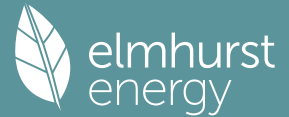


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Property Reference	CPG-7172-23 P16		Issued on Date	13/01/2024	
Assessment Reference	SEC1 - ASHP ROI TF 0.15 improv	Prop Type Ref	DS		
Property	Plots 16, Collygree Parc, South Road, Penzance, Cornwall, TR20 9LY				
SAP Rating	98 A	DER	-0.51	TER	11.71
Environmental	100 A	% DER < TER			104.36
CO ₂ Emissions (t/year)	-0.11	DFEE	31.51	TFEE	36.04
Compliance Check	See BREL	% DFEE < TFEE			12.58
% DPER < TPER	88.13	DPER	7.26	TPER	61.18
Assessor Details	Mr. Stuart Thomas			Assessor ID	V220-0003
Client	Cornwall Planning Group, CPG				

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	40.0000 (1b)	x 2.3700 (2b)	= 94.8000 (1b) - (3b)
First floor	40.0000 (1c)	x 2.6200 (2c)	= 104.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 199.6000 (5)

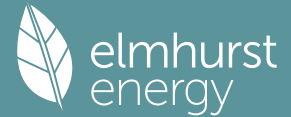
2. Ventilation rate

	m3 per hour												
Number of open chimneys	0 * 80 =											0.0000 (6a)	
Number of open flues	0 * 20 =											0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)	
Number of blocked chimneys	0 * 20 =											0.0000 (6f)	
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)	
Number of passive vents	0 * 10 =											0.0000 (7b)	
Number of flueless gas fires	0 * 40 =											0.0000 (7c)	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												1.0000 (17)	
Infiltration rate												0.0500 (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) =											0.0425 (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	0.0542	0.0531	0.0521	0.0468	0.0457	0.0404	0.0404	0.0393	0.0425	0.0457	0.0478	0.0499 (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) =												81.0000 (23c)	
Effective ac	0.1492	0.1481	0.1471	0.1417	0.1407	0.1354	0.1354	0.1343	0.1375	0.1407	0.1428	0.1449 (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
Window (Uw = 1.20)			11.9700	1.1450	13.7061		(27)
Door			2.1200	1.0000	2.1200		(26a)
Floor 1 P/a 0.45			40.0000	0.1200	4.8000	110.0000	(28a)
External Wall 1 Render	64.8700	9.4500	55.4200	0.1500	8.3130	9.0000	498.7800 (29a)
External Wall 2 stone	11.8500	2.1200	9.7300	0.1500	1.4595	9.0000	87.5700 (29a)
External Wall 3 clad	13.1000	2.5200	10.5800	0.1500	1.5870	9.0000	95.2200 (29a)
External Roof 1 Horz	40.0000		40.0000	0.0900	3.6000	9.0000	360.0000 (30)
Total net area of external elements Aum (A, m ²)			169.8200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	35.5856	(33)
Party Wall 1			39.9200	0.0000	0.0000	20.0000	798.4000 (32)
Internal Wall 1 GF			34.1300			9.0000	307.1700 (32c)
Internal Wall 2 FF			60.2000			9.0000	541.8000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)
Internal Ceiling 1			40.0000			9.0000	360.0000 (32e)

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Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 8168.9400 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 102.1118 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	9.9800	0.0300	0.2994
E5 Ground floor (normal)	18.0000	0.0210	0.3780
E10 Eaves (insulation at ceiling level)	10.0000	0.0440	0.4400
E12 Gable (insulation at ceiling level)	8.0000	0.0510	0.4080
E6 Intermediate floor within a dwelling	18.0000	0.0800	1.4400
P1 Party wall - Ground floor	8.0000	0.1490	1.1920
P2 Party wall - Intermediate floor within a dwelling	8.0000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400
E18 Party wall between dwellings	9.9800	0.0395	0.3942
E2 Other lintels (including other steel lintels)	10.6100	0.0840	0.8912
E3 Sill	9.6000	0.0430	0.4128
E4 Jamb	23.1000	0.0340	0.7854
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.4810 (36)
Point Thermal bridges			0.0000 (36a)
Total fabric heat loss			46.0667 (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	9.8267	9.7567	9.6867	9.3368	9.2668	8.9169	8.9169	8.8469	9.0569	9.2668	9.4068	9.5467 (38)
Heat transfer coeff	55.8933	55.8234	55.7534	55.4034	55.3335	54.9835	54.9835	54.9136	55.1235	55.3335	55.4734	55.6134 (39)
Average = Sum(39)m / 12 =												55.3859
HLP	0.6987	0.6978	0.6969	0.6925	0.6917	0.6873	0.6873	0.6864	0.6890	0.6917	0.6934	0.6952 (40)
HLP (average)												0.6923
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 (42)
Hot water usage for baths	75.5424	74.4205	72.8406	69.9276	67.7463	65.3277	64.0212	65.5901	67.2982	69.8863	72.8593	75.2870 (42b)
Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522 (42c)
Average daily hot water use (litres/day)												106.2689 (43)
Daily hot water use	115.3945	112.8235	109.7944	105.4322	101.8018	97.9340	96.6275	99.6456	102.8029	106.8401	111.2623	115.1391 (44)
Energy conte	182.7567	160.6591	168.7499	144.3314	137.0448	120.4213	116.8626	123.3820	126.7662	144.9810	158.5135	180.2801 (45)
Energy content (annual)												Total = Sum(45)m = 1764.7487
Distribution loss (46)m = 0.15 x (45)m	27.4135	24.0989	25.3125	21.6497	20.5567	18.0632	17.5294	18.5073	19.0149	21.7472	23.7770	27.0420 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (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	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (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	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (64)
Total per year (kWh/year)												2354.0047 (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	100.8037	89.5817	96.1465	86.7358	85.6045	78.7857	78.8940	81.0616	80.8954	88.2433	91.4513	99.9802 (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	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0636	129.6061	117.0636	120.9657	117.0636	120.9657	117.0636	117.0636	120.9657	117.0636	120.9657	117.0636 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143 (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)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)
Water heating gains (Table 5)	135.4889	133.3061	129.2291	120.4664	115.0598	109.4245	106.0403	108.9538	112.3547	118.6066	127.0158	134.3821 (72)
Total internal gains	531.9359	544.5728	522.2150	505.1384	480.4092	464.1829	447.2142	447.8506	460.8919	475.4577	503.1895	521.1468 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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	W/m2	or Table 6b	or Table 6c	Table 6d	
Northeast	4.4100	11.2829	0.7600	0.7000	18.3445 (75)
Southwest	7.5600	36.7938	0.7600	0.7000	102.5514 (79)

Solar gains	120.8959	212.0238	306.2851	406.6304	480.2215	487.6405	465.6048	409.0375	340.7732	238.6953	145.9151	102.7437 (83)
Total gains	652.8318	756.5965	828.5001	911.7688	960.6306	951.8234	912.8190	856.8881	801.6650	714.1530	649.1046	623.8905 (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	40.5979	40.6488	40.6998	40.9568	41.0086	41.2696	41.2696	41.3222	41.1648	41.0086	40.9052	40.8022
alpha	3.7065	3.7099	3.7133	3.7305	3.7339	3.7513	3.7513	3.7548	3.7443	3.7339	3.7270	3.7201
util living area	0.9019	0.8497	0.7781	0.6546	0.5102	0.3641	0.2637	0.2927	0.4587	0.6966	0.8505	0.9131 (86)
Living	20.1474	20.3454	20.5510	20.7528	20.8625	20.9058	20.9150	20.9138	20.8893	20.7429	20.4272	20.1019
Non living	19.3345	19.5779	19.8272	20.0669	20.1891	20.2368	20.2448	20.2448	20.2205	20.0613	19.6857	19.2809
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	20.5638	20.3454	20.5510	20.7528	20.8625	20.9058	20.9150	20.9138	20.8893	20.7429	20.4272	20.2276 (87)
Th 2	20.3420	20.3428	20.3436	20.3474	20.3482	20.3521	20.3521	20.3528	20.3505	20.3482	20.3467	20.3451 (88)
util rest of house	0.8918	0.8358	0.7591	0.6290	0.4789	0.3287	0.2253	0.2522	0.4192	0.6671	0.8344	0.9040 (89)
MIT 2	19.9404	19.5779	19.8272	20.0669	20.1891	20.2368	20.2448	20.2448	20.2205	20.0613	19.6857	19.4727 (90)
Living area fraction									fLA = Living area / (4) =			0.4205 (91)
MIT	20.2025	19.9006	20.1316	20.3553	20.4723	20.5181	20.5267	20.5261	20.5017	20.3479	19.9975	19.7901 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2025	19.9006	20.1316	20.3553	20.4723	20.5181	20.5267	20.5261	20.5017	20.3479	19.9975	19.7901 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8896	0.8257	0.7526	0.6293	0.4849	0.3378	0.2357	0.2631	0.4285	0.6671	0.8250	0.8954 (94)
Useful gains	580.7353	624.7156	623.5306	573.7616	465.8574	321.5540	215.1625	225.4466	343.5467	476.4282	535.5276	558.6598 (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	888.8456	837.3853	760.0073	634.6634	485.4013	325.3977	215.9016	226.5776	352.8856	539.3863	715.4710	867.0191 (97)
Space heating kWh	229.2340	142.9141	101.5387	43.8493	14.5407	0.0000	0.0000	0.0000	0.0000	46.8409	129.5593	229.4193 (98a)
Space heating requirement - total per year (kWh/year)												937.8963
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	229.2340	142.9141	101.5387	43.8493	14.5407	0.0000	0.0000	0.0000	0.0000	46.8409	129.5593	229.4193 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												937.8963
Space heating per m2										(98c) / (4) =		11.7237 (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 %) 400.0410 (206)

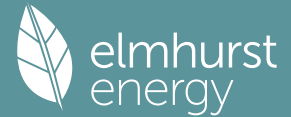
Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	229.2340	142.9141	101.5387	43.8493	14.5407	0.0000	0.0000	0.0000	0.0000	46.8409	129.5593	229.4193 (98)
Space heating efficiency (main heating system 1)	400.0410	400.0410	400.0410	400.0410	400.0410	0.0000	0.0000	0.0000	0.0000	400.0410	400.0410	400.0410 (210)
Space heating fuel (main heating system)	57.3026	35.7249	25.3821	10.9612	3.6348	0.0000	0.0000	0.0000	0.0000	11.7090	32.3865	57.3490 (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	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (64)
Efficiency of water heater (217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600 (216)
Fuel for water heating, kWh/month	113.7512	100.5875	106.9072	94.1871	91.4156	82.5043	81.5543	84.7398	85.6045	95.2934	101.1167	112.5410 (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	11.8300	10.6852	11.8300	11.4484	11.8300	11.4484	11.8300	11.4484	11.8300	11.4484	11.8300	11.8300 (231)
Lighting	22.6332	18.1572	16.3485	11.9776	9.2519	7.5588	8.4399	10.9704	14.2495	18.6961	21.1172	23.2622 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-41.5789	-61.3351	-92.2236	-106.6229	-116.9748	-109.5834	-108.1057	-101.1305	-87.8308	-71.0898	-46.3318	-35.5134 (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	-17.9311	-40.6830	-87.5571	-141.1596	-193.6653	-197.3280	-194.1408	-160.1991	-112.2678	-61.0811	-24.8186	-13.8909 (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)

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Annual totals kWh/year	
Space heating fuel - main system 1	234.4501 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	204.6600
Water heating fuel used	1150.2026 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)	
mechanical ventilation fans (SFP = 0.5720)	139.2889 (230a)
Total electricity for the above, kWh/year	139.2889 (231)
Electricity for lighting (calculated in Appendix L)	182.6625 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2223.0433 (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	-516.4392 (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	234.4501	0.1570	36.8177 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1150.2026	0.1408	161.9882 (264)
Space and water heating			198.8059 (265)
Pumps, fans and electric keep-hot	139.2889	0.1387	19.3211 (267)
Energy for lighting	182.6625	0.1443	26.3638 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-978.3208	0.1339	-131.0337
PV Unit electricity exported	-1244.7225	0.1242	-154.5328
Total			-285.5664 (269)
Total CO2, kg/year			-41.0756 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-0.5100 (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	234.4501	1.5813	370.7395 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1150.2026	1.5208	1749.1725 (278)
Space and water heating			2119.9119 (279)
Pumps, fans and electric keep-hot	139.2889	1.5128	210.7162 (281)
Energy for lighting	182.6625	1.5338	280.1739 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-978.3208	1.4950	-1462.5679
PV Unit electricity exported	-1244.7225	0.4556	-567.1534
Total			-2029.7213 (283)
Total Primary energy kWh/year			581.0807 (286)
Dwelling Primary energy Rate (DPER)			7.2600 (287)

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

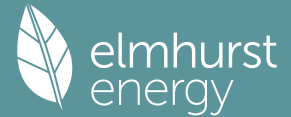
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.0000 (1b)	x 2.3700 (2b)	= 94.8000 (1b) - (3b)
First floor	40.0000 (1c)	x 2.6200 (2c)	= 104.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 199.6000 (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	3 * 10 = 30.0000 (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) =	30.0000 / (5) = 0.1503 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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Measured/design AP50													5.0000 (17)
Infiltration rate													0.4003 (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) = 0.3403 (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													
	0.4338	0.4253	0.4168	0.3743	0.3658	0.3232	0.3232	0.3147	0.3403	0.3658	0.3828	0.3998	(22b)
Effective ac	0.5941	0.5904	0.5869	0.5700	0.5669	0.5522	0.5522	0.5495	0.5579	0.5669	0.5733	0.5799	(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 Semi-glazed door			2.1200	1.0000	2.1200			(26a)
TER Opening Type (Uw = 1.20)			11.9700	1.1450	13.7061			(27)
Floor 1 P/a 0.45			40.0000	0.1300	5.2000			(28a)
External Wall 1 Render	64.8700	9.4500	55.4200	0.1800	9.9756			(29a)
External Wall 2 stone	11.8500	2.1200	9.7300	0.1800	1.7514			(29a)
External Wall 3 clad	13.1000	2.5200	10.5800	0.1800	1.9044			(29a)
External Roof 1 Horz	40.0000		40.0000	0.1100	4.4000			(30)
Total net area of external elements Aum(A, m2)			169.8200					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 39.0575			(33)
Party Wall 1			39.9200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 102.1118 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E16 Corner (normal)	9.9800	0.0900	0.8982	
E5 Ground floor (normal)	18.0000	0.1600	2.8800	
E10 Eaves (insulation at ceiling level)	10.0000	0.0600	0.6000	
E12 Gable (insulation at ceiling level)	8.0000	0.0600	0.4800	
E6 Intermediate floor within a dwelling	18.0000	0.0000	0.0000	
P1 Party wall - Ground floor	8.0000	0.0800	0.6400	
P2 Party wall - Intermediate floor within a dwelling	8.0000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.1200	0.9600	
E18 Party wall between dwellings	9.9800	0.0600	0.5988	
E2 Other lintels (including other steel lintels)	10.6100	0.0500	0.5305	
E3 Sill	9.6000	0.0500	0.4800	
E4 Jamb	23.1000	0.0500	1.1550	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2225 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 48.2800 (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	
	39.1323	38.8916	38.6557	37.5476	37.3403	36.3751	36.3751	36.1964	36.7469	37.3403	37.7597	38.1982	(38)
Heat transfer coeff													
	87.4123	87.1717	86.9357	85.8276	85.6203	84.6551	84.6551	84.4764	85.0269	85.6203	86.0397	86.4782	(39)
Average = Sum(39)m / 12 =													85.8266

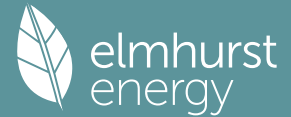
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.0927	1.0896	1.0867	1.0728	1.0703	1.0582	1.0582	1.0560	1.0628	1.0703	1.0755	1.0810	(40)
HLP (average)													1.0728
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4629 (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	75.5424	74.4205	72.8406	69.9276	67.7463	65.3277	64.0212	65.5901	67.2982	69.8863	72.8593	75.2870	(42b)
Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522	(42c)
Average daily hot water use (litres/day)													106.2689 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	115.3945	112.8235	109.7944	105.4322	101.8018	97.9340	96.6275	99.6456	102.8029	106.8401	111.2623	115.1391	(44)
Energy conte	182.7567	160.6591	168.7499	144.3314	137.0448	120.4213	116.8626	123.3820	126.7662	144.9810	158.5135	180.2801	(45)
Energy content (annual)													Total = Sum(45)m = 1764.7487
Distribution loss (46)m = 0.15 x (45)m													
	27.4135	24.0989	25.3125	21.6497	20.5567	18.0632	17.5294	18.5073	19.0149	21.7472	23.7770	27.0420	(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													
	237.6635	210.2523	223.6567	197.4670	191.9516	173.5569	171.7694	178.2888	179.9019	199.8878	211.6491	235.1869	(62)
WVHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	237.6635	210.2523	223.6567	197.4670	191.9516	173.5569	171.7694	178.2888	179.9019	199.8878	211.6491	235.1869	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2411.2319 (64)
Electric shower(s)													2411 (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													

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104.6920 93.0937 100.0348 90.4987 89.4928 82.5485 82.7823 84.9500 84.6583 92.1316 95.2142 103.8686 (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	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0636	129.6061	117.0636	120.9657	117.0636	120.9657	117.0636	117.0636	120.9657	117.0636	120.9657	117.0636 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143 (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)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)
Water heating gains (Table 5)	140.7151	138.5323	134.4553	125.6926	120.2861	114.6508	111.2665	114.1800	117.5809	123.8328	132.2420	139.6083 (72)
Total internal gains	540.1621	552.7990	530.4412	513.3646	488.6354	469.4091	452.4404	453.0769	466.1181	483.6839	511.4157	529.3730 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
Northeast	4.4100	11.2829	0.6300	0.7000	0.7700	15.2066 (75)						
Southwest	7.5600	36.7938	0.6300	0.7000	0.7700	85.0097 (79)						
Solar gains	100.2164	175.7565	253.8942	337.0752	398.0783	404.2283	385.9619	339.0705	282.4830	197.8658	120.9559	85.1691 (83)
Total gains	640.3785	728.5555	784.3355	850.4398	886.7137	873.6374	838.4023	792.1474	748.6011	681.5497	632.3716	614.5421 (84)

7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
tau	25.9591	26.0308	26.1015	26.4385	26.5025	26.8046	26.8046	26.8613	26.6874	26.5025	26.3733	26.2396
alpha	2.7306	2.7354	2.7401	2.7626	2.7668	2.7870	2.7870	2.7908	2.7792	2.7668	2.7582	2.7493
util living area	0.9380	0.9124	0.8760	0.8027	0.6939	0.5458	0.4173	0.4538	0.6407	0.8236	0.9106	0.9436 (86)
MIT	18.7942	19.1014	19.5246	20.0799	20.5316	20.8311	20.9412	20.9244	20.7222	20.1483	19.3983	18.7496 (87)
Th 2	20.0068	20.0093	20.0117	20.0231	20.0252	20.0351	20.0351	20.0370	20.0313	20.0252	20.0209	20.0164 (88)
util rest of house	0.9294	0.9007	0.8590	0.7751	0.6502	0.4809	0.3348	0.3705	0.5791	0.7931	0.8966	0.9358 (89)
MIT 2	17.4444	17.8296	18.3580	19.0428	19.5726	19.9017	20.0014	19.9911	19.7955	19.1405	18.2156	17.3941 (90)
Living area fraction												0.4205 (91)
MIT	18.0120	18.3644	18.8486	19.4789	19.9759	20.2925	20.3966	20.3835	20.1852	19.5643	18.7129	17.9641 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0120	18.3644	18.8486	19.4789	19.9759	20.2925	20.3966	20.3835	20.1852	19.5643	18.7129	17.9641 (93)

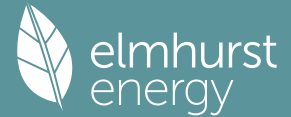
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9069	0.8762	0.8350	0.7578	0.6478	0.4990	0.3666	0.4015	0.5895	0.7765	0.8734	0.9142 (94)
Useful gains	580.7776	638.3955	654.9199	644.4344	574.3824	435.9027	307.3326	318.0434	441.3229	529.2212	552.2848	561.8386 (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	1198.5984	1173.7150	1073.5335	907.9621	708.5821	481.9035	321.4006	336.5128	517.4037	767.5254	999.1707	1190.2936 (97)
Space heating kWh	459.6587	359.7347	311.4485	189.7399	99.8446	0.0000	0.0000	0.0000	0.0000	177.2983	321.7579	467.5705 (98a)
Space heating requirement - total per year (kWh/year)												2387.0531
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	459.6587	359.7347	311.4485	189.7399	99.8446	0.0000	0.0000	0.0000	0.0000	177.2983	321.7579	467.5705 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2387.0531
Space heating per m ²												(98c) / (4) = 29.8382 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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)
Space heating requirement	459.6587	359.7347	311.4485	189.7399	99.8446	0.0000	0.0000	0.0000	0.0000	177.2983	321.7579	467.5705 (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)	498.0051	389.7451	337.4307	205.5687	108.1740	0.0000	0.0000	0.0000	0.0000	192.0891	348.6001	506.5770 (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)

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 80.0000 (4)
 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 199.6000 (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 3 * 10 = 30.0000 (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) = 30.0000 / (5) = 0.1503 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 1.0000 (17)
 Infiltration rate 0.2003 (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) = 0.1703 (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
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
Adj infilt rate	0.2171	0.2128	0.2086	0.1873	0.1830	0.1617	0.1617	0.1575	0.1703	0.1830	0.1915	0.2001
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000
Effective ac	0.5236	0.5226	0.5217	0.5175	0.5167	0.5131	0.5131	0.5124	0.5145	0.5167	0.5183	0.5200

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
Window (Uw = 1.20)			11.9700	1.1450	13.7061		(27)
Door			2.1200	1.0000	2.1200		(26a)
Floor 1 P/a 0.45			40.0000	0.1200	4.8000	110.0000	4400.0000 (28a)
External Wall 1 Render	64.8700	9.4500	55.4200	0.1500	8.3130	9.0000	498.7800 (29a)
External Wall 2 stone	11.8500	2.1200	9.7300	0.1500	1.4595	9.0000	87.5700 (29a)
External Wall 3 clad	13.1000	2.5200	10.5800	0.1500	1.5870	9.0000	95.2200 (29a)
External Roof 1 Horz	40.0000		40.0000	0.0900	3.6000	9.0000	360.0000 (30)
Total net area of external elements Aum(A, m2)			169.8200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	35.5856		(33)
Party Wall 1			39.9200	0.0000	0.0000	20.0000	798.4000 (32)
Internal Wall 1 GF			34.1300			9.0000	307.1700 (32c)
Internal Wall 2 FF			60.2000			9.0000	541.8000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)
Internal Ceiling 1			40.0000			9.0000	360.0000 (32e)
Heat capacity Cm = Sum(A x k)						(28) ... (30) + (32) + (32a) ... (32e) =	8168.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							102.1118 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				9.9800	0.0300	0.2994	
E5 Ground floor (normal)				18.0000	0.0210	0.3780	
E10 Eaves (insulation at ceiling level)				10.0000	0.0440	0.4400	
E12 Gable (insulation at ceiling level)				8.0000	0.0510	0.4080	
E6 Intermediate floor within a dwelling				18.0000	0.0800	1.4400	
P1 Party wall - Ground floor				8.0000	0.1490	1.1920	
P2 Party wall - Intermediate floor within a dwelling				8.0000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				8.0000	0.4800	3.8400	
E18 Party wall between dwellings				9.9800	0.0395	0.3942	
E2 Other lintels (including other steel lintels)				10.6100	0.0840	0.8912	
E3 Sill				9.6000	0.0430	0.4128	
E4 Jamb				23.1000	0.0340	0.7854	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.4810 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 46.0667 (37)

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

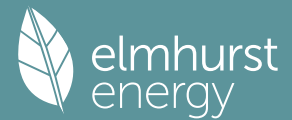
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.4859	34.4256	34.3666	34.0891	34.0372	33.7956	33.7956	33.7508	33.8887	34.0372	34.1422	34.2520
Average = Sum(39)m / 12 =	80.5526	80.4923	80.4332	80.1558	80.1039	79.8622	79.8622	79.8175	79.9553	80.1039	80.2089	80.3187

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0069	1.0062	1.0054	1.0019	1.0013	0.9983	0.9983	0.9977	0.9994	1.0013	1.0026	1.0040
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4629 (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
Hot water usage for baths	28.2963	27.8761	27.2843	26.1931	25.3761	24.4701	23.9808	24.5684	25.2083	26.1777	27.2913	28.2006
Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522
Average daily hot water use (litres/day)												62.4644 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1485	66.2791	64.2381	61.6978	59.4316	57.0764	56.5871	58.6239	60.7129	63.1315	65.6943	68.0528	(44)
Energy conte	107.9305	94.3805	98.7316	84.4612	80.0063	70.1821	68.4372	72.5886	74.8651	85.6688	93.5935	106.5542	(45)
Energy content (annual)	Total = Sum(45)m = 1037.3997												
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	91.7409	80.2234	83.9218	71.7920	68.0054	59.6548	58.1716	61.7003	63.6353	72.8185	79.5545	90.5711	(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	91.7409	80.2234	83.9218	71.7920	68.0054	59.6548	58.1716	61.7003	63.6353	72.8185	79.5545	90.5711	(64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m = 881.7897 (64)												
Electric shower(s)	52.4656	46.7473	51.0463	48.7128	49.6269	47.3393	48.9172	49.6269	48.7128	51.0463	50.0864	52.4656	(64a)
Heat gains from water heating, kWh/month	36.0516	31.7427	33.7420	30.1262	29.4081	26.7485	26.7722	27.8318	28.0870	30.9662	32.4102	35.7592	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 596.7935 (64a)													

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0636	129.6061	117.0636	120.9657	117.0636	120.9657	117.0636	117.0636	120.9657	117.0636	120.9657	117.0636	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(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)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)
Water heating gains (Table 5)	48.4565	47.2361	45.3522	41.8420	39.5270	37.1507	35.9841	37.4083	39.0098	41.6212	45.0142	48.0634	(72)
Total internal gains	444.9035	458.5028	438.3381	426.5140	404.8763	391.9091	377.1581	376.3052	387.5470	398.4723	421.1879	434.8282	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m ²	Table 6a	Specific data	Specific data	factor	W							
		W/m ²	or Table 6b	or Table 6c	Table 6d								
Northeast	4.4100	11.2829	0.7600	0.7000	0.7700	18.3445 (75)							
Southwest	7.5600	36.7938	0.7600	0.7000	0.7700	102.5514 (79)							
Solar gains	120.8959	212.0238	306.2851	406.6304	480.2215	487.6405	465.6048	409.0375	340.7732	238.6953	145.9151	102.7437	(83)
Total gains	565.7995	670.5266	744.6232	833.1444	885.0978	879.5496	842.7629	785.3426	728.3201	637.1676	567.1030	537.5718	(84)

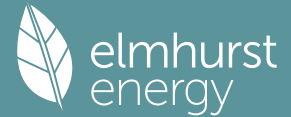
7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	28.1698	28.1909	28.2116	28.3092	28.3276	28.4133	28.4133	28.4292	28.3802	28.3276	28.2905	28.2518	
alpha	2.8780	2.8794	2.8808	2.8873	2.8885	2.8942	2.8942	2.8953	2.8920	2.8885	2.8860	2.8835	
util living area	0.9504	0.9215	0.8796	0.7962	0.6758	0.5236	0.3970	0.4385	0.6330	0.8326	0.9247	0.9564	(86)
MIT	18.8628	19.2051	19.6461	20.1873	20.6107	20.8656	20.9553	20.9394	20.7593	20.1975	19.4348	18.7872	(87)
Th 2	20.0776	20.0782	20.0788	20.0817	20.0823	20.0848	20.0848	20.0852	20.0838	20.0823	20.0812	20.0800	(88)
util rest of house	0.9435	0.9111	0.8636	0.7692	0.6334	0.4624	0.3211	0.3606	0.5739	0.8040	0.9129	0.9504	(89)
MIT 2	18.1268	18.4613	18.8895	19.4045	19.7883	20.0016	20.0645	20.0562	19.9233	19.4265	18.6936	18.0543	(90)
Living area fraction	fLA = Living area / (4) = 0.4205 (91)												
MIT	18.4363	18.7740	19.2076	19.7337	20.1342	20.3650	20.4390	20.4276	20.2749	19.7507	19.0052	18.3625	(92)
Temperature adjustment	0.0000												
adjusted MIT	18.4363	18.7740	19.2076	19.7337	20.1342	20.3650	20.4390	20.4276	20.2749	19.7507	19.0052	18.3625	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9280	0.8933	0.8459	0.7579	0.6359	0.4818	0.3511	0.3905	0.5869	0.7924	0.8960	0.9358	(94)
Useful gains	525.0639	598.9599	629.8924	631.4638	562.8764	423.7572	295.9351	306.7150	427.4597	504.8628	508.1250	503.0358	(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	1138.7147	1116.7532	1022.1169	868.3821	675.6084	460.4020	306.5947	321.4702	493.7129	733.0095	954.9067	1137.5144	(97)
Space heating kWh	456.5561	347.9571	291.8151	170.5812	83.8726	0.0000	0.0000	0.0000	0.0000	169.7411	321.6828	472.0521	(98a)
Space heating requirement - total per year (kWh/year)	2314.2581												
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	456.5561	347.9571	291.8151	170.5812	83.8726	0.0000	0.0000	0.0000	0.0000	169.7411	321.6828	472.0521	(98c)

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Space heating requirement after solar contribution - total per year (kWh/year)
Space heating per m2

2314.2581
(98c) / (4) = 28.9282 (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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	750.7050	590.9805	606.6129	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8320	0.8835	0.8597	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	624.5828	522.1462	521.4831	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	978.3372	937.7884	873.0146	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	254.7032	309.2378	261.5395	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	63.6758	77.3094	65.3849	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												206.3701 (107)
Energy for space heating												28.9282 (99)
Energy for space cooling												2.5796 (108)
Total												31.5079 (109)
Fabric Energy Efficiency (DFEE)												31.5 (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	40.0000 (1b)	x 2.3700 (2b)	= 94.8000 (1b) - (3b)
First floor	40.0000 (1c)	x 2.6200 (2c)	= 104.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 199.6000 (5)

2. Ventilation rate

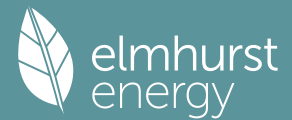
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (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) =	30.0000 / (5) = 0.1503 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4003 (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) = 0.3403 (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	0.4338	0.4253	0.4168	0.3743	0.3658	0.3232	0.3232	0.3147	0.3403	0.3658	0.3828	0.3998 (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	0.5941	0.5904	0.5869	0.5700	0.5669	0.5522	0.5522	0.5495	0.5579	0.5669	0.5733	0.5799 (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 Semi-glazed door			2.1200	1.0000	2.1200		(26a)
TER Opening Type (Uw = 1.20)			11.9700	1.1450	13.7061		(27)
Floor 1 P/a 0.45			40.0000	0.1300	5.2000		(28a)
External Wall 1 Render	64.8700	9.4500	55.4200	0.1800	9.9756		(29a)
External Wall 2 stone	11.8500	2.1200	9.7300	0.1800	1.7514		(29a)
External Wall 3 clad	13.1000	2.5200	10.5800	0.1800	1.9044		(29a)
External Roof 1 Horz	40.0000		40.0000	0.1100	4.4000		(30)
Total net area of external elements Aum(A, m2)			169.8200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.0575	(33)
Party Wall 1			39.9200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							102.1118 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	9.9800	0.0900	0.8982
E5 Ground floor (normal)	18.0000	0.1600	2.8800
E10 Eaves (insulation at ceiling level)	10.0000	0.0600	0.6000
E12 Gable (insulation at ceiling level)	8.0000	0.0600	0.4800
E6 Intermediate floor within a dwelling	18.0000	0.0000	0.0000
P1 Party wall - Ground floor	8.0000	0.0800	0.6400
P2 Party wall - Intermediate floor within a dwelling	8.0000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.1200	0.9600
E18 Party wall between dwellings	9.9800	0.0600	0.5988
E2 Other lintels (including other steel lintels)	10.6100	0.0500	0.5305
E3 Sill	9.6000	0.0500	0.4800
E4 Jamb	23.1000	0.0500	1.1550

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2225 (36)
 Point Thermal bridges 0.0000 (36a) =
 Total fabric heat loss (33) + (36) + (36a) = 48.2800 (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	39.1323	38.8916	38.6557	37.5476	37.3403	36.3751	36.3751	36.1964	36.7469	37.3403	37.7597	38.1982 (38)
Average = Sum(39)m / 12 =	87.4123	87.1717	86.9357	85.8276	85.6203	84.6551	84.6551	84.4764	85.0269	85.6203	86.0397	86.4782 (39)
												85.8266

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0927	1.0896	1.0867	1.0728	1.0703	1.0582	1.0582	1.0560	1.0628	1.0703	1.0755	1.0810 (40)
HLP (average)												1.0728
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4629 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	28.2963	27.8761	27.2843	26.1931	25.3761	24.4701	23.9808	24.5684	25.2083	26.1777	27.2913	28.2006 (42b)	
Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522 (42c)	
Average daily hot water use (litres/day)													62.4644 (43)
Daily hot water use	68.1485	66.2791	64.2381	61.6978	59.4316	57.0764	56.5871	58.6239	60.7129	63.1315	65.6943	68.0528 (44)	
Energy content (annual)	107.9305	94.3805	98.7316	84.4612	80.0063	70.1821	68.4372	72.5886	74.8651	85.6688	93.5935	106.5542 (45)	
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1037.3997
Water storage loss:													0.0000 (46)
Total storage loss													0.0000 (56)
If cylinder contains dedicated solar storage													0.0000 (57)
Primary loss													0.0000 (59)
Combi loss													0.0000 (61)
Total heat required for water heating calculated for each month	91.7409	80.2234	83.9218	71.7920	68.0054	59.6548	58.1716	61.7003	63.6353	72.8185	79.5545	90.5711 (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)	
FV 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	91.7409	80.2234	83.9218	71.7920	68.0054	59.6548	58.1716	61.7003	63.6353	72.8185	79.5545	90.5711 (64)	
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 881.7897 (64)
Electric shower(s)	52.4656	46.7473	51.0463	48.7128	49.6269	47.3393	48.9172	49.6269	48.7128	51.0463	50.0864	52.4656 (64a)	
Heat gains from water heating, kWh/month	36.0516	31.7427	33.7420	30.1262	29.4081	26.7485	26.7722	27.8318	28.0870	30.9662	32.4102	35.7592 (65)	

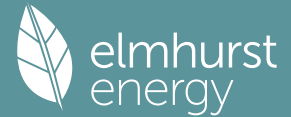
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0636	129.6061	117.0636	120.9657	117.0636	120.9657	117.0636	117.0636	120.9657	117.0636	120.9657	117.0636 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143 (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)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)
Water heating gains (Table 5)	48.4565	47.2361	45.3522	41.8420	39.5270	37.1507	35.9841	37.4083	39.0098	41.6212	45.0142	48.0634 (72)
Total internal gains	444.9035	458.5028	438.3381	426.5140	404.8763	391.9091	377.1581	376.3052	387.5470	398.4723	421.1879	434.8282 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	4.4100	11.2829	0.6300	0.7000	0.7700	15.2066 (75)						
Southwest	7.5600	36.7938	0.6300	0.7000	0.7700	85.0097 (79)						
Solar gains	100.2164	175.7565	253.8942	337.0752	398.0783	404.2283	385.9619	339.0705	282.4830	197.8658	120.9559	85.1691 (83)

Full SAP Calculation Printout



Total gains 545.1199 634.2593 692.2323 763.5892 802.9546 796.1374 763.1200 715.3757 670.0300 596.3381 542.1439 519.9973 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
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	25.9591	26.0308	26.1015	26.4385	26.5025	26.8046	26.8046	26.8613	26.6874	26.5025	26.3733	26.2396
alpha	2.7306	2.7354	2.7401	2.7626	2.7668	2.7870	2.7870	2.7908	2.7792	2.7668	2.7582	2.7493
util living area	0.9564	0.9342	0.9024	0.8349	0.7314	0.5836	0.4519	0.4931	0.6848	0.8602	0.9350	0.9611 (86)
MIT	18.5906	18.9158	19.3639	19.9633	20.4593	20.7994	20.9281	20.9067	20.6684	20.0232	19.2203	18.5430 (87)
Th 2	20.0068	20.0093	20.0117	20.0231	20.0252	20.0351	20.0370	20.0370	20.0313	20.0252	20.0209	20.0164 (88)
util rest of house	0.9500	0.9249	0.8881	0.8100	0.6894	0.5174	0.3646	0.4053	0.6243	0.8338	0.9242	0.9554 (89)
MIT 2	17.8114	18.1318	18.5712	19.1540	19.6131	19.9099	20.0025	19.9920	19.8081	19.2236	18.4436	17.7711 (90)
Living area fraction									fLA = Living area / (4) =			0.4205 (91)
MIT	18.1391	18.4615	18.9046	19.4943	19.9689	20.2840	20.3917	20.3767	20.1698	19.5598	18.7702	18.0957 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1391	18.4615	18.9046	19.4943	19.9689	20.2840	20.3917	20.3767	20.1698	19.5598	18.7702	18.0957 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9343	0.9065	0.8687	0.7946	0.6868	0.5354	0.3980	0.4376	0.6337	0.8190	0.9067	0.9407 (94)	
Useful gains	509.3230	574.9316	601.3472	606.7743	551.4393	426.2303	303.6932	313.0152	424.5667	488.4006	491.5885	489.1768 (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	1209.7042	1182.1755	1078.4000	909.2841	707.9896	481.1777	320.9882	335.9335	516.1000	767.1437	1004.1026	1201.6760 (97)	
Space heating kWh	521.0836	408.0679	354.9273	217.8070	116.4734	0.0000	0.0000	0.0000	0.0000	207.3849	369.0102	530.0994 (98a)	
Space heating requirement - total per year (kWh/year)												2724.8536	
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	521.0836	408.0679	354.9273	217.8070	116.4734	0.0000	0.0000	0.0000	0.0000	207.3849	369.0102	530.0994 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2724.8536	
Space heating per m2												(98c) / (4) =	34.0607 (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	795.7584	626.4481	642.0208	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7721	0.8342	0.8076	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	614.4056	522.6080	518.5180	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	880.8425	844.6992	791.2351	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	191.8346	239.6359	202.9015	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	47.9586	59.9090	50.7254	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												158.5930 (107)
Energy for space heating												34.0607 (99)
Energy for space cooling												1.9824 (108)
Total												36.0431 (109)
Fabric Energy Efficiency (TFEE)												36.0 (109)

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

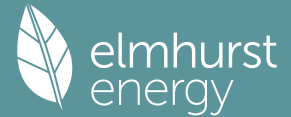
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.0000 (1b)	x	2.3700 (2b) = 94.8000 (1b) - (3b)
First floor	40.0000 (1c)	x	2.6200 (2c) = 104.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	199.6000 (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)

Full SAP Calculation Printout



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 1.0000 (17)
 Infiltration rate 0.0500 (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) = 0.0425 (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	0.0542	0.0531	0.0521	0.0468	0.0457	0.0404	0.0404	0.0393	0.0425	0.0457	0.0478	0.0499 (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)												81.0000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.1492	0.1481	0.1471	0.1417	0.1407	0.1354	0.1354	0.1343	0.1375	0.1407	0.1428	0.1449 (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
Window (Uw = 1.20)			11.9700	1.1450	13.7061		(27)
Door			2.1200	1.0000	2.1200		(26a)
Floor 1 P/a 0.45			40.0000	0.1200	4.8000	110.0000	4400.0000 (28a)
External Wall 1 Render	64.8700	9.4500	55.4200	0.1500	8.3130	9.0000	498.7800 (29a)
External Wall 2 stone	11.8500	2.1200	9.7300	0.1500	1.4595	9.0000	87.5700 (29a)
External Wall 3 clad	13.1000	2.5200	10.5800	0.1500	1.5870	9.0000	95.2200 (29a)
External Roof 1 Horz	40.0000		40.0000	0.0900	3.6000	9.0000	360.0000 (30)
Total net area of external elements Aum(A, m2)			169.8200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5856		(33)
Party Wall 1			39.9200	0.0000	0.0000	20.0000	798.4000 (32)
Internal Wall 1 GF			34.1300			9.0000	307.1700 (32c)
Internal Wall 2 FF			60.2000			9.0000	541.8000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)
Internal Ceiling 1			40.0000			9.0000	360.0000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 8168.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							102.1118 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	9.9800	0.0300	0.2994
E5 Ground floor (normal)	18.0000	0.0210	0.3780
E10 Eaves (insulation at ceiling level)	10.0000	0.0440	0.4400
E12 Gable (insulation at ceiling level)	8.0000	0.0510	0.4080
E6 Intermediate floor within a dwelling	18.0000	0.0800	1.4400
P1 Party wall - Ground floor	8.0000	0.1490	1.1920
P2 Party wall - Intermediate floor within a dwelling	8.0000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400
E18 Party wall between dwellings	9.9800	0.0395	0.3942
E2 Other lintels (including other steel lintels)	10.6100	0.0840	0.8912
E3 Sill	9.6000	0.0430	0.4128
E4 Jamb	23.1000	0.0340	0.7854

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4810 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 46.0667 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	9.8267	9.7567	9.6867	9.3368	9.2668	8.9169	8.9169	8.8469	9.0569	9.2668	9.4068	9.5467 (38)
Heat transfer coeff	55.8933	55.8234	55.7534	55.4034	55.3335	54.9835	54.9835	54.9136	55.1235	55.3335	55.4734	55.6134 (39)
Average = Sum(39)m / 12 =												55.3859

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6987	0.6978	0.6969	0.6925	0.6917	0.6873	0.6873	0.6864	0.6890	0.6917	0.6934	0.6952 (40)
HLP (average)												0.6923
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4629 (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)

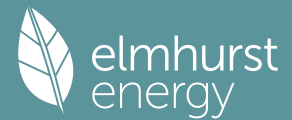
Hot water usage for baths 75.5424 74.4205 72.8406 69.9276 67.7463 65.3277 64.0212 65.5901 67.2982 69.8863 72.8593 75.2870 (42b)

Hot water usage for other uses 39.8522 38.4030 36.9538 35.5047 34.0555 32.6063 32.6063 34.0555 35.5047 36.9538 38.4030 39.8522 (42c)

Average daily hot water use (litres/day) 106.2689 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.3945	112.8235	109.7944	105.4322	101.8018	97.9340	96.6275	99.6456	102.8029	106.8401	111.2623	115.1391 (44)
Energy conte	182.7567	160.6591	168.7499	144.3314	137.0448	120.4213	116.8626	123.3820	126.7662	144.9810	158.5135	180.2801 (45)
Energy content (annual)										Total = Sum(45)m =		1764.7487
Distribution loss (46)m = 0.15 x (45)m	27.4135	24.0989	25.3125	21.6497	20.5567	18.0632	17.5294	18.5073	19.0149	21.7472	23.7770	27.0420 (46)
Water storage loss:												250.0000 (47)
Store volume												1.6000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8640 (55)
Enter (49) or (54) in (55)												
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)

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If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (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	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (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	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (64)
	Total per year (kWh/year) = Sum(64)m =											2354.0047 (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	100.8037	89.5817	96.1465	86.7358	85.6045	78.7857	78.8940	81.0616	80.8954	88.2433	91.4513	99.9802 (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	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.8578	22.9666	18.6777	14.1402	10.5700	8.9236	9.6423	12.5334	16.8223	21.3598	24.9301	26.5764 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.5232	330.9219	322.3573	304.1245	281.1088	259.4772	245.0260	241.6274	250.1919	268.4248	291.4405	313.0720 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400 (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)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)
Water heating gains (Table 5)	135.4889	133.3061	129.2291	120.4664	115.0598	109.4245	106.0403	108.9538	112.3547	118.6066	127.0158	134.3821 (72)
Total internal gains	590.3671	588.6919	571.7614	540.2283	508.2358	479.3226	462.2058	464.6119	480.8662	509.8884	544.8836	575.5277 (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	4.4100	11.2829	0.7600	0.7000	0.7700	18.3445 (75)						
Southwest	7.5600	36.7938	0.7600	0.7000	0.7700	102.5514 (79)						
Solar gains	120.8959	212.0238	306.2851	406.6304	480.2215	487.6405	465.6048	409.0375	340.7732	238.6953	145.9151	102.7437 (83)
Total gains	711.2630	800.7156	878.0465	946.8588	988.4573	966.9632	927.8107	873.6493	821.6393	748.5837	690.7987	678.2714 (84)

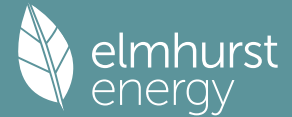
7. Mean internal temperature (heating season)

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	40.5979	40.6488	40.6998	40.9568	41.0086	41.2696	41.2696	41.3222	41.1648	41.0086	40.9052	40.8022
alpha	3.7065	3.7099	3.7133	3.7305	3.7339	3.7513	3.7513	3.7548	3.7443	3.7339	3.7270	3.7201
util living area	0.8796	0.8306	0.7541	0.6372	0.4978	0.3587	0.2595	0.2872	0.4486	0.6752	0.8295	0.8932 (86)
Living	20.2296	20.3951	20.5902	20.7672	20.8668	20.9064	20.9152	20.9140	20.8914	20.7607	20.4741	20.1827
Non living	19.4352	19.6375	19.8729	20.0826	20.1934	20.2373	20.2449	20.2449	20.2222	20.0806	19.7414	19.3803
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	20.6059	20.3951	20.5902	20.7672	20.8668	20.9064	20.9152	20.9140	20.8914	20.7607	20.4741	20.2971 (87)
Th 2	20.3420	20.3428	20.3436	20.3474	20.3482	20.3521	20.3521	20.3528	20.3505	20.3482	20.3467	20.3451 (88)
util rest of house	0.8680	0.8157	0.7344	0.6115	0.4669	0.3237	0.2217	0.2475	0.4098	0.6454	0.8121	0.8826 (89)
MIT 2	19.9805	19.6375	19.8729	20.0826	20.1934	20.2373	20.2449	20.2449	20.2222	20.0806	19.7414	19.5542 (90)
Living area fraction	FLA = Living area / (4) =											0.4205 (91)
MIT	20.2435	19.9561	20.1745	20.3705	20.4766	20.5186	20.5268	20.5263	20.5036	20.3666	20.0495	19.8665 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2435	19.9561	20.1745	20.3705	20.4766	20.5186	20.5268	20.5263	20.5036	20.3666	20.0495	19.8665 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	616.0704	645.6482	640.1217	579.8475	467.6248	321.7752	215.2093	225.5301	344.3192	483.7937	555.1177	592.9007 (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	891.1353	840.4794	762.4007	635.5052	485.6384	325.4272	215.9081	226.5890	352.9893	540.4181	718.3538	871.2698 (97)	
Space heating kWh	204.6483	130.9265	90.9756	40.0735	13.4021	0.0000	0.0000	0.0000	0.0000	42.1286	117.5300	207.1066 (98a)	
Space heating requirement - total per year (kWh/year)												846.7912	
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	204.6483	130.9265	90.9756	40.0735	13.4021	0.0000	0.0000	0.0000	0.0000	42.1286	117.5300	207.1066 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												846.7912	
Space heating per m2												(98c) / (4) =	10.5849 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													400.0410 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	204.6483	130.9265	90.9756	40.0735	13.4021	0.0000	0.0000	0.0000	0.0000	42.1286	117.5300	207.1066	(98)
Space heating efficiency (main heating system 1)	400.0410	400.0410	400.0410	400.0410	400.0410	0.0000	0.0000	0.0000	0.0000	400.0410	400.0410	400.0410	(210)
Space heating fuel (main heating system)	51.1568	32.7283	22.7416	10.0173	3.3502	0.0000	0.0000	0.0000	0.0000	10.5311	29.3795	51.7714	(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 requirement	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265	(64)
Efficiency of water heater (217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	(216)
Fuel for water heating, kWh/month	113.7512	100.5875	106.9072	94.1871	91.4156	82.5043	81.5543	84.7398	85.6045	95.2934	101.1167	112.5410	(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	11.8300	10.6852	11.8300	11.4484	11.8300	11.4484	11.8300	11.4484	11.8300	11.4484	11.8300	11.4484	(231)
Lighting	22.6332	18.1572	16.3485	11.9776	9.2519	7.5588	8.4399	10.9704	14.2495	18.6961	21.1172	23.2622	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-41.4777	-61.2161	-92.0241	-106.5038	-116.9263	-109.5834	-108.1057	-101.1305	-87.8308	-71.0148	-46.2537	-35.4395	(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	-18.0323	-40.8020	-87.7566	-141.2787	-193.7138	-197.3280	-194.1408	-160.1991	-112.2678	-61.1561	-24.8967	-13.9649	(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													211.6761 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													204.6600
Water heating fuel used													1150.2026 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720) mechanical ventilation fans (SFP = 0.5720)													139.2889 (230a)
Total electricity for the above, kWh/year													139.2889 (231)
Electricity for lighting (calculated in Appendix L)													182.6625 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-2223.0433 (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													-539.2132 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	211.6761	16.4900	34.9054 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1150.2026	16.4900	189.6684 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	139.2889	16.4900	22.9687 (249)
Energy for lighting	182.6625	16.4900	30.1210 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-977.5064	16.4900	-161.1908
PV Unit electricity exported	-1245.5369	5.5900	-69.6255
Total			-230.8163 (252)
Total energy cost			46.8473 (255)

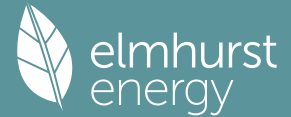
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.1349 (257)
SAP value		97.8129
SAP rating (Section 12)		98 (258)
SAP band		A

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

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	211.6761	0.1570	33.2365 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1150.2026	0.1408	161.9882 (264)
Space and water heating			195.2247 (265)
Pumps, fans and electric keep-hot	139.2889	0.1387	19.3211 (267)
Energy for lighting	182.6625	0.1443	26.3638 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-977.5064	0.1339	-130.9101
PV Unit electricity exported	-1245.5369	0.1242	-154.6727
Total			-285.5828 (269)
Total CO2, kg/year			-44.6732 (272)
CO2 emissions per m2			-0.5600 (273)
EI value			100.4789
EI rating			100 (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	40.0000 (1b)	x 2.3700 (2b)	= 94.8000 (1b) - (3b)
First floor	40.0000 (1c)	x 2.6200 (2c)	= 104.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 199.6000 (5)

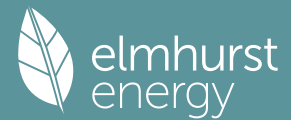
2. Ventilation rate

	m3 per hour												
Number of open chimneys	0 * 80 =											0.0000 (6a)	
Number of open flues	0 * 20 =											0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)	
Number of blocked chimneys	0 * 20 =											0.0000 (6f)	
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)	
Number of passive vents	0 * 10 =											0.0000 (7b)	
Number of flueless gas fires	0 * 40 =											0.0000 (7c)	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												1.0000 (17)	
Infiltration rate												0.0500 (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) =											0.0425 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	6.6000	6.2000	6.1000	5.6000	5.5000	4.7000	4.6000	4.5000	5.0000	5.8000	6.0000	6.5000	(22)
Wind factor	1.6500	1.5500	1.5250	1.4000	1.3750	1.1750	1.1500	1.1250	1.2500	1.4500	1.5000	1.6250	(22a)
Adj infiltr rate	0.0701	0.0659	0.0648	0.0595	0.0584	0.0499	0.0489	0.0478	0.0531	0.0616	0.0638	0.0691	(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)													81.0000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													
Effective ac	0.1651	0.1609	0.1598	0.1545	0.1534	0.1449	0.1439	0.1428	0.1481	0.1566	0.1587	0.1641	(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
Window (Uw = 1.20)			11.9700	1.1450	13.7061		(27)
Door			2.1200	1.0000	2.1200		(26a)
Floor 1 P/a 0.45			40.0000	0.1200	4.8000	110.0000	4400.0000 (28a)
External Wall 1 Render	64.8700	9.4500	55.4200	0.1500	8.3130	9.0000	498.7800 (29a)
External Wall 2 stone	11.8500	2.1200	9.7300	0.1500	1.4595	9.0000	87.5700 (29a)
External Wall 3 clad	13.1000	2.5200	10.5800	0.1500	1.5870	9.0000	95.2200 (29a)
External Roof 1 Horz	40.0000		40.0000	0.0900	3.6000	9.0000	360.0000 (30)
Total net area of external elements Aum(A, m2)			169.8200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	35.5856	(33)
Party Wall 1			39.9200	0.0000	0.0000	20.0000	798.4000 (32)
Internal Wall 1 GF			34.1300			9.0000	307.1700 (32c)
Internal Wall 2 FF			60.2000			9.0000	541.8000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)
Internal Ceiling 1			40.0000			9.0000	360.0000 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	8168.9400	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							102.1118 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				9.9800	0.0300	0.2994	

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E5 Ground floor (normal)	18.0000	0.0210	0.3780
E10 Eaves (insulation at ceiling level)	10.0000	0.0440	0.4400
E12 Gable (insulation at ceiling level)	8.0000	0.0510	0.4080
E6 Intermediate floor within a dwelling	18.0000	0.0800	1.4400
P1 Party wall - Ground floor	8.0000	0.1490	1.1920
P2 Party wall - Intermediate floor within a dwelling	8.0000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400
E18 Party wall between dwellings	9.9800	0.0395	0.3942
E2 Other lintels (including other steel lintels)	10.6100	0.0840	0.8912
E3 Sill	9.6000	0.0430	0.4128
E4 Jamb	23.1000	0.0340	0.7854
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.4810 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	46.0667 (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	10.8765	10.5965	10.5265	10.1766	10.1066	9.5467	9.4768	9.4068	9.7567	10.3166	10.4565	10.8065 (38)
Average = Sum(39)m / 12 =	56.9431	56.6632	56.5932	56.2433	56.1733	55.6134	55.5434	55.4734	55.8234	56.3832	56.5232	56.8731 (39)
HLP	0.7118	0.7083	0.7074	0.7030	0.7022	0.6952	0.6943	0.6934	0.6978	0.7048	0.7065	0.7109 (40)
HLP (average)												0.7030
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4629 (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 75.5424 74.4205 72.8406 69.9276 67.7463 65.3277 64.0212 65.5901 67.2982 69.8863 72.8593 75.2870 (42b)

Hot water usage for other uses 39.8522 38.4030 36.9538 35.5047 34.0555 32.6063 32.6063 34.0555 35.5047 36.9538 38.4030 39.8522 (42c)

Average daily hot water use (litres/day) 106.2689 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	115.3945	112.8235	109.7944	105.4322	101.8018	97.9340	96.6275	99.6456	102.8029	106.8401	111.2623	115.1391 (44)
Energy content (annual)	182.7567	160.6591	168.7499	144.3314	137.0448	120.4213	116.8626	123.3820	126.7662	144.9810	158.5135	180.2801 (45)
Distribution loss (46)m = 0.15 x (45)m	27.4135	24.0989	25.3125	21.6497	20.5567	18.0632	17.5294	18.5073	19.0149	21.7472	23.7770	27.0420 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage												
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	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (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	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (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	100.8037	89.5817	96.1465	86.7358	85.6045	78.7857	78.8940	81.0616	80.8954	88.2433	91.4513	99.9802 (65)

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

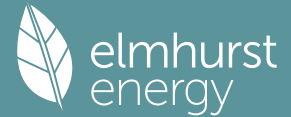
Metabolic gains (Table 5), Watts

(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	25.8578	22.9666	18.6777	14.1402	10.5700	8.9236	9.6423	12.5334	16.8223	21.3598	24.9301	26.5764 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	327.5232	330.9219	322.3573	304.1245	281.1088	259.4772	245.0260	241.6274	250.1919	268.4248	291.4405	313.0720 (68)
Pumps, fans	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400 (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)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)
Total internal gains	135.4889	133.3061	129.2291	120.4664	115.0598	109.4245	106.0403	108.9538	112.3547	118.6066	127.0158	134.3821 (72)
FGHRS	590.3671	588.6919	571.7614	540.2283	508.2358	479.3226	462.2058	464.6119	480.8662	509.8884	544.8836	575.5277 (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	4.4100	15.8649	0.7600	0.7000	0.7700	25.7941 (75)						
Southwest	7.5600	48.0626	0.7600	0.7000	0.7700	133.9596 (79)						
Solar gains	159.7537	241.9825	347.4510	476.3894	536.4903	595.5914	513.2000	483.6134	407.1773	281.5525	184.9883	131.6282 (83)

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Total gains 750.1208 830.6744 919.2124 1016.6177 1044.7261 1074.9141 975.4059 948.2253 888.0434 791.4410 729.8719 707.1560 (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	39.8494	40.0463	40.0958	40.3453	40.3955	40.8022	40.8536	40.9052	40.6488	40.2451	40.1455	39.8985
alpha	3.6566	3.6698	3.6731	3.6897	3.6930	3.7201	3.7236	3.7270	3.7099	3.6830	3.6764	3.6599
util living area	0.8085	0.7585	0.6879	0.5826	0.4662	0.3324	0.2717	0.2733	0.3824	0.5692	0.7271	0.8138 (86)
Living	20.4921	20.5908	20.6986	20.8076	20.8753	20.9077	20.9137	20.9138	20.9024	20.8397	20.6882	20.5011
Non living	19.7476	19.8663	19.9919	20.1185	20.1927	20.2311	20.2373	20.2382	20.2245	20.1561	19.9861	19.7608
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	20.7402	20.5908	20.6986	20.8076	20.8753	20.9077	20.9137	20.9138	20.9024	20.8397	20.6882	20.5709 (87)
Th 2	20.3304	20.3335	20.3343	20.3381	20.3389	20.3451	20.3459	20.3467	20.3428	20.3366	20.3351	20.3312 (88)
util rest of house	0.7899	0.7374	0.6638	0.5554	0.4353	0.2999	0.2352	0.2359	0.3439	0.5331	0.7001	0.7946 (89)
MIT 2	20.0981	19.8663	19.9919	20.1185	20.1927	20.2311	20.2373	20.2382	20.2245	20.1561	19.9861	19.8636 (90)
Living area fraction									fLA = Living area / (4) =			0.4205 (91)
MIT	20.3681	20.1710	20.2891	20.4083	20.4797	20.5156	20.5217	20.5223	20.5096	20.4436	20.2813	20.1610 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3681	20.1710	20.2891	20.4083	20.4797	20.5156	20.5217	20.5223	20.5096	20.4436	20.2813	20.1610 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.7910	0.7320	0.6621	0.5584	0.4419	0.3084	0.2451	0.2460	0.3537	0.5391	0.6978	0.7894 (94)
Useful gains	593.3317	608.0945	608.6196	567.6311	461.7139	331.5404	239.0636	233.2617	314.1254	426.6297	509.2838	558.2142 (95)
Ext temp.	7.0000	7.3000	8.1000	9.6000	12.0000	14.5000	16.2000	16.3000	14.8000	12.4000	9.8000	7.6000 (96)
Heat loss rate W	761.2202	729.3096	689.8185	607.8916	476.3330	334.5500	240.0429	234.2248	318.7265	453.5215	592.4391	714.3855 (97)
Space heating kWh	124.9091	81.4565	60.4120	28.9875	10.8766	0.0000	0.0000	0.0000	0.0000	20.0075	59.8718	116.1914 (98a)
Space heating requirement - total per year (kWh/year)												502.7124
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	124.9091	81.4565	60.4120	28.9875	10.8766	0.0000	0.0000	0.0000	0.0000	20.0075	59.8718	116.1914 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												502.7124
Space heating per m2												(98c) / (4) = 6.2839 (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)

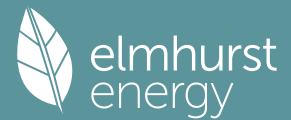
Efficiency of main space heating system 1 (in %) 400.2809 (206)

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	124.9091	81.4565	60.4120	28.9875	10.8766	0.0000	0.0000	0.0000	0.0000	20.0075	59.8718	116.1914 (98)
Space heating efficiency (main heating system 1)	400.2809	400.2809	400.2809	400.2809	400.2809	0.0000	0.0000	0.0000	0.0000	400.2809	400.2809	400.2809 (210)
Space heating fuel (main heating system)	31.2053	20.3498	15.0924	7.2418	2.7173	0.0000	0.0000	0.0000	0.0000	4.9984	14.9574	29.0275 (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	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (64)
Efficiency of water heater (217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600 (216)
Fuel for water heating, kWh/month	113.7512	100.5875	106.9072	94.1871	91.4156	82.5043	81.5543	84.7398	85.6045	95.2934	101.1167	112.5410 (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	11.8300	10.6852	11.8300	11.4484	11.8300	11.4484	11.8300	11.8300	11.4484	11.8300	11.4484	11.8300 (231)
Lighting	22.6332	18.1572	16.3485	11.9776	9.2519	7.5588	8.4399	10.9704	14.2495	18.6961	21.1172	23.2622 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-52.7714	-68.3794	-100.7094	-116.5827	-123.5456	-119.8836	-113.2134	-110.3132	-98.0808	-80.4248	-56.3637	-44.1811 (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	-28.6222	-51.8692	-108.3129	-177.4854	-225.0912	-255.5678	-220.8712	-201.4735	-145.8547	-80.2228	-36.9675	-21.3404 (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												125.5899 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												204.6600
Water heating fuel used												1150.2026 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)		
mechanical ventilation fans (SFP = 0.5720)		139.2889 (230a)
Total electricity for the above, kWh/year		139.2889 (231)
Electricity for lighting (calculated in Appendix L)		182.6625 (232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation		-2638.1280 (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		-1040.3841 (238)

10a. Fuel costs - using BEDF prices (535)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	125.5899	25.1600	31.5984 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1150.2026	25.1600	289.3910 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	139.2889	25.1600	35.0451 (249)
Energy for lighting	182.6625	25.1600	45.9579 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.4491	25.1600	-272.8474
PV Unit electricity exported	-1553.6789	5.8100	-90.2687
Total			-363.1161 (252)
Total energy cost			38.8762 (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	125.5899	0.1570	19.7157 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1150.2026	0.1408	161.9882 (264)
Space and water heating			181.7039 (265)
Pumps, fans and electric keep-hot	139.2889	0.1387	19.3211 (267)
Energy for lighting	182.6625	0.1443	26.3638 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.4491	0.1345	-145.8542
PV Unit electricity exported	-1553.6789	0.1251	-194.3256
Total			-340.1798 (269)
Total CO2, kg/year			-112.7910 (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	125.5899	1.5811	198.5749 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1150.2026	1.5208	1749.1725 (278)
Space and water heating			1947.7474 (279)
Pumps, fans and electric keep-hot	139.2889	1.5128	210.7162 (281)
Energy for lighting	182.6625	1.5338	280.1739 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.4491	1.4971	-1623.4792
PV Unit electricity exported	-1553.6789	0.4591	-713.2845
Total			-2336.7636 (283)
Total Primary energy kWh/year			101.8738 (286)

SAP 10 EPC IMPROVEMENTS

SEC1 - ASHP ROI TF 0.15 improv

Current energy efficiency rating:	A 98
Current environmental impact rating:	A 100

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	+ 1.7	-£ 69	-40 kg (35.7%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£69	0.50 kg/m ²	A 99	A 101
Total Savings	£69	0.50 kg/m²		

Potential energy efficiency rating:	A 99
Potential environmental impact rating:	A 101

Fuel prices for cost data on this page from database revision number 535 TEST (04 Jan 2024)
 Recommendation texts revision number 6.1 (11 Jun 2019)

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Typical heating and lighting costs of this home (per year, South West England):

	Current £402	Potential £321	Saving £81
Electricity			
Space heating	£67	£87	-£20
Water heating	£289	£188	£102
Lighting	£46	£46	£0
Generated (PV)	-£363	-£351	-£12
Total cost of fuels	£39	-£30	£69
Total cost of uses	£39	-£30	£70
Delivered energy	-13 kWh/m ²	-17 kWh/m ²	4 kWh/m ²
Carbon dioxide emissions	-0.1 tonnes	-0.2 tonnes	0.0 tonnes
CO2 emissions per m ²	-1 kg/m ²	-2 kg/m ²	1 kg/m ²
Primary energy	1 kWh/m ²	-4 kWh/m ²	5 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.0000 (1b)	x 2.3700 (2b)	= 94.8000 (1b) - (3b)
First floor	40.0000 (1c)	x 2.6200 (2c)	= 104.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	199.6000 (5)

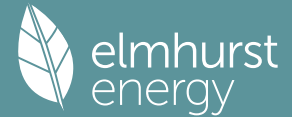
2. Ventilation rate

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	1.0000 (17)	
Infiltration rate	0.0500 (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) =	0.0425 (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 infiltr rate	0.0542, 0.0531, 0.0521, 0.0468, 0.0457, 0.0404, 0.0404, 0.0393, 0.0425, 0.0457, 0.0478, 0.0499	(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) =		81.0000 (23c)
Effective ac	0.1492, 0.1481, 0.1471, 0.1417, 0.1407, 0.1354, 0.1354, 0.1343, 0.1375, 0.1407, 0.1428, 0.1449	(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
Window (Uw = 1.20)			11.9700	1.1450	13.7061		(27)
Door			2.1200	1.0000	2.1200		(26a)
Floor 1 P/a 0.45			40.0000	0.1200	4.8000	110.0000	4400.0000 (28a)
External Wall 1 Render	64.8700	9.4500	55.4200	0.1500	8.3130	9.0000	498.7800 (29a)
External Wall 2 stone	11.8500	2.1200	9.7300	0.1500	1.4595	9.0000	87.5700 (29a)
External Wall 3 clad	13.1000	2.5200	10.5800	0.1500	1.5870	9.0000	95.2200 (29a)
External Roof 1 Horz	40.0000		40.0000	0.0900	3.6000	9.0000	360.0000 (30)
Total net area of external elements Aum(A, m ²)			169.8200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	35.5856	(33)
Party Wall 1			39.9200	0.0000	0.0000	20.0000	798.4000 (32)
Internal Wall 1 GF			34.1300			9.0000	307.1700 (32c)
Internal Wall 2 FF			60.2000			9.0000	541.8000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)
Internal Ceiling 1			40.0000			9.0000	360.0000 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	8168.9400	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							102.1118 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				9.9800	0.0300	0.2994	

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E5 Ground floor (normal)	18.0000	0.0210	0.3780
E10 Eaves (insulation at ceiling level)	10.0000	0.0440	0.4400
E12 Gable (insulation at ceiling level)	8.0000	0.0510	0.4080
E6 Intermediate floor within a dwelling	18.0000	0.0800	1.4400
P1 Party wall - Ground floor	8.0000	0.1490	1.1920
P2 Party wall - Intermediate floor within a dwelling	8.0000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400
E18 Party wall between dwellings	9.9800	0.0395	0.3942
E2 Other lintels (including other steel lintels)	10.6100	0.0840	0.8912
E3 Sill	9.6000	0.0430	0.4128
E4 Jamb	23.1000	0.0340	0.7854
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.4810 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	46.0667 (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	9.8267	9.7567	9.6867	9.3368	9.2668	8.9169	8.9169	8.8469	9.0569	9.2668	9.4068	9.5467 (38)
Average = Sum(39)m / 12 =	55.8933	55.8234	55.7534	55.4034	55.3335	54.9835	54.9835	54.9136	55.1235	55.3335	55.4734	55.6134 (39)
HLP	0.6987	0.6978	0.6969	0.6925	0.6917	0.6873	0.6873	0.6864	0.6890	0.6917	0.6934	0.6952 (40)
HLP (average)												0.6923
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

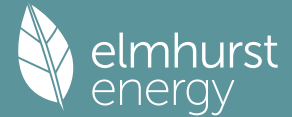
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4629 (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	75.5424	74.4205	72.8406	69.9276	67.7463	65.3277	64.0212	65.5901	67.2982	69.8863	72.8593	75.2870 (42b)
Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522 (42c)
Average daily hot water use (litres/day)												106.2689 (43)
Daily hot water use	115.3945	112.8235	109.7944	105.4322	101.8018	97.9340	96.6275	99.6456	102.8029	106.8401	111.2623	115.1391 (44)
Energy conte	182.7567	160.6591	168.7499	144.3314	137.0448	120.4213	116.8626	123.3820	126.7662	144.9810	158.5135	180.2801 (45)
Energy content (annual)												Total = Sum(45)m = 1764.7487
Distribution loss (46)m = 0.15 x (45)m	27.4135	24.0989	25.3125	21.6497	20.5567	18.0632	17.5294	18.5073	19.0149	21.7472	23.7770	27.0420 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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	232.8031	205.8623	217.4006	186.0098	174.2969	156.2465	153.8821	161.3320	169.7954	193.6317	206.9455	230.3265 (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												599.3060 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												599.3060
Solar input	-0.0000	-16.2478	-57.1859	-77.6199	-99.9149	-91.8832	-91.1420	-80.4420	-56.3516	-28.5186	-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	232.8031	189.6145	160.2146	108.3899	74.3819	64.3633	62.7401	80.8900	113.4438	165.1131	206.9455	230.3265 (64)
												Total per year (kWh/year) = Sum(64)m = 1689.2263 (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	100.8037	89.5817	95.0299	81.3329	75.3691	68.7003	68.4724	71.3845	76.5731	87.1267	91.4513	99.9802 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.8578	22.9666	18.6777	14.1402	10.5700	8.9236	9.6423	12.5334	16.8223	21.3598	24.9301	26.5764 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.5232	330.9219	322.3573	304.1245	281.1088	259.4772	245.0260	241.6274	250.1919	268.4248	291.4405	313.0720 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400 (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)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)
Water heating gains (Table 5)	135.4889	133.3061	127.7283	112.9624	101.3025	95.4171	92.0328	95.9469	106.3515	117.1058	127.0158	134.3821 (72)
Total internal gains	590.3671	588.6919	570.2606	532.7243	494.4785	465.3152	448.1984	451.6049	474.8630	508.3876	544.8836	575.5277 (73)

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6. Solar gains

[Jan]				Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	g Specific data or Table 6c	FF	Access factor Table 6d	Gains W		
Northeast				4.4100	11.2829	0.7600	0.7000		0.7700	18.3445 (75)		
Southwest				7.5600	36.7938	0.7600	0.7000		0.7700	102.5514 (79)		
Solar gains	120.8959	212.0238	306.2851	406.6304	480.2215	487.6405	465.6048	409.0375	340.7732	238.6953	145.9151	102.7437 (83)
Total gains	711.2630	800.7156	876.5457	939.3548	974.7000	952.9557	913.8032	860.6424	815.6361	747.0829	690.7987	678.2714 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	40.5979	40.6488	40.6998	40.9568	41.0086	41.2696	41.2696	41.3222	41.1648	41.0086	40.9052	40.8022
alpha	3.7065	3.7099	3.7133	3.7305	3.7339	3.7513	3.7513	3.7548	3.7443	3.7339	3.7270	3.7201
util living area	0.8796	0.8306	0.7549	0.6408	0.5038	0.3637	0.2634	0.2914	0.4516	0.6761	0.8295	0.8932 (86)
Living	20.2296	20.3951	20.5891	20.7642	20.8648	20.9058	20.9151	20.9138	20.8908	20.7600	20.4741	20.1827
Non living	19.4352	19.6375	19.8716	20.0794	20.1913	20.2368	20.2448	20.2448	20.2217	20.0798	19.7414	19.3803
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	20.6059	20.3951	20.5891	20.7642	20.8648	20.9058	20.9151	20.9138	20.8908	20.7600	20.4741	20.2971 (87)
Th 2	20.3420	20.3428	20.3436	20.3474	20.3482	20.3521	20.3521	20.3528	20.3505	20.3482	20.3467	20.3451 (88)
util rest of house	0.8680	0.8157	0.7351	0.6151	0.4728	0.3283	0.2251	0.2511	0.4126	0.6463	0.8121	0.8826 (89)
MIT 2	19.9805	19.6375	19.8716	20.0794	20.1913	20.2368	20.2448	20.2448	20.2217	20.0798	19.7414	19.5542 (90)
Living area fraction									fLA = Living area / (4) =			0.4205 (91)
MIT	20.2435	19.9561	20.1733	20.3674	20.4745	20.5181	20.5267	20.5261	20.5031	20.3658	20.0495	19.8665 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2435	19.9561	20.1733	20.3674	20.4745	20.5181	20.5267	20.5261	20.5031	20.3658	20.0495	19.8665 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8662	0.8063	0.7297	0.6160	0.4789	0.3374	0.2355	0.2620	0.4219	0.6472	0.8036	0.8741 (94)
Useful gains	616.0704	645.6482	639.6468	578.5980	466.7727	321.5711	215.1657	225.4659	344.0943	483.4905	555.1177	592.9007 (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	891.1353	840.4794	762.3325	635.3327	485.5242	325.3999	215.9021	226.5802	352.9591	540.3758	718.3538	871.2698 (97)
Space heating kWh	204.6483	130.9265	91.2781	40.8490	13.9511	0.0000	0.0000	0.0000	0.0000	42.3227	117.5300	207.1066 (98a)
Space heating requirement - total per year (kWh/year)												848.6123
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	204.6483	130.9265	91.2781	40.8490	13.9511	0.0000	0.0000	0.0000	0.0000	42.3227	117.5300	207.1066 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												848.6123
Space heating per m ²										(98c) / (4) =		10.6077 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 %)												400.0410 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	204.6483	130.9265	91.2781	40.8490	13.9511	0.0000	0.0000	0.0000	0.0000	42.3227	117.5300	207.1066 (98)
Space heating efficiency (main heating system 1)	400.0410	400.0410	400.0410	400.0410	400.0410	0.0000	0.0000	0.0000	0.0000	400.0410	400.0410	400.0410 (210)
Space heating fuel (main heating system)	51.1568	32.7283	22.8172	10.2112	3.4874	0.0000	0.0000	0.0000	0.0000	10.5796	29.3795	51.7714 (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	232.8031	189.6145	160.2146	108.3899	74.3819	64.3633	62.7401	80.8900	113.4438	165.1131	206.9455	230.3265 (64)
Efficiency of water heater (217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600 (216)
Fuel for water heating, kWh/month	113.7512	92.6485	78.2833	52.9610	36.3442	31.4489	30.6558	39.5241	55.4304	80.6768	101.1167	112.5410 (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	18.6245	16.8222	18.6245	18.0237	18.6245	18.0237	18.6245	18.6245	18.0237	18.6245	18.0237	18.6245 (231)
Lighting	22.6332	18.1572	16.3485	11.9776	9.2519	7.5588	8.4399	10.9704	14.2495	18.6961	21.1172	23.2622 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-41.5895	-61.1440	-90.3220	-101.9122	-108.0865	-100.5251	-99.1500	-94.5157	-84.8795	-70.5127	-46.4235	-35.5294 (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)												

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(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	-17.9205	-40.8741	-89.4588	-145.8703	-202.5536	-206.3863	-203.0964	-166.8139	-115.2191	-61.6582	-24.7269	-13.8750	(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												212.1313	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												204.6600	
Water heating fuel used												825.3817	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)													
mechanical ventilation fans (SFP = 0.5720)												139.2889	(230a)
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												219.2889	(231)
Electricity for lighting (calculated in Appendix L)												182.6625	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2223.0433	(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												-783.5788	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	212.1313	16.4900	34.9805	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	825.3817	16.4900	136.1054	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	139.2889	16.4900	22.9687	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	182.6625	16.4900	30.1210	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-934.5901	16.4900	-154.1139	
PV Unit electricity exported	-1288.4532	5.5900	-72.0245	
Total			-226.1384	(252)
Total energy cost			11.2292	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.0323	(257)
SAP value		99.4758	
SAP rating (Section 12)		99	(258)
SAP band		A	

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

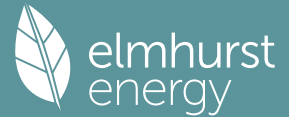
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	212.1313	0.1570	33.3005	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	825.3817	0.1462	120.6641	(264)
Space and water heating			153.9646	(265)
Pumps, fans and electric keep-hot	219.2889	0.1387	30.4181	(267)
Energy for lighting	182.6625	0.1443	26.3638	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-934.5901	0.1344	-125.6229	
PV Unit electricity exported	-1288.4532	0.1238	-159.5520	
Total			-285.1750	(269)
Total CO2, kg/year			-74.4284	(272)
CO2 emissions per m2			-0.9300	(273)
EI value			100.7979	
EI rating			101	(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	40.0000 (1b)	x 2.3700 (2b)	= 94.8000 (1b) - (3b)

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First floor
 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 80.0000 40.0000 (1c) x 2.6200 (2c) = 104.8000 (1c) - (3c) (4)
 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 199.6000 (5)

2. Ventilation rate

m3 per hour

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

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 1.0000 (17)
 Infiltration rate 0.0500 (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) = 0.0425 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	6.6000	6.2000	6.1000	5.6000	5.5000	4.7000	4.6000	4.5000	5.0000	5.8000	6.0000	6.5000
Wind factor	1.6500	1.5500	1.5250	1.4000	1.3750	1.1750	1.1500	1.1250	1.2500	1.4500	1.5000	1.6250
Adj infilt rate	0.0701	0.0659	0.0648	0.0595	0.0584	0.0499	0.0489	0.0478	0.0531	0.0616	0.0638	0.0691
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000
Effective ac	0.1651	0.1609	0.1598	0.1545	0.1534	0.1449	0.1439	0.1428	0.1481	0.1566	0.1587	0.1641

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
Window (Uw = 1.20)			11.9700	1.1450	13.7061		(27)
Door			2.1200	1.0000	2.1200		(26a)
Floor 1 P/a 0.45			40.0000	0.1200	4.8000	110.0000	4400.0000 (28a)
External Wall 1 Render	64.8700	9.4500	55.4200	0.1500	8.3130	9.0000	498.7800 (29a)
External Wall 2 stone	11.8500	2.1200	9.7300	0.1500	1.4595	9.0000	87.5700 (29a)
External Wall 3 clad	13.1000	2.5200	10.5800	0.1500	1.5870	9.0000	95.2200 (29a)
External Roof 1 Horz	40.0000		40.0000	0.0900	3.6000	9.0000	360.0000 (30)
Total net area of external elements Aum(A, m2)			169.8200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 35.5856		(33)
Party Wall 1			39.9200	0.0000	0.0000	20.0000	798.4000 (32)
Internal Wall 1 GF			34.1300			9.0000	307.1700 (32c)
Internal Wall 2 FF			60.2000			9.0000	541.8000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)
Internal Ceiling 1			40.0000			9.0000	360.0000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) = 8168.9400	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							102.1118 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	9.9800	0.0300	0.2994
E5 Ground floor (normal)	18.0000	0.0210	0.3780
E10 Eaves (insulation at ceiling level)	10.0000	0.0440	0.4400
E12 Gable (insulation at ceiling level)	8.0000	0.0510	0.4080
E6 Intermediate floor within a dwelling	18.0000	0.0800	1.4400
P1 Party wall - Ground floor	8.0000	0.1490	1.1920
P2 Party wall - Intermediate floor within a dwelling	8.0000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	8.0000	0.4800	3.8400
E18 Party wall between dwellings	9.9800	0.0395	0.3942
E2 Other lintels (including other steel lintels)	10.6100	0.0840	0.8912
E3 Sill	9.6000	0.0430	0.4128
E4 Jamb	23.1000	0.0340	0.7854

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

Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 46.0667 (37)

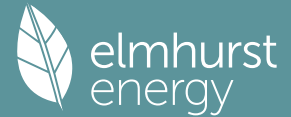
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	10.8765	10.5965	10.5265	10.1766	10.1066	9.5467	9.4768	9.4068	9.7567	10.3166	10.4565	10.8065
Average = Sum(39)m / 12 =	56.9431	56.6632	56.5932	56.2433	56.1733	55.6134	55.5434	55.4734	55.8234	56.3832	56.5232	56.8731
HLP	0.7118	0.7083	0.7074	0.7030	0.7022	0.6952	0.6943	0.6934	0.6978	0.7048	0.7065	0.7109
HLP (average)												0.7030
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4629 (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 75.5424 74.4205 72.8406 69.9276 67.7463 65.3277 64.0212 65.5901 67.2982 69.8863 72.8593 75.2870 (42b)

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Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522 (42c)
Average daily hot water use (litres/day)												106.2689 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	115.3945	112.8235	109.7944	105.4322	101.8018	97.9340	96.6275	99.6456	102.8029	106.8401	111.2623	115.1391 (44)
Energy content (annual)	182.7567	160.6591	168.7499	144.3314	137.0448	120.4213	116.8626	123.3820	126.7662	144.9810	158.5135	180.2801 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1764.7487
	27.4135	24.0989	25.3125	21.6497	20.5567	18.0632	17.5294	18.5073	19.0149	21.7472	23.7770	27.0420 (46)
Water storage loss:												250.0000 (47)
Store volume												1.6000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8640 (55)
Enter (49) or (54) in (55)												
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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	232.8031	205.8623	217.4006	186.0098	174.2969	156.2465	153.8821	161.3320	169.7954	193.6317	206.9455	230.3265 (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												760.2870 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												760.2870
Solar input	-9.5843	-27.8777	-72.6433	-95.7729	-112.5478	-111.8749	-100.3437	-97.4999	-74.4755	-44.6636	-13.0032	-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	223.2188	177.9846	144.7572	90.2369	61.7490	44.3716	53.5384	63.8320	95.3198	148.9680	193.9423	230.3265 (64)
												Total per year (kWh/year) = Sum(64)m = 1528.2453 (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	100.8037	89.5817	95.0299	81.3329	75.3691	68.7003	68.4724	71.3845	76.5731	87.1267	91.4513	99.9802 (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	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.8578	22.9666	18.6777	14.1402	10.5700	8.9236	9.6423	12.5334	16.8223	21.3598	24.9301	26.5764 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.5232	330.9219	322.3573	304.1245	281.1088	259.4772	245.0260	241.6274	250.1919	268.4248	291.4405	313.0720 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400 (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)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)
Water heating gains (Table 5)	135.4889	133.3061	127.7283	112.9624	101.3025	95.4171	92.0328	95.9469	106.3515	117.1058	127.0158	134.3821 (72)
Total internal gains	590.3671	588.6919	570.2606	532.7243	494.4785	465.3152	448.1984	451.6049	474.8630	508.3876	544.8836	575.5277 (73)

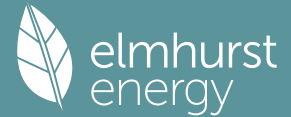
6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains					
		m ²	Table 6a	Specific data	Specific data	factor	W					
			W/m ²	or Table 6b	or Table 6c	Table 6d						
Northeast		4.4100	15.8649	0.7600	0.7000	0.7700	25.7941 (75)					
Southwest		7.5600	48.0626	0.7600	0.7000	0.7700	133.9596 (79)					
Solar gains	159.7537	241.9825	347.4510	476.3894	536.4903	595.5914	513.2000	483.6134	407.1773	281.5525	184.9883	131.6282 (83)
Total gains	750.1208	830.6744	917.7116	1009.1137	1030.9688	1060.9066	961.3984	935.2183	882.0402	789.9402	729.8719	707.1560 (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	39.8494	40.0463	40.0958	40.3453	40.3955	40.8022	40.8536	40.9052	40.6488	40.2451	40.1455	39.8985
alpha	3.6566	3.6698	3.6731	3.6897	3.6930	3.7201	3.7236	3.7270	3.7099	3.6830	3.6764	3.6599
util living area	0.8085	0.7585	0.6886	0.5860	0.4717	0.3366	0.2756	0.2771	0.3849	0.5701	0.7271	0.8138 (86)
Living	20.4921	20.5908	20.6978	20.8055	20.8737	20.9073	20.9135	20.9136	20.9021	20.8394	20.6882	20.5011
Non living	19.7476	19.8663	19.9910	20.1163	20.1911	20.2308	20.2372	20.2381	20.2242	20.1557	19.9861	19.7608
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	20.7402	20.5908	20.6978	20.8055	20.8737	20.9073	20.9135	20.9136	20.9021	20.8394	20.6882	20.5709 (87)
Th 2	20.3304	20.3335	20.3343	20.3381	20.3389	20.3451	20.3459	20.3467	20.3428	20.3366	20.3351	20.3312 (88)

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util rest of house	0.7899	0.7374	0.6645	0.5588	0.4406	0.3038	0.2386	0.2391	0.3461	0.5339	0.7001	0.7946 (89)
MIT 2	20.0981	19.8663	19.9910	20.1163	20.1911	20.2308	20.2372	20.2381	20.2242	20.1557	19.9861	19.8636 (90)
Living area fraction									flA = Living area / (4) =			0.4205 (91)
MIT	20.3681	20.1710	20.2882	20.4061	20.4781	20.5153	20.5216	20.5222	20.5093	20.4432	20.2813	20.1610 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3681	20.1710	20.2882	20.4061	20.4781	20.5153	20.5216	20.5222	20.5093	20.4432	20.2813	20.1610 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.7910	0.7320	0.6628	0.5616	0.4472	0.3124	0.2486	0.2494	0.3560	0.5399	0.6978	0.7894 (94)
Useful gains	593.3317	608.0945	608.2822	566.7374	461.0487	331.3884	239.0065	233.2082	314.0103	426.4742	509.2838	558.2142 (95)
Ext temp.	7.0000	7.3000	8.1000	9.6000	12.0000	14.5000	16.2000	16.3000	14.8000	12.4000	9.8000	7.6000 (96)
Heat loss rate W	761.2202	729.3096	689.7705	607.7686	476.2433	334.5296	240.0350	234.2175	318.7110	453.5000	592.4391	714.3855 (97)
Space heating kWh	124.9091	81.4565	60.6273	29.5425	11.3048	0.0000	0.0000	0.0000	0.0000	20.1073	59.8718	116.1914 (98a)
Space heating requirement - total per year (kWh/year)												504.0107
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	124.9091	81.4565	60.6273	29.5425	11.3048	0.0000	0.0000	0.0000	0.0000	20.1073	59.8718	116.1914 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												504.0107
Space heating per m2												6.3001 (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 %)												400.2809 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	124.9091	81.4565	60.6273	29.5425	11.3048	0.0000	0.0000	0.0000	0.0000	20.1073	59.8718	116.1914 (98)
Space heating efficiency (main heating system 1)	400.2809	400.2809	400.2809	400.2809	400.2809	0.0000	0.0000	0.0000	0.0000	400.2809	400.2809	400.2809 (210)
Space heating fuel (main heating system)	31.2053	20.3498	15.1462	7.3804	2.8242	0.0000	0.0000	0.0000	0.0000	5.0233	14.9574	29.0275 (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	223.2188	177.9846	144.7572	90.2369	61.7490	44.3716	53.5384	63.8320	95.3198	148.9680	193.9423	230.3265 (64)
Efficiency of water heater												204.6600 (216)
(217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600 (217)
Fuel for water heating, kWh/month	109.0681	86.9660	70.7306	44.0911	30.1715	21.6807	26.1597	31.1893	46.5747	72.7881	94.7632	112.5410 (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	18.6245	16.8222	18.6245	18.0237	18.6245	18.0237	18.6245	18.0237	18.0237	18.6245	18.0237	18.6245 (231)
Lighting	22.6332	18.1572	16.3485	11.9776	9.2519	7.5588	8.4399	10.9704	14.2495	18.6961	21.1172	23.2622 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-52.8272	-67.9944	-97.8892	-109.5100	-112.2446	-106.3267	-102.2739	-100.5918	-92.9938	-79.1091	-56.3723	-44.3211 (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)	-28.5664	-52.2542	-111.1331	-184.5581	-236.3923	-269.1247	-231.8107	-211.1949	-150.9417	-81.5386	-36.9589	-21.2004 (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												125.9142 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												204.6600
Water heating fuel used												746.7240 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)												
mechanical ventilation fans (SFP = 0.5720)												139.2889 (230a)
pump for solar water heating												80.0000 (230g)
Total electricity for the above, kWh/year												219.2889 (231)
Electricity for lighting (calculated in Appendix L)												182.6625 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2638.1280 (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												-1363.5384 (238)

10a. Fuel costs - using BEDF prices (535)

Full SAP Calculation Printout



	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	125.9142	25.1600	31.6800 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	746.7240	25.1600	187.8758 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	139.2889	25.1600	35.0451 (249)
Pump for solar water heating	80.0000	25.1600	20.1280 (249)
Energy for lighting	182.6625	25.1600	45.9579 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1022.4540	25.1600	-257.2494
PV Unit electricity exported	-1615.6739	5.8100	-93.8707
Total			-351.1201 (252)
Total energy cost			-30.4333 (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	125.9142	0.1569	19.7612 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	746.7240	0.1474	110.0354 (264)
Space and water heating			129.7967 (265)
Pumps, fans and electric keep-hot	219.2889	0.1387	30.4181 (267)
Energy for lighting	182.6625	0.1443	26.3638 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1022.4540	0.1351	-138.1617
PV Unit electricity exported	-1615.6739	0.1247	-201.4810
Total			-339.6427 (269)
Total CO2, kg/year			-153.0641 (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	125.9142	1.5810	199.0680 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	746.7240	1.5452	1153.8083 (278)
Space and water heating			1352.8763 (279)
Pumps, fans and electric keep-hot	219.2889	1.5128	331.7402 (281)
Energy for lighting	182.6625	1.5338	280.1739 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1022.4540	1.4994	-1533.0988
PV Unit electricity exported	-1615.6739	0.4577	-739.5234
Total			-2272.6223 (283)
Total Primary energy kWh/year			-307.8319 (286)