	71.5668 (42a)
Hot water usage for baths	31.0177	30.5570	29.9083	28.7122	27.8166	26.8235	26.2871	26.9312	27.6326	28.6953	29.9160	30.9128 (42b)
Hot water usage for other uses	43.7174	42.1276	40.5379	38.9482	37.3585	35.7687	35.7687	37.3585	38.9482	40.5379	42.1276	43.7174 (42c)
Average daily hot water use (litres/day)												134.7373 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	146.5771	143.4471	139.6354	133.8394	129.1327	124.0726	122.1281	125.9233	129.9259	135.2381	141.1234	146.1970 (44)
Energy content (annual)	232.1423	204.2667	214.6144	183.2195	173.8374	152.5617	147.7033	155.9193	160.2116	183.5169	201.0561	228.9091 (45)
Distribution loss (46)m = 0.15 x (45)m	34.8213	30.6400	32.1922	27.4829	26.0756	22.8843	22.1555	23.3879	24.0317	27.5275	30.1584	34.3364 (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	330.5239	293.1275	312.9960	278.4275	272.2190	217.1937	214.4897	222.7057	224.8436	281.8985	296.2641	327.2907 (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												649.1737 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												649.1737
Solar input	-0.0000	-16.1705	-59.7379	-83.8181	-112.3154	-101.2436	-100.8116	-87.1654	-59.0099	-28.9012	-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	330.5239	276.9570	253.2581	194.6094	159.9036	115.9501	113.6781	135.5403	165.8337	252.9972	296.2641	327.2907 (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	121.0734	107.5577	115.2454	103.3909	101.6870	68.7364	67.7213	70.4531	71.2800	104.9054	109.3216	119.9984 (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	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.1719	34.7921	28.2949	21.4210	16.0125	13.5184	14.6071	18.9869	25.4841	32.3580	37.7665	40.2606 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	415.1391	419.4470	408.5914	385.4810	356.3083	328.8901	310.5731	306.2653	317.1209	340.2312	369.4039	396.8221 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820 (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)	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114 (71)
Water heating gains (Table 5)	162.7330	160.0561	154.8997	143.5984	136.6761	95.4672	91.0232	94.6950	99.0000	141.0019	151.8355	161.2881 (72)
Total internal gains	728.7318	725.9830	703.4736	662.1882	620.6846	549.5634	527.8911	531.6349	553.2927	625.2789	670.6937	710.0585 (73)

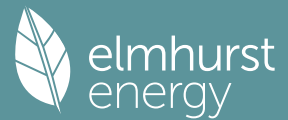
6. Solar gains

[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			
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												879.6664	992.1688	1089.8907	1175.0514	1223.9525	1160.5355	1111.9567	1046.8129	983.4845	925.6458	853.1804	838.1005 (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	55.9792	56.0459	56.1127	56.4492	56.5170	56.8584	56.8584	56.9272	56.7214	56.5170	56.3816	56.2468
alpha	4.7319	4.7364	4.7408	4.7633	4.7678	4.7906	4.7906	4.7951	4.7814	4.7678	4.7588	4.7498
util living area	0.8559	0.7908	0.6943	0.5620	0.4240	0.3083	0.2216	0.2457	0.3913	0.6050	0.7905	0.8741 (86)
Living	20.5940	20.7093	20.8199	20.8961	20.9259	20.9338	20.9351	20.9350	20.9305	20.8897	20.7433	20.5568
Non living	20.0419	20.1816	20.3132	20.4032	20.4363	20.4471	20.4483	20.4488	20.4430	20.3982	20.2272	19.9986
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	20.7923	20.7093	20.8199	20.8961	20.9259	20.9338	20.9351	20.9350	20.9305	20.8897	20.7433	20.6188 (87)
Th 2	20.5243	20.5248	20.5254	20.5281	20.5286	20.5313	20.5313	20.5319	20.5303	20.5286	20.5276	20.5265 (88)
util rest of house	0.8450	0.7771	0.6774	0.5426	0.4033	0.2859	0.1980	0.2208	0.3653	0.5817	0.7746	0.8641 (89)
MIT 2	20.3320	20.1816	20.3132	20.4032	20.4363	20.4471	20.4483	20.4488	20.4430	20.3982	20.2272	20.0937 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.4885	20.3610	20.4854	20.5708	20.6028	20.6126	20.6138	20.6141	20.6087	20.5653	20.4027	20.2723 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4885	20.3610	20.4854	20.5708	20.6028	20.6126	20.6138	20.6141	20.6087	20.5653	20.4027	20.2723 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8441	0.7722	0.6760	0.5444	0.4066	0.2898	0.2022	0.2252	0.3697	0.5835	0.7703	0.8584 (94)
Useful gains	742.5245	766.1519	736.7506	639.6661	497.6415	336.2818	224.8319	235.7114	363.5724	540.1537	657.1877	719.4375 (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	921.3832	878.9325	794.1016	658.7224	501.8884	336.9212	224.9169	235.8554	365.6035	561.7877	751.7318	910.4161 (97)
Space heating kWh	133.0709	75.7885	42.6692	13.7206	3.1597	0.0000	0.0000	0.0000	0.0000	16.0957	68.0717	142.0880 (98a)
Space heating requirement - total per year (kWh/year)												494.6644
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	133.0709	75.7885	42.6692	13.7206	3.1597	0.0000	0.0000	0.0000	0.0000	16.0957	68.0717	142.0880 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												494.6644
Space heating per m2										(98c) / (4) =		4.3127 (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	526.7371	414.6654	425.3580	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.9906	0.9959	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	521.7865	412.9542	422.8061	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1245.9878	1193.8398	1119.8974	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	521.4249	580.9788	518.6360	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	93.1928	103.8367	92.6943	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												289.7237 (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 %)												203.0989 (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	133.0709	75.7885	42.6692	13.7206	3.1597	0.0000	0.0000	0.0000	0.0000	16.0957	68.0717	142.0880 (98)
Space heating efficiency (main heating system 1)	203.0989	203.0989	203.0989	203.0989	203.0989	0.0000	0.0000	0.0000	0.0000	203.0989	203.0989	203.0989 (210)
Space heating fuel (main heating system)	65.5203	37.3161	21.0091	6.7556	1.5558	0.0000	0.0000	0.0000	0.0000	7.9251	33.5165	69.9600 (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	330.5239	276.9570	253.2581	194.6094	159.9036	115.9501	113.6781	135.5403	165.8337	252.9972	296.2641	327.2907 (64)
Efficiency of water heater (217)m	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012	136.6012 (216)
Fuel for water heating, kWh/month	241.9627	202.7486	185.3996	142.4654	117.0587	84.8822	83.2190	99.2234	121.3999	185.2087	216.8826	239.5958 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	186.3855	207.6733	185.3886	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	53.0098	47.8799	53.0098	51.2999	53.0098	51.2999	53.0098	53.0098	51.2999	53.0098	51.2999	53.0098 (231)
Lighting	34.2869	27.5063	24.7663	18.1449	14.0156	11.4509	12.7855	16.6191	21.5866	28.3228	31.9905	35.2399 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-28.3128	-44.1549	-69.8390	-85.4436	-97.3768	-91.7142	-90.5076	-83.2602	-70.1236	-53.5198	-32.4908	-23.9416 (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)												

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(233b)m	-6.9523	-16.3003	-36.6978	-61.3904	-86.7063	-90.1593	-88.6015	-71.6019	-48.4534	-24.8037	-9.6724	-5.3351	(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												243.5584	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												136.6012	
Water heating fuel used												1920.0467	(219)
Space cooling fuel												579.4475	(221)

Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3860)													
mechanical ventilation fans (SFP = 1.3860)												544.1482	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												624.1482	(231)
Electricity for lighting (calculated in Appendix L)												276.7152	(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												2326.5570	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	243.5584	16.4900	40.1628 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1920.0467	16.4900	316.6157 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Space cooling	579.4475	16.4900	95.5509 (248)
Pumps, fans and electric keep-hot	544.1482	16.4900	89.7300 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	276.7152	16.4900	45.6303 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-770.6847	16.4900	-127.0859
PV Unit electricity exported	-546.6743	5.5900	-30.5591
Total			-157.6450 (252)
Total energy cost			443.2368 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.9992 (257)
SAP value		83.8037
SAP rating (Section 12)		84 (258)
SAP band		B

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

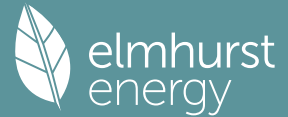
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	243.5584	0.1584	38.5785 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1920.0467	0.1450	278.4089 (264)
Space and water heating			316.9874 (265)
Space cooling	579.4475	0.1142	66.1815 (266)
Pumps, fans and electric keep-hot	544.1482	0.1387	75.5771 (267)
Energy for lighting	276.7152	0.1443	39.9386 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-770.6847	0.1329	-102.4568
PV Unit electricity exported	-546.6743	0.1230	-67.2653
Total			-169.7221 (269)
Total CO2, kg/year			339.9624 (272)
CO2 emissions per m2			2.9600 (273)
EI value			97.1475
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	57.5000 (1b)	x 3.0000 (2b)	= 172.5000 (1b) - (3b)

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First floor 37.1000 (1c) x 2.8000 (2c) = 103.8800 (1c) - (3c)
Second floor 20.1000 (1d) x 2.2600 (2d) = 45.4260 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 114.7000 (4)
Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 321.8060 (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
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	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	1.2000	2.7600		(26)
Windows (Uw = 0.67)			15.5100	0.6525	10.1205		(27)
Opening			1.4000	0.6525	0.9135		(27a)
Heatloss Floor 1			57.5000	0.1000	5.7500		(28a)
Exposed Bike Store			0.6000	0.1600	0.0960		(28b)
EWS 01	41.9000	16.8100	25.0900	0.1400	3.5126		(29a)
EWS 02	29.3500	1.0000	28.3500	0.1800	5.1030		(29a)
RFS 01	41.0000		41.0000	0.1200	4.9200		(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)			189.4500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.8956		(33)
Party Wall 1			147.8000	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)	39.4700	0.0100	0.3947
E20 Exposed floor (normal)	2.4000	0.0100	0.0240
E6 Intermediate floor within a dwelling	21.4800	0.0100	0.2148
E15 Flat roof with parapet	56.7300	0.0100	0.5673
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)	5.8000	0.0100	0.0580
E18 Party wall between dwellings	23.2000	0.0100	0.2320

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.0011 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.8967 (37)

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

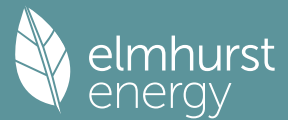
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	19.4100	19.2746	19.2746	19.0715	19.0715	18.8007	18.8684	18.7330	18.8007	18.9361	18.9361	19.1392 (38)
Heat transfer coeff	56.3067	56.1713	56.1713	55.9682	55.9682	55.6974	55.7651	55.6297	55.6974	55.8328	55.8328	56.0359 (39)
Average = Sum(39)m / 12 =												55.9230

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.4909	0.4897	0.4897	0.4880	0.4880	0.4856	0.4862	0.4850	0.4856	0.4868	0.4868	0.4885 (40)
HLP (average)												0.4876
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.8403 (42)
Hot water usage for mixer showers												
71.8421	70.7624	69.1892	66.1790	63.9576	61.4803	60.0722	61.6336	63.3451	66.0050	69.0798	71.5668 (42a)	
Hot water usage for baths												
31.0177	30.5570	29.9083	28.7122	27.8166	26.8235	26.2871	26.9312	27.6326	28.6953	29.9160	30.9128 (42b)	
Hot water usage for other uses												

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Average daily hot water use (litres/day)	43.7174	42.1276	40.5379	38.9482	37.3585	35.7687	35.7687	37.3585	38.9482	40.5379	42.1276	43.7174 (42c) 134.7373 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	146.5771	143.4471	139.6354	133.8394	129.1327	124.0726	122.1281	125.9233	129.9259	135.2381	141.1234	146.1970 (44)
Energy conte	232.1423	204.2667	214.6144	183.2195	173.8374	152.5617	147.7033	155.9193	160.2116	183.5169	201.0561	228.9091 (45)
Energy content (annual)										Total =	Sum(45)m =	2237.9583
Distribution loss (46)m = 0.15 x (45)m	34.8213	30.6400	32.1922	27.4829	26.0756	22.8843	22.1555	23.3879	24.0317	27.5275	30.1584	34.3364 (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	330.5239	293.1275	312.9960	278.4275	272.2190	217.1937	214.4897	222.7057	224.8436	281.8985	296.2641	327.2907 (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												709.8286 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												709.8286
Solar input	-0.0000	-17.5827	-60.8081	-88.5538	-114.5366	-111.7308	-109.8568	-98.5617	-68.1093	-36.1404	-3.9484	-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	330.5239	275.5448	252.1879	189.8737	157.6824	105.4629	104.6329	124.1441	156.7343	245.7581	292.3157	327.2907 (64)
								Total per year (kWh/year) =	Sum(64)m =			2562.1513 (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) =	Sum(64a)m =			0.0000 (64a)
Heat gains from water heating, kWh/month	121.0734	107.5577	115.2454	103.3909	101.6870	68.7364	67.7213	70.4531	71.2800	104.9054	109.3216	119.9984 (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	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171	170.4171 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.1719	34.7921	28.2949	21.4210	16.0125	13.5184	14.6071	18.9869	25.4841	32.3580	37.7665	40.2606 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	415.1391	419.4470	408.5914	385.4810	356.3083	328.8901	310.5731	306.2653	317.1209	340.2312	369.4039	396.8221 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820	54.8820 (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)	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114	-113.6114 (71)
Water heating gains (Table 5)	162.7330	160.0561	154.8997	143.5984	136.6761	95.4672	91.0232	94.6950	99.0000	141.0019	151.8355	161.2881 (72)
Total internal gains	728.7318	725.9830	703.4736	662.1882	620.6846	549.5634	527.8911	531.6349	553.2927	625.2789	670.6937	710.0585 (73)

6. Solar gains												

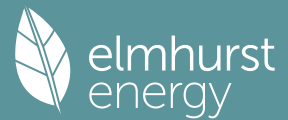
[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast				3.7000	12.9236	0.5200	0.8000		0.7700		13.7851 (75)	
Southwest				11.8100	40.4699	0.5200	0.8000		0.7700		137.7872 (79)	
Southeast				1.4000	30.0000	0.5200	0.8000		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	896.0289	991.8547	1086.0052	1187.8803	1225.2639	1205.7416	1148.0278	1089.4627	1015.7534	945.9445	877.9836	850.5728 (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	56.5850	56.7214	56.7214	56.9272	56.9272	57.2040	57.1345	57.2736	57.2040	57.0653	57.0653	56.8584
alpha	4.7723	4.7814	4.7814	4.7951	4.7951	4.8136	4.8090	4.8182	4.8136	4.8044	4.8044	4.7906
util living area	0.8264	0.7661	0.6588	0.5116	0.3636	0.2308	0.1506	0.1634	0.3172	0.5398	0.7408	0.8459 (86)
Living	20.6677	20.7534	20.8514	20.9120	20.9315	20.9354	20.9356	20.9357	20.9341	20.9109	20.8050	20.6388
Non living	20.1363	20.2397	20.3548	20.4246	20.4454	20.4513	20.4509	20.4521	20.4503	20.4255	20.3054	20.1037
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	20.8300	20.7534	20.8514	20.9120	20.9315	20.9354	20.9356	20.9357	20.9341	20.9109	20.8050	20.6893 (87)
Th 2	20.5292	20.5303	20.5303	20.5319	20.5319	20.5341	20.5335	20.5346	20.5341	20.5330	20.5330	20.5313 (88)

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util rest of house	0.8137	0.7512	0.6408	0.4917	0.3427	0.2094	0.1279	0.1396	0.2919	0.5155	0.7227	0.8341 (89)
MIT 2	20.3726	20.2397	20.3548	20.4246	20.4454	20.4513	20.4509	20.4521	20.4503	20.4255	20.3054	20.1808 (90)
Living area fraction									fLA = Living area / (4) =			0.3400 (91)
MIT	20.5281	20.4143	20.5236	20.5903	20.6106	20.6159	20.6157	20.6165	20.6148	20.5905	20.4753	20.3537 (92)
Temperature adjustment												0.0000
adjusted MIT	20.5281	20.4143	20.5236	20.5903	20.6106	20.6159	20.6157	20.6165	20.6148	20.5905	20.4753	20.3537 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8137	0.7475	0.6405	0.4942	0.3462	0.2131	0.1319	0.1438	0.2963	0.5185	0.7204	0.8293	(94)
Useful gains	729.1107	741.3715	695.6089	587.0275	424.1982	256.9734	151.4333	156.6719	300.9756	490.4537	632.4929	705.4032	(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	868.7046	832.1401	737.1716	598.3188	425.9540	257.0924	151.4411	156.6837	301.5897	501.9664	696.5286	854.7538	(97)
Space heating kWh	103.8578	60.9965	30.9227	8.1297	1.3063	0.0000	0.0000	0.0000	0.0000	8.5654	46.1057	111.1168	(98a)
Space heating requirement - total per year (kWh/year)												371.0009	
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	103.8578	60.9965	30.9227	8.1297	1.3063	0.0000	0.0000	0.0000	0.0000	8.5654	46.1057	111.1168	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												371.0009	
Space heating per m2										(98c) / (4) =			3.2345 (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	445.5789	340.1669	344.9039	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9962	0.9985	0.9980	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	443.8690	339.6663	344.2230	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1297.3217	1234.7618	1168.3319	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	614.4859	665.9511	613.1370	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			0.7149	(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	109.8253	119.0235	109.5842	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												338.4330	(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 %)													202.8467 (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	103.8578	60.9965	30.9227	8.1297	1.3063	0.0000	0.0000	0.0000	0.0000	8.5654	46.1057	111.1168 (98)	
Space heating efficiency (main heating system 1)	202.8467	202.8467	202.8467	202.8467	202.8467	0.0000	0.0000	0.0000	0.0000	202.8467	202.8467	202.8467 (210)	
Space heating fuel (main heating system)	51.2002	30.0702	15.2444	4.0078	0.6440	0.0000	0.0000	0.0000	0.0000	4.2226	22.7294	54.7787 (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	330.5239	275.5448	252.1879	189.8737	157.6824	105.4629	104.6329	124.1441	156.7343	245.7581	292.3157	327.2907 (64)	
Efficiency of water heater (217)m	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906	136.7906 (216)	
Fuel for water heating, kWh/month	241.6277	201.4355	184.3605	138.8061	115.2728	77.0981	76.4913	90.7548	114.5798	179.6601	213.6958	239.2641 (219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	219.6506	238.0470	219.1684	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	53.0098	47.8799	53.0098	51.2999	53.0098	51.2999	53.0098	53.0098	51.2999	53.0098	51.2999	53.0098 (231)	
Lighting	34.2869	27.5063	24.7663	18.1449	14.0156	11.4509	12.7855	16.6191	21.5866	28.3228	31.9905	35.2399 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-31.4267	-44.6455	-69.8682	-87.1898	-97.6003	-95.4888	-93.6852	-87.6317	-74.2051	-56.9344	-36.7004	-26.3717 (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	-8.3658	-16.7782	-37.0583	-64.5661	-87.6272	-100.3075	-97.0697	-81.1168	-54.7631	-28.0423	-12.0519	-6.3356 (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													182.8972 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													136.7906
Water heating fuel used													1873.0466 (219)

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Space cooling fuel	676.8660 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3860)	
mechanical ventilation fans (SFP = 1.3860)	544.1482 (230a)
pump for solar water heating	80.0000 (230g)
Total electricity for the above, kWh/year	624.1482 (231)
Electricity for lighting (calculated in Appendix L)	276.7152 (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	2237.8429 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	182.8972	26.0600	47.6630 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1873.0466	26.0600	488.1160 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Space cooling	676.8660	26.0600	176.3913 (248)
Pumps, fans and electric keep-hot	544.1482	26.0600	141.8050 (249)
Pump for solar water heating	80.0000	26.0600	20.8480 (249)
Energy for lighting	276.7152	26.0600	72.1120 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.7478	26.0600	-208.9355
PV Unit electricity exported	-594.0825	5.8100	-34.5162
Total			-243.4517 (252)
Total energy cost			703.4836 (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	182.8972	0.1590	29.0827 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1873.0466	0.1455	272.4749 (264)
Space and water heating			301.5576 (265)
Space cooling	676.8660	0.1142	77.3282 (266)
Pumps, fans and electric keep-hot	624.1482	0.1387	86.5771 (267)
Energy for lighting	276.7152	0.1443	39.9386 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.7478	0.1330	-106.6160
PV Unit electricity exported	-594.0825	0.1225	-72.7808
Total			-179.3968 (269)
Total CO2, kg/year			326.0046 (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	182.8972	1.5886	290.5454 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1873.0466	1.5381	2880.9758 (278)
Space and water heating			3171.5212 (279)
Space cooling	676.8660	1.4210	961.8478 (280)
Pumps, fans and electric keep-hot	624.1482	1.5128	944.2114 (281)
Energy for lighting	276.7152	1.5338	424.4351 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-801.7478	1.4914	-1195.7023
PV Unit electricity exported	-594.0825	0.4494	-267.0032
Total			-1462.7056 (283)
Total Primary energy kWh/year			4039.3099 (286)