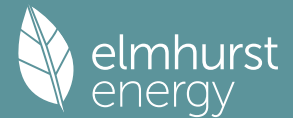


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Property Reference	5791	Issued on Date	14/10/2022
Assessment Reference	Proposed	Prop Type Ref	
Property	The Moorings, Reading, RG4 7EJ		
SAP Rating	83 B	DER	2.98
Environmental	96 A	% DER<TER	68.63
CO ₂ Emissions (t/year)	0.98	DFEE	49.97
Compliance Check	See BREL	% DFEE < TFEE	3.49
% DPER < TPER	36.67	DPER	32.42
Assessor Details	Mr. Harry Davey	Assessor ID	R434-0001
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	197.2600 (1b)	x 2.6000 (2b)	= 512.8760 (1b) -
First floor	174.0200 (1c)	x 2.9400 (2c)	= 511.6188 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	371.2800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1024.4948 (5)

2. Ventilation rate

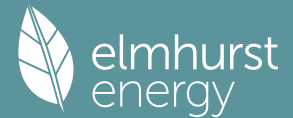
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	7 * 10 = 70.0000 (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) =	70.0000 / (5) = 0.0683 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3183 (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) = 0.2706 (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	0.3450	0.3382	0.3315	0.2976	0.2909	0.2570	0.2570	0.2503	0.2706	0.2909	0.3044	0.3179 (22b)
Effective ac	0.5595	0.5572	0.5549	0.5443	0.5423	0.5330	0.5330	0.5313	0.5366	0.5423	0.5463	0.5505 (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			5.8500	1.0000	5.8500		(26)
Window (Uw = 1.20)			146.0700	1.1450	167.2557		(27)
Opening			9.8400	1.1450	11.2672		(27a)
Heatloss Floor 1			211.3000	0.1000	21.1300		(28a)
Heatloss Floor 2			38.1600	0.1300	4.9608		(28b)
External Wall 1	348.6600	151.9200	196.7400	0.1800	35.4132		(29a)
External Roof 1	252.0600	9.8400	242.2200	0.1300	31.4886		(30)

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Total net area of external elements Aum(A, m2) 850.1800 (31)
 Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 277.3655 (33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	61.1200	0.0500	3.0560
E2 Other lintels (including other steel lintels)	58.8700	0.0500	2.9435
E3 Sill	119.9000	0.0500	5.9950
E4 Jamb	73.2000	0.0160	1.1712
E5 Ground floor (normal)	17.2000	0.2400	4.1280
R11 Upstands or kerbs of rooflights	7.6000	0.0000	0.0000
E6 Intermediate floor within a dwelling	19.0000	0.1500	2.8500
E24 Eaves (insulation at ceiling level - inverted)	33.1000	0.0700	2.3170
E20 Exposed floor (normal)	26.7000	0.3200	8.5440
E21 Exposed floor (inverted)	87.8000	0.0800	7.0240
E14 Flat roof	33.2000	0.0900	2.9880
E16 Corner (normal)	8.2000	-0.0900	-0.7380
E17 Corner (inverted - internal area greater than external area)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 40.2787 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 317.6442 (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	189.1602	188.3790	187.6132	184.0165	183.3435	180.2109	180.2109	179.6308	181.4175	183.3435	184.7049	186.1281	(38)
Heat transfer coeff	506.8044	506.0232	505.2574	501.6607	500.9877	497.8551	497.8551	497.2750	499.0617	500.9877	502.3491	503.7723	(39)
Average = Sum(39)m / 12 =												501.6575	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3650	1.3629	1.3609	1.3512	1.3494	1.3409	1.3409	1.3394	1.3442	1.3494	1.3530	1.3569	(40)
HLP (average)												1.3512	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.2246 (42)

Hot water usage for mixer showers

107.6429 106.0253 103.6680 99.1578 95.8294 92.1176 90.0078 92.3473 94.9117 98.8970 103.5041 107.2305 (42a)

Hot water usage for baths

33.7887 33.2869 32.5802 31.2773 30.3016 29.2198 28.6355 29.3372 30.1012 31.2588 32.5886 33.6744 (42b)

Hot water usage for other uses

47.6531 45.9202 44.1874 42.4546 40.7217 38.9889 38.9889 40.7217 42.4546 44.1874 45.9202 47.6531 (42c)

Average daily hot water use (litres/day)

173.8916 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	189.0847	185.2323	180.4356	172.8896	166.8528	160.3263	157.6322	162.4062	167.4675	174.3432	182.0129	188.5580	(44)
Energy conte	299.4639	263.7684	277.3228	236.6773	224.6159	197.1399	190.6425	201.0927	206.5041	236.5821	259.3107	295.2363	(45)
Energy content (annual)												2888.3566	
Distribution loss (46)m = 0.15 x (45)m													
44.9196 39.5653 41.5984 35.5016 33.6924 29.5710 28.5964 30.1639 30.9756 35.4873 38.8966 44.2854 (46)													

Water storage loss:

Store volume

a) If manufacturer declared loss factor is known (kWh/day):

Temperature factor from Table 2b

Enter (49) or (54) in (55)

Total storage loss

30.1320 27.2160 30.1320 29.1600 30.1320 29.1600 30.1320 30.1320 29.1600 30.1320 29.1600 30.1320 (56)

If cylinder contains dedicated solar storage

30.1320 27.2160 30.1320 29.1600 30.1320 29.1600 30.1320 30.1320 29.1600 30.1320 29.1600 30.1320 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month

352.8583 311.9956 330.7172 288.3493 278.0103 248.8119 244.0369 254.4871 258.1761 289.9765 310.9827 348.6307 (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

352.8583 311.9956 330.7172 288.3493 278.0103 248.8119 244.0369 254.4871 258.1761 289.9765 310.9827 348.6307 (64)

Total per year (kWh/year) = Sum(64)m = 3517.0326 (64)

12Total per year (kWh/year)

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

142.2873 126.2848 134.9253 120.0328 117.4003 106.8866 106.1041 109.5789 110.0002 121.3791 127.5584 140.8816 (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	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	(66)

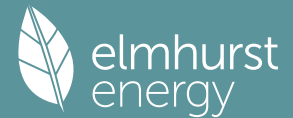
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

259.1136 286.8758 259.1136 267.7507 259.1136 267.7507 259.1136 259.1136 267.7507 259.1136 267.7507 259.1136 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

513.7217 519.0525 505.6190 477.0207 440.9204 406.9913 384.3245 378.9937 392.4272 421.0255 457.1258 491.0549 (68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838 (71)
Total internal gains	191.2463	187.9237	181.3513	166.7122	157.7961	148.4536	142.6131	147.2834	152.7781	163.1439	177.1645	189.3570 (72)
	1035.4505	1065.2210	1017.4528	982.8525	929.1991	894.5645	857.4201	856.7596	884.3249	914.6519	973.4099	1010.8944 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	73.5100	10.6334	0.6300	0.7000	0.7700	238.8856 (74)
East	17.6100	19.6403	0.6300	0.7000	0.7700	105.7009 (76)
South	39.9800	46.7521	0.6300	0.7000	0.7700	571.2358 (78)
West	14.9700	19.6403	0.6300	0.7000	0.7700	89.8547 (80)
Horizontal	9.8400	26.0000	0.6300	0.7000	1.0000	101.5429 (82)

Solar gains	1107.2199	1985.5047	2972.3819	4097.5776	4957.9808	5081.4500	4832.9564	4168.4876	3359.4261	2264.1836	1344.5216	935.5780 (83)
Total gains	2142.6705	3050.7257	3989.8347	5080.4302	5887.1799	5976.0145	5690.3765	5025.2472	4243.7510	3178.8355	2317.9315	1946.4724 (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	50.8743	50.9529	51.0301	51.3960	51.4650	51.7888	51.7888	51.8492	51.6636	51.4650	51.3255	51.1805
alpha	4.3916	4.3969	4.4020	4.4264	4.4310	4.4526	4.4526	4.4566	4.4442	4.4310	4.4217	4.4120
util living area	0.9982	0.9916	0.9674	0.8803	0.7100	0.5175	0.3816	0.4477	0.7225	0.9531	0.9949	0.9988 (86)
Living	19.6116	19.8620	20.2069	20.5963	20.8301	20.9110	20.9265	20.9227	20.8514	20.4746	19.9535	19.5695
Non living	18.1723	18.4928	18.9271	19.3954	19.6378	19.7101	19.7187	19.7187	19.6689	19.2703	18.6169	18.1231
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	19.7903	19.7919	19.7935	19.8010	19.8024	19.8089	19.8089	19.8101	19.8064	19.8024	19.7995	19.7966 (88)
util rest of house	0.9976	0.9887	0.9564	0.8444	0.6420	0.4279	0.2800	0.3357	0.6287	0.9311	0.9927	0.9984 (89)
MIT 2	19.7903	19.7919	19.7935	19.8010	19.8024	19.8089	19.8089	19.8101	19.8064	19.8024	19.7995	19.7966 (90)
Living area fraction									fLA = Living area / (4) =			0.1593 (91)
MIT	19.9830	19.9843	19.9857	19.9920	19.9932	19.9987	19.9987	19.9997	19.9966	19.9932	19.9908	19.9883 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9830	19.9843	19.9857	19.9920	19.9932	19.9987	19.9987	19.9997	19.9966	19.9932	19.9908	19.9883 (93)

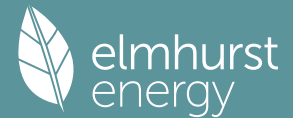
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9977	0.9893	0.9584	0.8508	0.6535	0.4426	0.2964	0.3539	0.6451	0.9353	0.9931	0.9985 (94)
Useful gains	2137.7195	3018.0189	3823.8523	4322.4257	3847.5028	2645.0614	1686.6732	1778.4174	2737.4976	2973.0230	2302.0301	1943.5185 (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	7948.2050	7633.0307	6813.7451	5564.4170	4154.7787	2687.7590	1692.0489	1790.0395	2942.7458	4705.8652	6475.6747	7953.7041 (97)
Space heating kWh	4323.0012	3101.2879	2224.4802	894.2337	228.6133	0.0000	0.0000	0.0000	0.0000	1289.2346	3005.0241	4471.5781 (98a)
Space heating requirement - total per year (kWh/year)												19537.4531
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	4323.0012	3101.2879	2224.4802	894.2337	228.6133	0.0000	0.0000	0.0000	0.0000	1289.2346	3005.0241	4471.5781 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												19537.4531
Space heating per m2										(98c) / (4) =		52.6219 (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 %)												370.1126 (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	4323.0012	3101.2879	2224.4802	894.2337	228.6133	0.0000	0.0000	0.0000	0.0000	1289.2346	3005.0241	4471.5781 (98)

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Space heating efficiency (main heating system 1)	370.1126	370.1126	370.1126	370.1126	370.1126	0.0000	0.0000	0.0000	0.0000	370.1126	370.1126	370.1126	(210)
Space heating fuel (main heating system)	1168.0233	837.9309	601.0280	241.6113	61.7686	0.0000	0.0000	0.0000	0.0000	348.3358	811.9216	1208.1669	(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	352.8583	311.9956	330.7172	288.3493	278.0103	248.8119	244.0369	254.4871	258.1761	289.9765	310.9827	348.6307	(64)
Efficiency of water heater												101.8800	(216)
(217)m	101.8800	101.8800	101.8800	101.8800	101.8800	101.8800	101.8800	101.8800	101.8800	101.8800	101.8800	101.8800	(217)
Fuel for water heating, kWh/month	346.3470	306.2383	324.6144	283.0283	272.8802	244.2206	239.5336	249.7911	253.4120	284.6255	305.2441	342.1974	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	69.2310	55.5397	50.0073	36.6375	28.2999	23.1212	25.8161	33.5567	43.5869	57.1883	64.5941	71.1551	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.2031	-69.7177	-122.9030	-158.4064	-181.2258	-170.9006	-167.3114	-148.9002	-117.4868	-85.8423	-47.5504	-32.9712	(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	-6.2225	-17.3735	-48.5146	-100.7936	-161.6094	-174.6994	-170.1670	-131.4390	-81.2332	-32.0073	-9.4736	-4.5264	(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												5278.7863	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												101.8800	
Water heating fuel used												3452.1325	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												558.7339	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2281.4784	(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												7008.1743	(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	5278.7863	0.1565	826.0229	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3452.1325	0.1411	486.9786	(264)
Space and water heating			1313.0015	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	558.7339	0.1443	80.6426	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1343.4190	0.1321	-177.4048	
PV Unit electricity exported	-938.0594	0.1189	-111.5224	
Total			-288.9272	(269)
Total CO2, kg/year			1104.7169	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			2.9800	(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	5278.7863	1.5793	8336.6948	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3452.1325	1.5216	5252.8319	(278)
Space and water heating			13589.5267	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	558.7339	1.5338	857.0047	(282)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1343.4190	1.4879	-1998.9096
PV Unit electricity exported	-938.0594	0.4360	-408.9974
Total			-2407.9070 (283)
Total Primary energy kWh/year			12038.6243 (286)
Dwelling Primary energy Rate (DPER)			32.4200 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	197.2600 (1b)	x 2.6000 (2b)	= 512.8760 (1b) -
First floor	174.0200 (1c)	x 2.9400 (2c)	= 511.6188 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	371.2800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 1024.4948 (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	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) = 0.0390 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2890 (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) = 0.2457 (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	0.3133	0.3071	0.3010	0.2703	0.2641	0.2334	0.2334	0.2273	0.2457	0.2641	0.2764	0.2887 (22b)
Effective ac	0.5491	0.5472	0.5453	0.5365	0.5349	0.5272	0.5272	0.5258	0.5302	0.5349	0.5382	0.5417 (25)

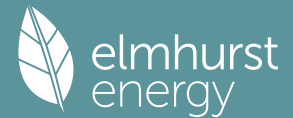
3. Heat losses and heat loss parameter

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
TER Opaque door			5.8500	1.0000	5.8500		(26)
TER Opening Type (Uw = 1.20)			81.5100	1.1450	93.3321		(27)
Opening			5.4900	2.0221	11.1011		(27a)
Heatloss Floor 1			211.3000	0.1300	27.4690		(28a)
Heatloss Floor 2			38.1600	0.1300	4.9608		(28b)
External Wall 1	348.6600	87.3600	261.3000	0.1800	47.0340		(29a)
External Roof 1	252.0600	5.4900	246.5700	0.1100	27.1227		(30)
Total net area of external elements Aum(A, m ²)			850.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	216.8697		(33)

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

List of Thermal Bridges			250.0000 (35)
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	61.1200	0.0500	3.0560
E3 Sill	58.8700	0.0500	2.9435
E4 Jamb	119.9000	0.0500	5.9950
E5 Ground floor (normal)	73.2000	0.1600	11.7120
R11 Upstands or kerbs of rooflights	17.2000	0.0800	1.3760
E6 Intermediate floor within a dwelling	7.6000	0.0000	0.0000

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E24 Eaves (insulation at ceiling level - inverted)														19.0000	0.2400	4.5600			
E20 Exposed floor (normal)														33.1000	0.3200	10.5920			
E21 Exposed floor (inverted)														26.7000	0.3200	8.5440			
E14 Flat roof														87.8000	0.0800	7.0240			
E16 Corner (normal)														33.2000	0.0900	2.9880			
E17 Corner (inverted - internal area greater than external area)														8.2000	-0.0900	-0.7380			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)																	58.0525	(36)	
Point Thermal bridges																	0.0000	(36a) =	
Total fabric heat loss																	(33) + (36) + (36a) =	274.9222	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)																			
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
Heat transfer coeff	185.6291	184.9849	184.3536	181.3881	180.8333	178.2505	178.2505	177.7722	179.2454	180.8333	181.9557	183.1291	(38)						
Average = Sum(39)m / 12 =	460.5512	459.9071	459.2758	456.3103	455.7555	453.1727	453.1727	452.6944	454.1675	455.7555	456.8779	458.0513	(39)						
														456.3076					
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
HLP (average)	1.2404	1.2387	1.2370	1.2290	1.2275	1.2206	1.2206	1.2193	1.2232	1.2275	1.2305	1.2337	(40)						
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31							

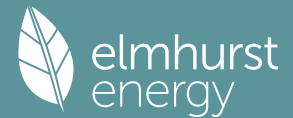
4. Water heating energy requirements (kWh/year)																			

Assumed occupancy																	3.2246	(42)	
Hot water usage for mixer showers	78.2858	77.1093	75.3949	72.1148	69.6941	66.9946	65.4603	67.1616	69.0267	71.9251	75.2757	77.9858	(42a)						
Hot water usage for baths	33.7887	33.2869	32.5802	31.2773	30.3016	29.2198	28.6355	29.3372	30.1012	31.2588	32.5886	33.6744	(42b)						
Hot water usage for other uses	47.6531	45.9202	44.1874	42.4546	40.7217	38.9889	38.9889	40.7217	42.4546	44.1874	45.9202	47.6531	(42c)						
Average daily hot water use (litres/day)														146.8252	(43)				
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
Energy conte	159.7275	156.3164	152.1625	145.8466	140.7175	135.2033	133.0846	137.2205	141.5825	147.3713	153.7845	159.3133	(44)						
Energy content (annual)	252.9693	222.5924	233.8681	199.6567	189.4328	166.2483	160.9543	169.9077	174.5853	199.9815	219.0942	249.4462	(45)						
Distribution loss (46)m = 0.15 x (45)m														Total = Sum(45)m =	2438.7367				
	37.9454	33.3889	35.0802	29.9485	28.4149	24.9372	24.1431	25.4862	26.1878	29.9972	32.8641	37.4169	(46)						
Water storage loss:																			
Store volume																250.0000	(47)		
a) If manufacturer declared loss factor is known (kWh/day):																1.8903	(48)		
Temperature factor from Table 2b																0.5400	(49)		
Enter (49) or (54) in (55)																1.0208	(55)		
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)						
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(57)						
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)						
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)						
Total heat required for water heating calculated for each month																			
WWHRS	307.8761	272.1856	288.7749	252.7923	244.3396	219.3839	215.8611	224.8145	227.7209	254.8883	272.2298	304.3530	(62)						
PV diverter	-35.7890	-31.6521	-33.1442	-27.4447	-25.5775	-21.8868	-20.5154	-21.8161	-22.6450	-26.6959	-30.2432	-35.1262	(63a)						
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)						
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)						
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)						
	272.0871	240.5336	255.6307	225.3476	218.7621	197.4970	195.3457	202.9984	205.0760	228.1923	241.9866	269.2267	(64)						
Total per year (kWh/year) = Sum(64)m =																	2752.6836	(64)	
12Total per year (kWh/year)																	2753	(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																			
	128.0377	113.6866	121.6866	108.8943	106.9118	97.7860	97.4427	100.4197	100.5581	110.4193	115.3573	126.8663	(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	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	(66)						
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	259.1136	286.8758	259.1136	267.7507	259.1136	267.7507	259.1136	259.1136	267.7507	259.1136	267.7507	259.1136	(67)						
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	513.7217	519.0525	505.6190	477.0207	440.9204	406.9913	384.3245	378.9937	392.4272	421.0255	457.1258	491.0549	(68)						
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	(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)	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	(71)						
Water heating gains (Table 5)	172.0937	169.1764	163.5572	151.2421	143.6987	135.8139	130.9714	134.9728	139.6640	148.4130	160.2185	170.5192	(72)						
Total internal gains	1019.2979	1049.4737	1002.6588	970.3825	918.1016	881.9248	845.7784	844.4490	871.2108	902.9210	959.4639	995.0567	(73)						

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				41.0100	10.6334	0.6300	0.7000	0.7700	133.2703 (74)			
East				9.8300	19.6403	0.6300	0.7000	0.7700	59.0028 (76)			
South				22.3100	46.7521	0.6300	0.7000	0.7700	318.7661 (78)			
West				8.3600	19.6403	0.6300	0.7000	0.7700	50.1794 (80)			
Horizontal				5.4900	26.0000	0.6300	0.7000	1.0000	56.6535 (82)			
Solar gains	617.8722	1107.9917	1658.7060	2286.5913	2766.7013	2835.5879	2696.9271	2326.1528	1874.6872	1263.5058	750.2964	522.0887 (83)
Total gains	1637.1701	2157.4654	2661.3648	3256.9737	3684.8029	3717.5128	3542.7055	3170.6017	2745.8980	2166.4268	1709.7603	1517.1454 (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, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.9836	56.0620	56.1391	56.5039	56.5727	56.8952	56.8952	56.9553	56.7705	56.5727	56.4338	56.2892
alpha	4.7322	4.7375	4.7426	4.7669	4.7715	4.7930	4.7930	4.7970	4.7847	4.7715	4.7623	4.7526
util living area	0.9995	0.9979	0.9922	0.9652	0.8791	0.7117	0.5466	0.6239	0.8769	0.9869	0.9986	0.9996 (86)
MIT	19.2801	19.5079	19.8578	20.3233	20.7156	20.9275	20.9836	20.9703	20.7932	20.2593	19.6788	19.2429 (87)
Th 2	19.8878	19.8892	19.8905	19.8969	19.8980	19.9036	19.9036	19.9046	19.9014	19.8980	19.8956	19.8931 (88)
util rest of house	0.9993	0.9972	0.9892	0.9513	0.8324	0.6158	0.4186	0.4912	0.8096	0.9797	0.9980	0.9995 (89)
MIT 2	17.8675	18.1602	18.6078	19.1957	19.6536	19.8618	19.8985	19.8939	19.7509	19.1253	18.3841	17.8233 (90)
Living area fraction	f _{LA} = Living area / (4) =											
MIT	18.0925	18.3749	18.8069	19.3753	19.8228	20.0316	20.0713	20.0654	19.9170	19.3060	18.5904	18.0495 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.0925	18.3749	18.8069	19.3753	19.8228	20.0316	20.0713	20.0654	19.9170	19.3060	18.5904	18.0495 (93)

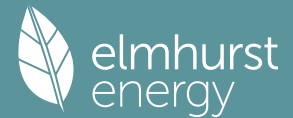
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9988	0.9956	0.9849	0.9425	0.8287	0.6280	0.4390	0.5119	0.8108	0.9739	0.9968	0.9992 (94)
Useful gains	1635.1824	2147.9556	2621.2712	3069.8235	3053.4364	2334.5377	1555.0885	1623.0528	2226.3208	2109.9018	1704.2356	1515.8585 (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	6352.1692	6197.1965	5652.2605	4780.0054	3702.0207	2461.4523	1573.1129	1659.3145	2641.8812	3967.7846	5249.6896	6343.7807 (97)
Space heating kWh	3509.4382	2721.0899	2255.0561	1231.3309	482.5467	0.0000	0.0000	0.0000	0.0000	1382.2648	2552.7269	3591.9741 (98a)
Space heating requirement - total per year (kWh/year)	17726.4276											
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	3509.4382	2721.0899	2255.0561	1231.3309	482.5467	0.0000	0.0000	0.0000	0.0000	1382.2648	2552.7269	3591.9741 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	17726.4276											
Space heating per m2	(98c) / (4) = 47.7441 (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	3509.4382	2721.0899	2255.0561	1231.3309	482.5467	0.0000	0.0000	0.0000	0.0000	1382.2648	2552.7269	3591.9741 (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)	3802.2082	2948.0930	2443.1810	1334.0530	522.8025	0.0000	0.0000	0.0000	0.0000	1497.5783	2765.6846	3891.6296 (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	272.0871	240.5336	255.6307	225.3476	218.7621	197.4970	195.3457	202.9984	205.0760	228.1923	241.9866	269.2267 (64)
Efficiency of water heater	88.0852	87.9940	87.7919	87.2772	85.7821	79.8000	79.8000	79.8000	79.8000	87.4032	87.9412	79.8000 (216)
Fuel for water heating, kWh/month	88.1071 (217)											

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	308.8908	273.3523	291.1781	258.1974	255.0205	247.4900	244.7940	254.3839	256.9874	261.0799	275.1686	305.5674	(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	53.8387	43.1914	38.8891	28.4918	22.0079	17.9806	20.0763	26.0960	33.8961	44.4735	50.2327	55.3350	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-146.6024	-190.0357	-251.2119	-258.7259	-260.0571	-235.6958	-232.0747	-227.4584	-217.9349	-204.3440	-154.7643	-128.7201	(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	-142.2251	-289.5123	-558.8147	-816.7415	-1059.4830	-1057.8035	-1045.9508	-895.3023	-669.0614	-406.9009	-187.3548	-113.2942	(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												19205.2304	(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												3232.1104	(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)												434.5091	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-9750.0697	(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												13207.7801	(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	19205.2304	0.2100	4033.0984 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	3232.1104	0.2100	678.7432 (264)
Space and water heating			4711.8416 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	434.5091	0.1443	62.7131 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2507.6253	0.1365	-342.3114
PV Unit electricity exported	-7242.4444	0.1267	-917.6595
Total			-1259.9710 (269)
Total CO2, kg/year			3526.5129 (272)
Target Carbon Dioxide Emission Rate (TER)			9.5000 (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	19205.2304	1.1300	21701.9103 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3232.1104	1.1300	3652.2847 (278)
Space and water heating			25354.1951 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	434.5091	1.5338	666.4645 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2507.6253	1.5046	-3773.0124
PV Unit electricity exported	-7242.4444	0.4651	-3368.6900
Total			-7141.7024 (283)
Total Primary energy kWh/year			19009.0580 (286)
Target Primary Energy Rate (TPER)			51.2000 (287)

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	197.2600 (1b)	x 2.6000 (2b)	= 512.8760 (1b) -
First floor	174.0200 (1c)	x 2.9400 (2c)	= 511.6188 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	371.2800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1024.4948 (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	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) = 0.0390 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2890 (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) = 0.2457 (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	0.3133	0.3071	0.3010	0.2703	0.2641	0.2334	0.2334	0.2273	0.2457	0.2641	0.2764	0.2887 (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	0.5491	0.5472	0.5453	0.5365	0.5349	0.5272	0.5272	0.5258	0.5302	0.5349	0.5382	0.5417 (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			5.8500	1.0000	5.8500		(26)
Window (Uw = 1.20)			146.0700	1.1450	167.2557		(27)
Opening			9.8400	1.1450	11.2672		(27a)
Heatloss Floor 1			211.3000	0.1000	21.1300		(28a)
Heatloss Floor 2			38.1600	0.1300	4.9608		(28b)
External Wall 1	348.6600	151.9200	196.7400	0.1800	35.4132		(29a)
External Roof 1	252.0600	9.8400	242.2200	0.1300	31.4886		(30)
Total net area of external elements Aum(A, m ²)			850.1800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	277.3655	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)

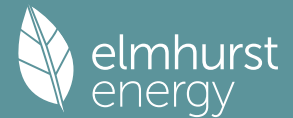
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	61.1200	0.0500	3.0560
E3 Sill	58.8700	0.0500	2.9435
E4 Jamb	119.9000	0.0500	5.9950
E5 Ground floor (normal)	73.2000	0.0160	1.1712
R11 Upstands or kerbs of rooflights	17.2000	0.2400	4.1280
E6 Intermediate floor within a dwelling	7.6000	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	19.0000	0.1500	2.8500
E20 Exposed floor (normal)	33.1000	0.0700	2.3170
E21 Exposed floor (inverted)	26.7000	0.3200	8.5440
E14 Flat roof	87.8000	0.0800	7.0240
E16 Corner (normal)	33.2000	0.0900	2.9880
E17 Corner (inverted - internal area greater than external area)	8.2000	-0.0900	-0.7380
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			40.2787 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 317.6442 (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	185.6291	184.9849	184.3536	181.3881	180.8333	178.2505	178.2505	177.7722	179.2454	180.8333	181.9557	183.1291 (38)
Heat transfer coeff	503.2733	502.6291	501.9978	499.0323	498.4775	495.8947	495.8947	495.4164	496.8896	498.4775	499.5999	500.7733 (39)

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Average = Sum(39)m / 12 =

499.0297

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3555	1.3538	1.3521	1.3441	1.3426	1.3356	1.3356	1.3343	1.3383	1.3426	1.3456	1.3488	(40)
HLP (average)												1.3441	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.2246 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
33.7887	33.2869	32.5802	31.2773	30.3016	29.2198	28.6355	29.3372	30.1012	31.2588	32.5886	33.6744		(42b)
Hot water usage for other uses													
47.6531	45.9202	44.1874	42.4546	40.7217	38.9889	38.9889	40.7217	42.4546	44.1874	45.9202	47.6531		(42c)
Average daily hot water use (litres/day)												74.6484	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.4417	79.2071	76.7676	73.7318	71.0233	68.2087	67.6243	70.0589	72.5558	75.4462	78.5088	81.3275	(44)
Energy conte	128.9838	112.7898	117.9889	100.9352	95.6111	83.8705	81.7858	86.7476	89.4685	102.3798	111.8502	127.3392	(45)
Energy content (annual)													Total = Sum(45)m = 1239.7503
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	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	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
109.6362	95.8714	100.2906	85.7949	81.2694	71.2900	69.5179	73.7354	76.0482	87.0228	95.0726	108.2383		(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	109.6362	95.8714	100.2906	85.7949	81.2694	71.2900	69.5179	73.7354	76.0482	87.0228	95.0726	108.2383	(64)
													Total per year (kWh/year) = Sum(64)m = 1053.7878 (64)
12Total per year (kWh/year)													1054 (64)
Electric shower(s)													
62.6939	55.8607	60.9978	58.2094	59.3017	56.5681	58.4537	59.3017	58.2094	60.9978	59.8508	62.6939		(64a)
													Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 713.1389 (64a)
Heat gains from water heating, kWh/month													
43.0825	37.9330	40.3221	36.0011	35.1428	31.9645	31.9929	33.2593	33.5644	37.0051	38.7309	42.7330		(65)

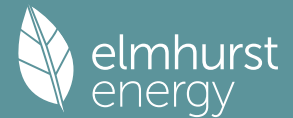
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
259.1136	286.8758	259.1136	267.7507	259.1136	267.7507	259.1136	259.1136	267.7507	259.1136	267.7507	259.1136		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
513.7217	519.0525	505.6190	477.0207	440.9204	406.9913	384.3245	378.9937	392.4272	421.0255	457.1258	491.0549		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230		(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)													
-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	(71)
Water heating gains (Table 5)													
57.9066	56.4480	54.1964	50.0015	47.2349	44.3952	43.0012	44.7033	46.6173	49.7381	53.7929	57.4369		(72)
Total internal gains	902.1108	933.7452	890.2979	866.1418	818.6379	790.5061	757.8082	754.1795	778.1641	801.2461	850.0383	878.9744	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				73.5100	10.6334		0.6300		0.7000		0.7700		238.8856 (74)
East				17.6100	19.6403		0.6300		0.7000		0.7700		105.7009 (76)
South				39.9800	46.7521		0.6300		0.7000		0.7700		571.2358 (78)
West				14.9700	19.6403		0.6300		0.7000		0.7700		89.8547 (80)
Horizontal				9.8400	26.0000		0.6300		0.7000		1.0000		101.5429 (82)
Solar gains	1107.2199	1985.5047	2972.3819	4097.5776	4957.9808	5081.4500	4832.9564	4168.4876	3359.4261	2264.1836	1344.5216	935.5780	(83)
Total gains	2009.3308	2919.2499	3862.6798	4963.7194	5776.6187	5871.9560	5590.7646	4922.6671	4137.5902	3065.4297	2194.5599	1814.5523	(84)

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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	51.2313	51.2969	51.3614	51.6667	51.7242	51.9936	51.9936	52.0438	51.8895	51.7242	51.6080	51.4870
alpha	4.4154	4.4198	4.4241	4.4444	4.4483	4.4662	4.4662	4.4696	4.4593	4.4483	4.4405	4.4325
util living area	0.9986	0.9929	0.9706	0.8864	0.7172	0.5240	0.3867	0.4549	0.7329	0.9581	0.9959	0.9991 (86)
MIT	19.2194	19.5541	20.0170	20.5432	20.8626	20.9730	20.9944	20.9889	20.8895	20.3732	19.6733	19.1610 (87)
Th 2	19.7976	19.7990	19.8003	19.8065	19.8076	19.8130	19.8130	19.8140	19.8109	19.8076	19.8053	19.8028 (88)
util rest of house	0.9981	0.9905	0.9605	0.8518	0.6496	0.4339	0.2842	0.3417	0.6399	0.9380	0.9941	0.9988 (89)
MIT 2	18.1851	18.5191	18.9742	19.4678	19.7270	19.8026	19.8119	19.8114	19.7579	19.3294	18.6439	18.1307 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.3499	18.6840	19.1403	19.6391	19.9079	19.9890	20.0003	19.9990	19.9381	19.4957	18.8079	18.2949 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.3499	18.6840	19.1403	19.6391	19.9079	19.9890	20.0003	19.9990	19.9381	19.4957	18.8079	18.2949 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9872	0.9533	0.8462	0.6557	0.4476	0.3006	0.3597	0.6509	0.9310	0.9919	0.9982 (94)
Useful gains	2003.7635	2881.8615	3682.3348	4200.1740	3787.7276	2628.5122	1680.5868	1770.8042	2693.0168	2853.9820	2176.8331	1811.2780 (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	7070.9350	6928.2428	6345.4171	5359.1677	4091.4518	2672.3842	1686.1668	1783.0001	2900.9127	4434.2959	5849.2488	7058.3261 (97)
Space heating kWh	3769.9756	2719.1682	1981.3332	834.4754	225.9708	0.0000	0.0000	0.0000	0.0000	1175.7536	2644.1393	3903.8038 (98a)
Space heating requirement - total per year (kWh/year)	17254.6201											
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	3769.9756	2719.1682	1981.3332	834.4754	225.9708	0.0000	0.0000	0.0000	0.0000	1175.7536	2644.1393	3903.8038 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	17254.6201											
Space heating per m2	(98c) / (4) = 46.4733 (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	4661.4101	3669.6208	3765.1646	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9271	0.9603	0.9349	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	4321.4538	3524.0263	3520.0020	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	6604.0635	6287.4704	5533.0093	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	1643.4789	2056.0025	1497.6774	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fC = cooled area / (4) =											
Intermittency factor (Table 10b)												1.0000 (105)
	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	410.8697	514.0006	374.4194	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	1299.2897 (107)											
Energy for space heating	46.4733 (99)											
Energy for space cooling	3.4995 (108)											
Total	49.9728 (109)											
Fabric Energy Efficiency (DFEE)	50.0 (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	197.2600 (1b)	x 2.6000 (2b)	= 512.8760 (1b) -
First floor	174.0200 (1c)	x 2.9400 (2c)	= 511.6188 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	371.2800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1024.4948 (5)

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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) = 0.0390 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2890 (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) = 0.2457 (21)

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	0.3133	0.3071	0.3010	0.2703	0.2641	0.2334	0.2334	0.2273	0.2457	0.2641	0.2764	0.2887	(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	0.5491	0.5472	0.5453	0.5365	0.5349	0.5272	0.5272	0.5258	0.5302	0.5349	0.5382	0.5417	(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			5.8500	1.0000	5.8500		(26)
TER Opening Type (Uw = 1.20)			81.5100	1.1450	93.3321		(27)
Opening			5.4900	2.0221	11.1011		(27a)
Heatloss Floor 1			211.3000	0.1300	27.4690		(28a)
Heatloss Floor 2			38.1600	0.1300	4.9608		(28b)
External Wall 1	348.6600	87.3600	261.3000	0.1800	47.0340		(29a)
External Roof 1	252.0600	5.4900	246.5700	0.1100	27.1227		(30)
Total net area of external elements Aum(A, m2)			850.1800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 216.8697		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	61.1200	0.0500	3.0560
E3 Sill	58.8700	0.0500	2.9435
E4 Jamb	119.9000	0.0500	5.9950
E5 Ground floor (normal)	73.2000	0.1600	11.7120
R11 Upstands or kerbs of rooflights	17.2000	0.0800	1.3760
E6 Intermediate floor within a dwelling	7.6000	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	19.0000	0.2400	4.5600
E20 Exposed floor (normal)	33.1000	0.3200	10.5920
E21 Exposed floor (inverted)	26.7000	0.3200	8.5440
E14 Flat roof	87.8000	0.0800	7.0240
E16 Corner (normal)	33.2000	0.0900	2.9880
E17 Corner (inverted - internal area greater than external area)	8.2000	-0.0900	-0.7380

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 58.0525 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 274.9222 (37)

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

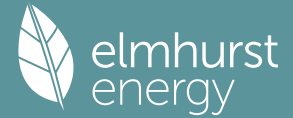
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	185.6291	184.9849	184.3536	181.3881	180.8333	178.2505	178.2505	177.7722	179.2454	180.8333	181.9557	183.1291	(38)
Average = Sum(39)m / 12 =	460.5512	459.9071	459.2758	456.3103	455.7555	453.1727	453.1727	452.6944	454.1675	455.7555	456.8779	458.0513	(39)
												456.3076	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2404	1.2387	1.2370	1.2290	1.2275	1.2206	1.2206	1.2193	1.2232	1.2275	1.2305	1.2337	(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 3.2246 (42)

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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	33.7887	33.2869	32.5802	31.2773	30.3016	29.2198	28.6355	29.3372	30.1012	31.2588	32.5886	33.6744 (42b)
Hot water usage for other uses	47.6531	45.9202	44.1874	42.4546	40.7217	38.9889	38.9889	40.7217	42.4546	44.1874	45.9202	47.6531 (42c)
Average daily hot water use (litres/day)												74.6484 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	81.4417	79.2071	76.7676	73.7318	71.0233	68.2087	67.6243	70.0589	72.5558	75.4462	78.5088	81.3275 (44)
Distribution loss (46)m = 0.15 x (45)m	128.9838	112.7898	117.9889	100.9352	95.6111	83.8705	81.7858	86.7476	89.4685	102.3798	111.8502	127.3392 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	109.6362	95.8714	100.2906	85.7949	81.2694	71.2900	69.5179	73.7354	76.0482	87.0228	95.0726	108.2383 (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	109.6362	95.8714	100.2906	85.7949	81.2694	71.2900	69.5179	73.7354	76.0482	87.0228	95.0726	108.2383 (64)
12Total per year (kWh/year)												1053.7878 (64)
Electric shower(s)	62.6939	55.8607	60.9978	58.2094	59.3017	56.5681	58.4537	59.3017	58.2094	60.9978	59.8508	62.6939 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												713.1389 (64a)
Heat gains from water heating, kWh/month	43.0825	37.9330	40.3221	36.0011	35.1428	31.9645	31.9929	33.2593	33.5644	37.0051	38.7309	42.7330 (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	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297	161.2297 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	259.1136	286.8758	259.1136	267.7507	259.1136	267.7507	259.1136	259.1136	267.7507	259.1136	267.7507	259.1136 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	513.7217	519.0525	505.6190	477.0207	440.9204	406.9913	384.3245	378.9937	392.4272	421.0255	457.1258	491.0549 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230	39.1230 (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)	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838	-128.9838 (71)
Water heating gains (Table 5)	57.9066	56.4480	54.1964	50.0015	47.2349	44.3952	43.0012	44.7033	46.6173	49.7381	53.7929	57.4369 (72)
Total internal gains	902.1108	933.7452	890.2979	866.1418	818.6379	790.5061	757.8082	754.1795	778.1641	801.2461	850.0383	878.9744 (73)

6. Solar gains

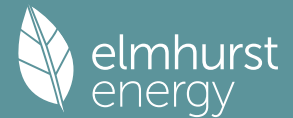
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	41.0100	10.6334	0.6300	0.7000	0.7700	133.2703 (74)
East	9.8300	19.6403	0.6300	0.7000	0.7700	59.0028 (76)
South	22.3100	46.7521	0.6300	0.7000	0.7700	318.7661 (78)
West	8.3600	19.6403	0.6300	0.7000	0.7700	50.1794 (80)
Horizontal	5.4900	26.0000	0.6300	0.7000	1.0000	56.6535 (82)

Solar gains	617.8722	1107.9917	1658.7060	2286.5913	2766.7013	2835.5879	2696.9271	2326.1528	1874.6872	1263.5058	750.2964	522.0887 (83)
Total gains	1519.9830	2041.7369	2549.0039	3152.7331	3585.3392	3626.0940	3454.7353	3080.3323	2652.8512	2064.7519	1600.3347	1401.0631 (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, n _{il,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.9836	56.0620	56.1391	56.5039	56.5727	56.8952	56.8952	56.9553	56.7705	56.5727	56.4338	56.2892
alpha	4.7322	4.7375	4.7426	4.7669	4.7715	4.7930	4.7930	4.7970	4.7847	4.7715	4.7623	4.7526
util living area	0.9996	0.9984	0.9935	0.9691	0.8880	0.7242	0.5589	0.6387	0.8882	0.9892	0.9989	0.9998 (86)
MIT	19.2469	19.4753	19.8270	20.2981	20.6998	20.9218	20.9820	20.9672	20.7785	20.2320	19.6478	19.2099 (87)
Th 2	19.8878	19.8892	19.8905	19.8969	19.8980	19.9036	19.9036	19.9046	19.9014	19.8980	19.8956	19.8931 (88)

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util rest of house	0.9995	0.9978	0.9910	0.9565	0.8433	0.6285	0.4288	0.5045	0.8243	0.9831	0.9985	0.9997 (89)
MIT 2	18.2802	18.5093	18.8605	19.3269	19.6951	19.8681	19.8992	19.8953	19.7738	19.2695	18.6868	18.2472 (90)
Living area fraction									fLA = Living area / (4) =			0.1593 (91)
MIT	18.4342	18.6632	19.0145	19.4816	19.8552	20.0360	20.0717	20.0661	19.9338	19.4229	18.8399	18.4006 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4342	18.6632	19.0145	19.4816	19.8552	20.0360	20.0717	20.0661	19.9338	19.4229	18.8399	18.4006 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9992	0.9968	0.9881	0.9503	0.8413	0.6411	0.4496	0.5256	0.8266	0.9793	0.9978	0.9995	(94)	
Useful gains	1518.7889	2035.2268	2518.7176	2995.8894	3016.2509	2324.8550	1553.3061	1619.0905	2192.8823	2022.0831	1596.7920	1400.3178	(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	6509.5153	6329.7943	5747.5976	4828.4999	3716.7729	2463.4453	1573.2639	1659.6130	2649.5402	4021.0629	5363.7181	6504.5872	(97)	
Space heating kWh	3713.1005	2885.9494	2402.2867	1319.4796	521.1884	0.0000	0.0000	0.0000	0.0000	1487.2410	2712.1868	3797.5764	(98a)	
Space heating requirement - total per year (kWh/year)	18839.0087													
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	3713.1005	2885.9494	2402.2867	1319.4796	521.1884	0.0000	0.0000	0.0000	0.0000	1487.2410	2712.1868	3797.5764	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	18839.0087													
Space heating per m2											(98c) / (4) =			50.7407 (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	4259.8230	3353.4777	3440.4771	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8045	0.8788	0.8257	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3426.8598	2947.0429	2840.7150	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	4037.3278	3845.9043	3425.3948	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	439.5370	668.7529	435.0018	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	109.8842	167.1882	108.7504	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement													385.8229 (107)
Energy for space heating													50.7407 (99)
Energy for space cooling													1.0392 (108)
Total													51.7799 (109)
Fabric Energy Efficiency (TFEE)													51.8 (109)

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