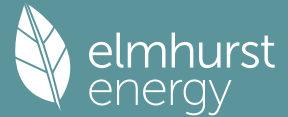


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Property Reference	65a Kiln				Issued on Date	10/05/2024
Assessment Reference	65a Kiln ASHP AS BUILT KNA		Prop Type Ref	65a		
Property	65a Kiln Road, Emmer Green, READING, RG4 8UE					
SAP Rating	80 C	DER	3.73	TER	8.30	
Environmental	96 A	% DER < TER				55.06
CO ₂ Emissions (t/year)	0.66	DFEE	42.29	TFEE	43.14	
Compliance Check	See BREL	% DFEE < TFEE				1.97
% DPER < TPER	12.68	DPER	38.67	TPER	44.28	
Assessor Details	Mr. Alan Ironmonger				Assessor ID	L609-0001
Client	65 Kiln Road, Mr P Felgate					

SAP 10 WORKSHEET FOR New Build (As Built) (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	123.4700 (1b)	x 2.3800 (2b)	= 293.8586 (1b) - (3b)
First floor	66.7000 (1c)	x 2.3000 (2c)	= 153.4100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	190.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 447.2686 (5)

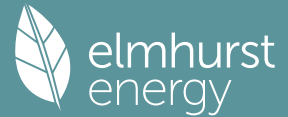
2. Ventilation rate

	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	1 * 20 = 20.0000 (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) = 20.0000 / (5) = 0.0447 (8)											
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	3.8200 (17)											
Infiltration rate	0.2357 (18)											
Number of sides sheltered	1 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2180 (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	0.2780	0.2725	0.2671	0.2398	0.2344	0.2071	0.2071	0.2017	0.2180	0.2344	0.2453	0.2562 (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) =												35.0000 (23c)
Effective ac	0.6030	0.5975	0.5921	0.5648	0.5594	0.5321	0.5321	0.5267	0.5430	0.5594	0.5703	0.5812 (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 + pd (Uw = 1.30)			30.1400	1.2357	37.2452		(27)
pers door			4.0100	1.0000	4.0100		(26a)
Opening			2.0900	1.2357	2.5827		(27a)
ground floor			123.4700	0.1200	14.8164	75.0000	9260.2500 (28a)
brickwork	148.8800	29.1500	119.7300	0.2400	28.7352	150.0000	17959.5000 (29a)
timber	53.9800	5.0000	48.9800	0.1800	8.8164	9.0000	440.8200 (29a)
flat ceil line	83.4100		83.4100	0.1000	8.3410	9.0000	750.6900 (30)
raking	37.6200	2.0900	35.5300	0.1500	5.3295	9.0000	319.7700 (30)
flat roof	8.6400		8.6400	0.1700	1.4688	9.0000	77.7600 (30)
Total net area of external elements Aum(A, m ²)			456.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	111.3452		(33)
blockw			75.0000			75.0000	5625.0000 (32c)
stud p			40.0000			9.0000	360.0000 (32c)
Internal Floor 1			66.7000			18.0000	1200.6000 (32d)

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Internal Ceiling 1 66.7000 9.0000 600.3000 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 36594.6900 (34)
Thermal mass parameter (TMP = C_m / TFA) in $\text{kJ/m}^2\text{K}$ 192.4315 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	20.8800	0.2950	6.1596
E3 Sill	18.9700	0.0200	0.3794
E4 Jamb	46.8000	0.0150	0.7020
E5 Ground floor (normal)	52.3000	0.0300	1.5690
E6 Intermediate floor within a dwelling	37.0000	0.0030	0.1110
E16 Corner (normal)	25.0600	0.0450	1.1277
R1 Head of roof window	1.5600	0.2400	0.3744
R2 Sill of roof window	1.5600	0.2400	0.3744
R3 Jamb of roof window	5.3600	0.2400	1.2864
E10 Eaves (insulation at ceiling level)	39.5200	0.0640	2.5293
E17 Corner (inverted - internal area greater than external area)	7.1400	-0.0940	-0.6712
E15 Flat roof with parapet	7.9000	0.3000	2.3700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.3120 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 127.6573 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$
(38)m Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Heat transfer coeff 89.0016 88.1970 87.3925 83.3697 82.5652 78.5424 78.5424 77.7379 80.1515 82.5652 84.1743 85.7834 (38)
Average = $\text{Sum}(39)\text{m} / 12 =$ 216.6589 215.8543 215.0498 211.0270 210.2225 206.1997 206.1997 205.3952 207.8088 210.2225 211.8316 213.4407 (39)
210.8259

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1393	1.1351	1.1308	1.1097	1.1054	1.0843	1.0843	1.0801	1.0928	1.1054	1.1139	1.1224 (40)
HLP (average)												1.1086
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9891 (42)
Hot water usage for mixer showers 72.4594 71.3500 69.7152 67.2002 64.9468 61.7943 59.3009 62.2159 63.6819 66.8043 70.0560 72.3941 (42a)
Hot water usage for baths 31.3754 30.9018 30.2280 29.2189 28.3096 27.0577 26.1080 27.2693 27.8788 29.1192 30.4089 31.3505 (42b)
Hot water usage for other uses 45.2415 43.5964 41.9512 40.3061 38.6610 37.0158 37.0158 38.6610 40.3061 41.9512 43.5964 45.2415 (42c)
Average daily hot water use (litres/day) 137.0231 (43)

Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Energy conte 149.0763 145.8482 141.8944 136.7252 131.9173 125.8678 122.4247 128.1462 131.8669 137.8748 144.0613 148.9861 (44)
Energy content (annual) 219.4661 192.9867 202.7642 178.5973 169.9888 145.5620 135.2829 150.8304 152.9590 177.6656 194.7036 218.7970 (45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$ Total = Sum(45)m = 2139.6036
32.9199 28.9480 30.4146 26.7896 25.4983 21.8343 20.2924 22.6246 22.9438 26.6498 29.2055 32.8196 (46)

Water storage loss:
Store volume 250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.4100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7614 (55)
Total storage loss

23.6034 21.3192 23.6034 22.8420 23.6034 22.8420 23.6034 23.6034 22.8420 23.6034 22.8420 23.6034 (56)
If cylinder contains dedicated solar storage
Primary loss 23.6034 21.3192 23.6034 22.8420 23.6034 22.8420 23.6034 23.6034 22.8420 23.6034 22.8420 23.6034 (57)
Combi loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 (59)
Total heat required for water heating calculated for each month 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)
WWHRS 266.3319 235.3171 249.6300 223.9513 216.8546 190.9160 182.1487 197.6962 198.3130 224.5314 240.0576 265.6628 (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 (63d)
Output from w/h 266.3319 235.3171 249.6300 223.9513 216.8546 190.9160 182.1487 197.6962 198.3130 224.5314 240.0576 265.6628 (64)
Total per year (kWh/year) = Sum(64)m = 2691.4106 (64)
2691 (64)

12Total per year (kWh/year)
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month 110.4651 98.0324 104.9117 95.6668 94.0139 84.6826 82.4742 87.6437 87.1421 96.5665 101.0221 110.2427 (65)

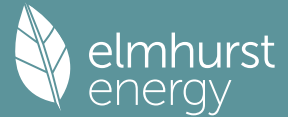
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(66)m 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 187.7680 207.8860 187.7680 194.0269 187.7680 187.7680 187.7680 187.7680 194.0269 187.7680 194.0269 187.7680 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 361.6046 365.3569 355.9012 335.7710 310.3603 286.4779 270.5229 266.7706 276.2263 296.3565 321.7672 345.6496 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 (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) -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 (71)
Water heating gains (Table 5) 148.4746 145.8815 141.0104 132.8706 126.3628 117.6147 110.8524 117.8007 121.0306 129.7936 140.3085 148.1756 (72)
Total internal gains 765.6839 786.9611 752.5163 730.5052 692.3278 665.9562 636.9801 640.1760 659.1206 681.7548 723.9393 749.4299 (73)

6. Solar gains

[Jan] Area Solar flux g FF Access Gains

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				m2	Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
Southeast					7.1400	36.7938	0.7200		0.7000		0.7700	91.7565 (77)
Southwest					1.4400	36.7938	0.7200		0.7000		0.7700	18.5055 (79)
Northwest					21.5600	11.2829	0.7200		0.7000		0.7700	84.9640 (81)
Southeast					2.0900	26.0000	0.7200		0.7000		1.0000	24.6486 (82)
Solar gains	219.8747	411.9570	659.5847	972.3419	1226.5296	1277.0065	1206.5545	1008.5753	766.9604	481.5020	270.2600	183.6557 (83)
Total gains	985.5586	1198.9182	1412.1009	1702.8471	1918.8574	1942.9627	1843.5345	1648.7513	1426.0810	1163.2568	994.1993	933.0857 (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	46.9180	47.0928	47.2690	48.1701	48.3545	49.2978	49.2978	49.4909	48.9161	48.3545	47.9871	47.6254
alpha	4.1279	4.1395	4.1513	4.2113	4.2236	4.2865	4.2865	4.2994	4.2611	4.2236	4.1991	4.1750
util living area	0.9966	0.9920	0.9792	0.9312	0.8160	0.6315	0.4799	0.5495	0.8121	0.9662	0.9930	0.9973 (86)
Living	19.5595	19.7399	20.0248	20.4219	20.7237	20.8793	20.9160	20.9077	20.7831	20.3722	19.9066	19.5451
Non living	18.2683	18.5013	18.8656	19.3713	19.7215	19.8898	19.9164	19.9158	19.8026	19.3220	18.7281	18.2602
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	8	0	0	0	0	0	0	0	0	0	0	0
16 / 9	23	22	0	0	0	0	0	0	0	0	0	31
MIT	20.3947	20.1692	20.0248	20.4219	20.7237	20.8793	20.9160	20.9077	20.7831	20.3722	19.9066	20.1760 (87)
Th 2	19.9689	19.9723	19.9757	19.9929	19.9964	20.0137	20.0137	20.0172	20.0068	19.9964	19.9895	19.9826 (88)
util rest of house	0.9957	0.9898	0.9734	0.9119	0.7681	0.5505	0.3780	0.4425	0.7448	0.9531	0.9908	0.9966 (89)
MIT 2	19.4120	19.1469	18.8656	19.3713	19.7215	19.8898	19.9164	19.9158	19.8026	19.3220	18.7281	19.2224 (90)
Living area fraction	fLA = Living area / (4) = 0.1325 (91)											
MIT	19.5422	19.2823	19.0191	19.5105	19.8543	20.0208	20.0488	20.0472	19.9325	19.4611	18.8842	19.3487 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5422	19.2823	19.0191	19.5105	19.8543	20.0208	20.0488	20.0472	19.9325	19.4611	18.8842	19.3487 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9952	0.9880	0.9661	0.9005	0.7604	0.5512	0.3817	0.4459	0.7390	0.9438	0.9873	0.9960 (94)
Useful gains	980.8497	1184.4754	1364.2871	1533.4159	1459.1586	1070.8707	703.7348	735.1521	1053.8148	1097.8791	981.5632	929.3758 (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	3302.3488	3104.4913	2692.2321	2239.0998	1714.2079	1117.7754	711.1451	749.1211	1212.0435	1862.8054	2496.2758	3233.3472 (97)
Space heating kWh	1727.1953	1290.2507	987.9911	508.0924	189.7566	0.0000	0.0000	0.0000	0.0000	569.1051	1090.5930	1714.1548 (98a)
Space heating requirement - total per year (kWh/year)												8077.1391
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	1727.1953	1290.2507	987.9911	508.0924	189.7566	0.0000	0.0000	0.0000	0.0000	569.1051	1090.5930	1714.1548 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8077.1391
Space heating per m2	(98c) / (4) =											42.4733 (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 %)												347.0975 (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	1727.1953	1290.2507	987.9911	508.0924	189.7566	0.0000	0.0000	0.0000	0.0000	569.1051	1090.5930	1714.1548 (98)
Space heating efficiency (main heating system 1)	347.0975	347.0975	347.0975	347.0975	347.0975	0.0000	0.0000	0.0000	0.0000	347.0975	347.0975	347.0975 (210)
Space heating fuel (main heating system)	497.6109	371.7257	284.6436	146.3832	54.6695	0.0000	0.0000	0.0000	0.0000	163.9612	314.2036	493.8539 (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	266.3319	235.3171	249.6300	223.9513	216.8546	190.9160	182.1487	197.6962	198.3130	224.5314	240.0576	265.6628 (64)
Water heating requirement	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117 (216)
Efficiency of water heater (217)m	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117 (217)
Fuel for water heating, kWh/month	161.3040	142.5199	151.1885	135.6362	131.3381	115.6283	110.3184	119.7348	120.1083	135.9876	145.3910	160.8988 (219)
Space cooling fuel requirement	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)
(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	33.1362	29.9295	33.1362	32.0673	33.1362	32.0673	33.1362	33.1362	32.0673	33.1362	32.0673	33.1362 (231)
Lighting	47.1543	37.8289	34.0607	24.9544	19.2755	15.7482	17.5837	22.8560	29.6877	38.9518	43.9960	48.4648 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)
(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)	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)
(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)	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)
(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)
(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)												

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(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												2327.0516	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												165.1117	
Water heating fuel used												1630.0539	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.7150)													
mechanical ventilation fans (SFP = 0.7150)												390.1524	(230a)
Total electricity for the above, kWh/year												390.1524	(231)
Electricity for lighting (calculated in Appendix L)												380.5620	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4727.8200	(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 (high-rate cost)	1861.6413	0.1635	304.3284	(261)
Space heating - main system 1 (low-rate cost)	465.4103	0.1372	63.8728	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	1141.0378	0.1479	168.7930	(264)
Water heating - low rate cost	489.0162	0.1242	60.7140	(264)
Space and water heating			597.7082	(265)
Pumps, fans and electric keep-hot	390.1524	0.1432	54.1365	(267)
Energy for lighting	380.5620	0.1490	56.7113	(268)
Total CO2, kg/year			708.5559	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7300	(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 (high-rate cost)	1861.6413	1.2875	2996.0845	(275)
Space heating - main system 1 (low-rate cost)	465.4103	1.4968	696.6204	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating - high rate cost	1141.0378	1.5530	1771.9945	(278)
Water heating - low rate cost	489.0162	1.4443	706.2916	(278)
Space and water heating			6170.9911	(279)
Pumps, fans and electric keep-hot	390.1524	1.5335	590.2831	(281)
Energy for lighting	380.5620	1.5547	591.6767	(282)
Total Primary energy kWh/year			7352.9509	(286)
Dwelling Primary energy Rate (DPER)			38.6700	(287)

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

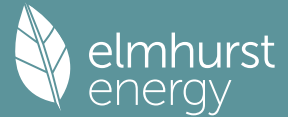
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	123.4700 (1b)	x 2.3800 (2b)	= 293.8586 (1b) - (3b)	
First floor	66.7000 (1c)	x 2.3000 (2c)	= 153.4100 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	190.1700		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 447.2686 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0894 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3394	(18)
Number of sides sheltered	1	(19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.9250 \quad (20)$$

$$(21) = (18) \times (20) = 0.3140 \quad (21)$$

	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	0.4003	0.3925	0.3846	0.3454	0.3375	0.2983	0.2983	0.2904	0.3140	0.3375	0.3532	0.3689	(22b)
Effective ac	0.5801	0.5770	0.5740	0.5596	0.5570	0.5445	0.5445	0.5422	0.5493	0.5570	0.5624	0.5681	(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			4.0100	1.0000	4.0100			(26a)
TER Opening Type (Uw = 1.20)			30.1400	1.1450	34.5115			(27)
Opening			2.0900	1.5918	3.3268			(27a)
ground floor			123.4700	0.1300	16.0511			(28a)
brickwork	148.8800	29.1500	119.7300	0.1800	21.5514			(29a)
timber	53.9800	5.0000	48.9800	0.1800	8.8164			(29a)
flat ceil line	83.4100		83.4100	0.1100	9.1751			(30)
raking	37.6200	2.0900	35.5300	0.1100	3.9083			(30)
flat roof	8.6400		8.6400	0.1100	0.9504			(30)
Total net area of external elements Aum(A, m2)			456.0000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	102.3009		(33)

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

192.4315 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	20.8800	0.0500	1.0440	
E3 Sill	18.9700	0.0500	0.9485	
E4 Jamb	46.8000	0.0500	2.3400	
E5 Ground floor (normal)	52.3000	0.1600	8.3680	
E6 Intermediate floor within a dwelling	37.0000	0.0000	0.0000	
E16 Corner (normal)	25.0600	0.0900	2.2554	
R1 Head of roof window	1.5600	0.0800	0.1248	
R2 Sill of roof window	1.5600	0.0600	0.0936	
R3 Jamb of roof window	5.3600	0.0800	0.4288	
E10 Eaves (insulation at ceiling level)	39.5200	0.0600	2.3712	
E17 Corner (inverted - internal area greater than external area)	7.1400	-0.0900	-0.6426	
E15 Flat roof with parapet	7.9000	0.5600	4.4240	

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

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 124.0566 (37)

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

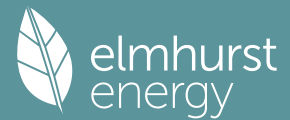
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	85.6259	85.1667	84.7166	82.6022	82.2066	80.3651	80.3651	80.0241	81.0744	82.2066	83.0069	83.8435	(38)
Heat transfer coeff	209.6826	209.2233	208.7732	206.6589	206.2633	204.4218	204.4218	204.0807	205.1311	206.2633	207.0635	207.9002	(39)
Average = Sum(39)m / 12 =												206.6570	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1026	1.1002	1.0978	1.0867	1.0846	1.0749	1.0749	1.0731	1.0787	1.0846	1.0888	1.0932	(40)
HLP (average)												1.0867	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9891 (42)
Hot water usage for mixer showers	74.3375	73.2204	71.5925	68.4778	66.1792	63.6158	62.1588	63.7744	65.5454	68.2977	71.4793	74.0527	(42a)
Hot water usage for baths	32.0908	31.6142	30.9430	29.7056	28.7790	27.7515	27.1965	27.8630	28.5886	29.6880	30.9510	31.9823	(42b)
Hot water usage for other uses	45.2415	43.5964	41.9512	40.3061	38.6610	37.0158	37.0158	38.6610	40.3061	41.9512	43.5964	45.2415	(42c)
Average daily hot water use (litres/day)												139.4186	(43)
Daily hot water use	151.6698	148.4310	144.4868	138.4895	133.6191	128.3832	126.3712	130.2984	134.4401	139.9370	146.0267	151.2765	(44)
Energy conte	240.2080	211.3637	222.0708	189.5851	179.8770	157.8621	152.8350	161.3366	165.7781	189.8931	208.0417	236.8625	(45)
Energy content (annual)										Total = Sum(45)m =		2315.7139	
Distribution loss (46)m = 0.15 x (45)m	36.0312	31.7046	33.3106	28.4378	26.9816	23.6793	22.9253	24.2005	24.8667	28.4840	31.2063	35.5294	(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	295.1148	260.9569	276.9776	242.7207	234.7838	210.9977	207.7418	216.2434	218.9137	244.7999	261.1774	291.7693	(62)
WWHRS	-33.9840	-30.0557	-31.4726	-26.0606	-24.2875	-20.7830	-19.4808	-20.7158	-21.5029	-25.3496	-28.7180	-33.3547	(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	(64d)
Output from w/h	261.1307	230.9012	245.5049	216.6602	210.4963	190.2147	188.2610	195.5276	197.4108	219.4504	232.4594	258.4146	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2646.4318	(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	123.7946	109.9530	117.7640	105.5455	103.7345	94.9976	94.7431	97.5699	97.6297	107.0649	111.6824	122.6822	(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	187.7680	207.8860	187.7680	194.0269	187.7680	194.0269	187.7680	187.7680	194.0269	187.7680	194.0269	187.7680 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	361.6046	365.3569	355.9012	335.7710	310.3603	286.4779	270.5229	266.7706	276.2263	296.3565	321.7672	345.6496 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647 (71)
Water heating gains (Table 5)	166.3906	163.6206	158.2849	146.5910	139.4282	131.9412	127.3428	131.1423	135.5968	143.9044	155.1144	164.8955 (72)
Total internal gains	786.5999	807.7002	772.7908	747.2257	708.3932	680.2827	653.4705	653.5176	673.6868	698.8656	741.7452	769.1498 (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
Southeast				7.1400	36.7938		0.6300		0.7000		0.7700		80.2870 (77)
Southwest				1.4400	36.7938		0.6300		0.7000		0.7700		16.1923 (79)
Northwest				21.5600	11.2829		0.6300		0.7000		0.7700		74.3435 (81)
Southeast				2.0900	26.0000		0.6300		0.7000		1.0000		21.5675 (82)
Solar gains	192.3903	360.4624	577.1366	850.7992	1073.2134	1117.3807	1055.7351	882.5033	671.0904	421.3142	236.4775		160.6987 (83)
Total gains	978.9902	1168.1626	1349.9274	1598.0249	1781.6066	1797.6633	1709.2056	1536.0209	1344.7772	1120.1798	978.2227		929.8485 (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	48.4790	48.5854	48.6901	49.1883	49.2826	49.7266	49.7266	49.8097	49.5546	49.2826	49.0921	48.8946
alpha	4.2319	4.2390	4.2460	4.2792	4.2855	4.3151	4.3151	4.3206	4.3036	4.2855	4.2728	4.2596
util living area	0.9967	0.9926	0.9818	0.9414	0.8395	0.6661	0.5101	0.5806	0.8316	0.9695	0.9934	0.9974 (86)
MIT	19.2407	19.4607	19.8134	20.3036	20.7045	20.9223	20.9807	20.9671	20.7920	20.2593	19.6681	19.2095 (87)
Th 2	19.9987	20.0007	20.0026	20.0117	20.0134	20.0213	20.0213	20.0228	20.0183	20.0134	20.0100	20.0064 (88)
util rest of house	0.9958	0.9907	0.9766	0.9244	0.7950	0.5847	0.4040	0.4705	0.7678	0.9576	0.9913	0.9967 (89)
MIT 2	17.9281	18.2103	18.6600	19.2770	19.7456	19.9700	20.0134	20.0079	19.8552	19.2337	18.4828	17.8933 (90)
Living area fraction	18.1020	18.3759	18.8128	19.4130	19.8726	20.0962	20.1415	20.1349	19.9793	19.3695	18.6398	18.0676 (92)
MIT	18.1020	18.3759	18.8128	19.4130	19.8726	20.0962	20.1415	20.1349	19.9793	19.3695	18.6398	18.0676 (93)
Temperature adjustment												0.0000
adjusted MIT	18.1020	18.3759	18.8128	19.4130	19.8726	20.0962	20.1415	20.1349	19.9793	19.3695	18.6398	18.0676 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9932	0.9859	0.9681	0.9115	0.7877	0.5914	0.4175	0.4838	0.7648	0.9469	0.9869	0.9945 (94)
Useful gains	972.3699	1151.6676	1306.8516	1456.5356	1403.4083	1063.1277	713.6127	743.1701	1028.5180	1060.7536	965.3875	924.7545 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.1000	10.6000	7.1000	4.2000	2.0000 (96)
Heat loss rate W	2894.0307	2819.4802	2570.5865	2172.6016	1685.7150	1123.5340	723.9677	762.2270	1206.0196	1808.8316	2389.4719	2883.0779 (97)
Space heating kWh	1429.7157	1120.7701	940.2188	515.5675	210.0362	0.0000	0.0000	0.0000	0.0000	556.5700	1025.3408	1456.9926 (98a)
Space heating requirement - total per year (kWh/year)												7255.2117
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	1429.7157	1120.7701	940.2188	515.5675	210.0362	0.0000	0.0000	0.0000	0.0000	556.5700	1025.3408	1456.9926 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7255.2117
Space heating per m ²												(98c) / (4) = 38.1512 (99)

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

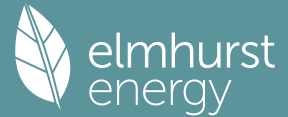
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1429.7157	1120.7701	940.2188	515.5675	210.0362	0.0000	0.0000	0.0000	0.0000	556.5700	1025.3408	1456.9926 (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)	1548.9877	1214.2688	1018.6553	558.5780	227.5582	0.0000	0.0000	0.0000	0.0000	603.0011	1110.8784	1578.5402 (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)

elmhurst
energy

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

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	123.4700 (1b)	2.3800 (2b)	293.8586 (1b) - (3b)
First floor	66.7000 (1c)	2.3000 (2c)	153.4100 (1c) - (3c)

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume

190.1700

(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 447.2686 (5)

2. Ventilation rate

												m3 per hour
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												4 * 10 = 40.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of flueless gas fires												0 * 40 = 0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans												40.0000 / (5) = 0.0894 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												3.8200 (17)
Infiltration rate												0.2804 (18)
Number of sides sheltered												1 (19)
												Shelter factor
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.2594 (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													
	0.3307	0.3242	0.3178	0.2853	0.2789	0.2464	0.2464	0.2399	0.2594	0.2789	0.2918	0.3048	(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	0.5547	0.5526	0.5505	0.5407	0.5389	0.5304	0.5304	0.5288	0.5336	0.5389	0.5426	0.5464	(25)

3. Heat losses and heat loss parameter

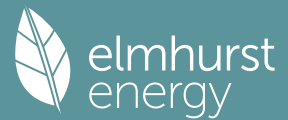
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
window + pd (Uw = 1.30)			30.1400	1.2357	37.2452			(27)
pers door			4.0100	1.0000	4.0100			(26a)
Opening			2.0900	1.2357	2.5827			(27a)
ground floor			123.4700	0.1200	14.8164	75.0000	9260.2500	(28a)
brickwork	148.8800	29.1500	119.7300	0.2400	28.7352	150.0000	17959.5000	(29a)
timber	53.9800	5.0000	48.9800	0.1800	8.8164	9.0000	440.8200	(29a)
flat ceil line	83.4100		83.4100	0.1000	8.3410	9.0000	750.6900	(30)
raking	37.6200	2.0900	35.5300	0.1500	5.3295	9.0000	319.7700	(30)
flat roof	8.6400		8.6400	0.1700	1.4688	9.0000	77.7600	(30)
Total net area of external elements Aum(A, m2)			456.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	111.3452			(33)
blockw			75.0000			75.0000	5625.0000	(32c)
stud p			40.0000			9.0000	360.0000	(32c)
Internal Floor 1			66.7000			18.0000	1200.6000	(32d)
Internal Ceiling 1			66.7000			9.0000	600.3000	(32e)
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) = 36594.6900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								192.4315 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E1 Steel lintel with perforated steel base plate				20.8800	0.2950		6.1596	
E3 Sill				18.9700	0.0200		0.3794	
E4 Jamb				46.8000	0.0150		0.7020	
E5 Ground floor (normal)				52.3000	0.0300		1.5690	
E6 Intermediate floor within a dwelling				37.0000	0.0030		0.1110	
E16 Corner (normal)				25.0600	0.0450		1.1277	
R1 Head of roof window				1.5600	0.2400		0.3744	
R2 Sill of roof window				1.5600	0.2400		0.3744	
R3 Jamb of roof window				5.3600	0.2400		1.2864	
E10 Eaves (insulation at ceiling level)				39.5200	0.0640		2.5293	
E17 Corner (inverted - internal area greater than external area)				7.1400	-0.0940		-0.6712	
E15 Flat roof with parapet				7.9000	0.3000		2.3700	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								16.3120 (36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	127.6573 (37)

List of thermal bridges			Length	Psi-value	Total								
K1 Element			20.8800	0.2950	6.1596								
E1 Steel lintel with perforated steel base plate			18.9700	0.0200	0.3794								
E3 Sill			46.8000	0.0150	0.7020								
E4 Jamb			52.3000	0.0300	1.5690								
E5 Ground floor (normal)			37.0000	0.0030	0.1110								
E6 Intermediate floor within a dwelling			25.0600	0.0450	1.1277								
E16 Corner (normal)			1.5600	0.2400	0.3744								
R1 Head of roof window			1.5600	0.2400	0.3744								
R2 Sill of roof window			5.3600	0.2400	1.2864								
R3 Jamb of roof window			39.5200	0.0640	2.5293								
E10 Eaves (insulation at ceiling level)			7.1400	-0.0940	-0.6712								
E17 Corner (inverted - internal area greater than external area)			7.9000	0.3000	2.3700								
E15 Flat roof with parapet													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						16.3120 (36)							
Point Thermal bridges					(36a) =	0.0000							
Total fabric heat loss					(33) + (36) + (36a) =	127.6573 (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	
	81.8719	81.5584	81.2511	79.8079	79.5379	78.2810	78.2810	78.0482	78.7651	79.5379	80.0842	80.6552	(38)
Heat transfer coeff													
	209.5291	209.2157	208.9084	207.4652	207.1952	205.9382	205.9382	205.7055	206.4224	207.1952	207.7414	208.3125	(39)
Average = Sum(39)m / 12 =												207.4639	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1018	1.1002	1.0985	1.0909	1.0895	1.0829	1.0829	1.0817	1.0855	1.0895	1.0924	1.0954	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9891 (42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	31.3754	30.9018	30.2280	29.2189	28.3096	27.0577	26.1080	27.2693	27.8788	29.1192	30.4089	31.3505	(42b)
Hot water usage for other uses													
	45.2415	43.5964	41.9512	40.3061	38.6610	37.0158	37.0158	38.6610	40.3061	41.9512	43.5964	45.2415	(42c)
Average daily hot water use (litres/day)												70.2211	(43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	76.6169	74.4982	72.1792	69.5250	66.9705	64.0735	63.1238	65.9303	68.1849	71.0705	74.0053	76.5921	(44)	
Energy conte	112.7934	98.5761	103.1426	90.8171	86.2983	74.0989	69.7536	77.6012	79.0911	91.5815	100.0206	112.4811	(45)	
Energy content (annual)	Total = Sum(45)m = 1096.2555													
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month														
	95.8744	83.7897	87.6712	77.1945	73.3535	62.9841	59.2906	65.9610	67.2275	77.8443	85.0175	95.6089	(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	95.8744	83.7897	87.6712	77.1945	73.3535	62.9841	59.2906	65.9610	67.2275	77.8443	85.0175	95.6089	(64)	
	Total per year (kWh/year) = Sum(64)m = 931.8171												(64)	
12Total per year (kWh/year)													932	(64)
Electric shower(s)	59.5320	53.0435	57.9214	55.2737	56.3109	53.7151	55.5056	56.3109	55.2737	57.9214	56.8323	59.5320	(64a)	
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 677.1726												(64a)	
Heat gains from water heating, kWh/month	38.8516	34.2083	36.3982	33.1171	32.4161	29.1748	28.6991	30.5680	30.6253	33.9414	35.4624	38.7852	(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	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558	149.4558	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	187.7680	207.8860	187.7680	194.0269	187.7680	194.0269	187.7680	187.7680	194.0269	187.7680	194.0269	187.7680	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	361.6046	365.3569	355.9012	335.7710	310.3603	286.4779	270.5229	266.7706	276.2263	296.3565	321.7672	345.6496	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456	37.9456	(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)	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	(71)
Water heating gains (Table 5)	52.2199	50.9052	48.9223	45.9959	43.5700	40.5206	38.5740	41.0860	42.5351	45.6202	49.2534	52.1307	(72)
Total internal gains	669.4292	691.9848	660.4281	643.6306	609.5351	588.8621	564.7016	563.4613	580.6251	597.5814	632.8842	653.3850	(73)

6. Solar gains

[Jan]												Gains				
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		W					
Southeast				7.1400	36.7938		0.7200	0.7000	0.7700		91.7565	(77)				
Southwest				1.4400	36.7938		0.7200	0.7000	0.7700		18.5055	(79)				
Northwest				21.5600	11.2829		0.7200	0.7000	0.7700		84.9640	(81)				
Southeast				2.0900	26.0000		0.7200	0.7000	1.0000		24.6486	(82)				
Solar gains				219.8747	411.9570	659.5847	972.3419	1226.5296	1277.0065	1206.5545	1008.5753	766.9604	481.5020	270.2600	183.6557	(83)
Total gains				889.3038	1103.9418	1320.0128	1615.9725	1836.0647	1865.8686	1771.2561	1572.0365	1347.5855	1079.0834	903.1442	837.0407	(84)

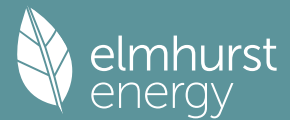
7. Mean internal temperature (heating season)

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	48.5145	48.5871	48.6586	48.9971	49.0609	49.3604	49.3604	49.4162	49.2446	49.0609	48.9319	48.7978	
alpha	4.2343	4.2391	4.2439	4.2665	4.2707	4.2907	4.2907	4.2944	4.2830	4.2707	4.2621	4.2532	
util living area	0.9977	0.9940	0.9832	0.9397	0.8293	0.6509	0.4971	0.5729	0.8325	0.9733	0.9951	0.9983	(86)
MIT	19.1805	19.4174	19.7930	20.3074	20.7176	20.9276	20.9820	20.9680	20.7885	20.2284	19.6116	19.1415	(87)
Th 2	19.9994	20.0007	20.0020	20.0082	20.0094	20.0148	20.0148	20.0158	20.0127	20.0094	20.0070	20.0046	(88)
util rest of house	0.9971	0.9924	0.9784	0.9223	0.7833	0.5694	0.3924	0.4629	0.7685	0.9626	0.9936	0.9978	(89)
MIT 2	18.3256	18.5625	18.9360	19.4397	19.8114	19.9779	20.0091	20.0046	19.8835	19.3731	18.7616	18.2905	(90)
Living area fraction	fLA = Living area / (4) = 0.1325												(91)
MIT	18.4388	18.6758	19.0495	19.5546	19.9315	20.1037	20.1380	20.1322	20.0034	19.4864	18.8742	18.4032	(92)
Temperature adjustment													0.0000
adjusted MIT	18.4388	18.6758	19.0495	19.5546	19.9315	20.1037	20.1380	20.1322	20.0034	19.4864	18.8742	18.4032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9957	0.9894	0.9722	0.9125	0.7793	0.5772	0.4059	0.4766	0.7678	0.9551	0.9909	0.9967	(94)
Useful gains	885.4848	1092.2107	1283.3816	1474.6273	1430.7580	1076.9752	719.0372	749.2227	1034.7310	1030.5829	894.9462	834.2441	(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	2962.4963	2882.1086	2621.6963	2210.4628	1705.5179	1133.4220	728.6098	767.7324	1218.5864	1841.2265	2445.9947	2958.7014	(97)
Space heating kWh	1545.2966	1202.8114	995.7062	529.8016	204.4214	0.0000	0.0000	0.0000	0.0000	603.1188	1116.7550	1580.5962	(98a)
Space heating requirement - total per year (kWh/year)	7778.5071												
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)

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Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1545.2966	1202.8114	995.7062	529.8016	204.4214	0.0000	0.0000	0.0000	0.0000	603.1188	1116.7550	1580.5962 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7778.5071
Space heating per m2												(98c) / (4) = 40.9029 (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	1935.8194	1523.9429	1563.3615	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8355	0.8967	0.8501	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1617.2989	1366.5327	1329.0789	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	2060.8284	1955.8056	1731.7574	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	319.3412	438.4191	299.5928	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	79.8353	109.6048	74.8982	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												264.3383 (107)
Energy for space heating												40.9029 (99)
Energy for space cooling												1.3900 (108)
Total												42.2929 (109)
Fabric Energy Efficiency (DFEE)												42.3 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	123.4700 (1b)	x 2.3800 (2b)	= 293.8586 (1b) - (3b)
First floor	66.7000 (1c)	x 2.3000 (2c)	= 153.4100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	190.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	447.2686 (5)

2. Ventilation rate

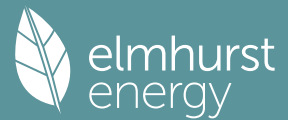
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0894 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3394 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3140 (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	0.4003	0.3925	0.3846	0.3454	0.3375	0.2983	0.2983	0.2904	0.3140	0.3375	0.3532	0.3689 (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	0.5801	0.5770	0.5740	0.5596	0.5570	0.5445	0.5445	0.5422	0.5493	0.5570	0.5624	0.5681 (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			4.0100	1.0000	4.0100		(26a)
TER Opening Type (Uw = 1.20)			30.1400	1.1450	34.5115		(27)
Opening			2.0900	1.5918	3.3268		(27a)
ground floor			123.4700	0.1300	16.0511		(28a)
brickwork	148.8800	29.1500	119.7300	0.1800	21.5514		(29a)
timber	53.9800	5.0000	48.9800	0.1800	8.8164		(29a)
flat ceil line	83.4100		83.4100	0.1100	9.1751		(30)
raking	37.6200	2.0900	35.5300	0.1100	3.9083		(30)
flat roof	8.6400		8.6400	0.1100	0.9504		(30)

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Total net area of external elements Aum(A, m2) 456.0000 (31)
Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 102.3009 (33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 192.4315 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	20.8800	0.0500	1.0440
E3 Sill	18.9700	0.0500	0.9485
E4 Jamb	46.8000	0.0500	2.3400
E5 Ground floor (normal)	52.3000	0.1600	8.3680
E6 Intermediate floor within a dwelling	37.0000	0.0000	0.0000
E16 Corner (normal)	25.0600	0.0900	2.2554
R1 Head of roof window	1.5600	0.0800	0.1248
R2 Sill of roof window	1.5600	0.0600	0.0936
R3 Jamb of roof window	5.3600	0.0800	0.4288
E10 Eaves (insulation at ceiling level)	39.5200	0.0600	2.3712
E17 Corner (inverted - internal area greater than external area)	7.1400	-0.0900	-0.6426
E15 Flat roof with parapet	7.9000	0.5600	4.4240

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.7557 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 124.0566 (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 85.6259 85.1667 84.7166 82.6022 82.2066 80.3651 80.3651 80.0241 81.0744 82.2066 83.0069 83.8435 (38)
Average = Sum(39)m / 12 = 209.6826 209.2233 208.7732 206.6589 206.2633 204.4218 204.4218 204.0807 205.1311 206.2633 207.0635 207.9002 (39)
206.6570

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
HLP (average) 1.1026 1.1002 1.0978 1.0867 1.0846 1.0749 1.0749 1.0731 1.0787 1.0846 1.0888 1.0932 (40)
Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9891 (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 32.0908 31.6142 30.9430 29.7056 28.7790 27.7515 27.1965 27.8630 28.5886 29.6880 30.9510 31.9823 (42b)
Hot water usage for other uses 45.2415 43.5964 41.9512 40.3061 38.6610 37.0158 37.0158 38.6610 40.3061 41.9512 43.5964 45.2415 (42c)
Average daily hot water use (litres/day) 70.8819 (43)
Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Energy conte 77.3323 75.2106 72.8943 70.0117 67.4399 64.7673 64.2124 66.5240 68.8947 71.6393 74.5474 77.2238 (44)
Energy content (annual) 122.4755 107.0989 112.0358 95.8425 90.7871 79.6390 77.6593 82.3705 84.9541 97.2139 106.2064 120.9139 (45)
Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1177.1969
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 104.1042 91.0340 95.2304 81.4661 77.1690 67.6931 66.0104 70.0150 72.2110 82.6318 90.2755 102.7768 (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 (63d)
Output from w/h 104.1042 91.0340 95.2304 81.4661 77.1690 67.6931 66.0104 70.0150 72.2110 82.6318 90.2755 102.7768 (64)
Total per year (kWh/year) = Sum(64)m = 1000.6174 (64)
1001 (64)
12Total per year (kWh/year)
Electric shower(s) 59.5320 53.0435 57.9214 55.2737 56.3109 53.7151 55.5056 56.3109 55.2737 57.9214 56.8323 59.5320 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 677.1726 (64a)
Heat gains from water heating, kWh/month 40.9090 36.0194 38.2880 34.1850 33.3700 30.3521 30.3790 31.5815 31.8712 35.1383 36.7769 40.5772 (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 5 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 149.4558 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 187.7680 207.8860 187.7680 194.0269 187.7680 194.0269 187.7680 187.7680 194.0269 187.7680 194.0269 187.7680 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 361.6046 365.3569 355.9012 335.7710 310.3603 286.4779 270.5229 266.7706 276.2263 296.3565 321.7672 345.6496 (68)
Pumps, fans 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 37.9456 (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) -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 -119.5647 (71)
Total internal gains 54.9853 53.6003 51.4623 47.4791 44.8521 42.1557 40.8320 42.4482 44.2655 47.2289 51.0791 54.5392 (72)
672.1946 694.6799 662.9682 645.1138 610.8172 590.4972 566.9596 564.8235 582.3555 599.1901 634.7099 655.7936 (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
Southeast	7.1400	36.7938	0.6300	0.7000	0.7700	80.2870 (77)

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Southwest	1.4400	36.7938	0.6300	0.7000	0.7700	16.1923 (79)
Northwest	21.5600	11.2829	0.6300	0.7000	0.7700	74.3435 (81)
Southeast	2.0900	26.0000	0.6300	0.7000	1.0000	21.5675 (82)

Solar gains	192.3903	360.4624	577.1366	850.7992	1073.2134	1117.3807	1055.7351	882.5033	671.0904	421.3142	236.4775	160.6987 (83)
Total gains	864.5849	1055.1423	1240.1048	1495.9130	1684.0306	1707.8778	1622.6948	1447.3269	1253.4459	1020.5043	871.1874	816.4923 (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	48.4790	48.5854	48.6901	49.1883	49.2826	49.7266	49.7266	49.8097	49.5546	49.2826	49.0921	48.8946
alpha	4.2319	4.2390	4.2460	4.2792	4.2855	4.3151	4.3151	4.3206	4.3036	4.2855	4.2728	4.2596
util living area	0.9980	0.9950	0.9865	0.9522	0.8596	0.6911	0.5341	0.6096	0.8572	0.9778	0.9958	0.9984 (86)
MIT	19.1620	19.3842	19.7423	20.2478	20.6708	20.9103	20.9770	20.9604	20.7613	20.1977	19.5952	19.1312 (87)
Th 2	19.9987	20.0007	20.0026	20.0117	20.0134	20.0213	20.0213	20.0228	20.0183	20.0134	20.0100	20.0064 (88)
util rest of house	0.9974	0.9936	0.9826	0.9378	0.8181	0.6097	0.4244	0.4967	0.7983	0.9688	0.9944	0.9980 (89)
MIT 2	18.3067	18.5296	18.8867	19.3872	19.7777	19.9744	20.0139	20.0085	19.8688	19.3470	18.7476	18.2815 (90)
Living area fraction	18.4200	18.6428	19.0001	19.5012	19.8960	20.0984	20.1415	20.1346	19.9870	19.4597	18.8598	0.1325 (91)
MIT	18.4200	18.6428	19.0001	19.5012	19.8960	20.0984	20.1415	20.1346	19.9870	19.4597	18.8598	18.3940 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4200	18.6428	19.0001	19.5012	19.8960	20.0984	20.1415	20.1346	19.9870	19.4597	18.8598	18.3940 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9961	0.9909	0.9773	0.9285	0.8124	0.6166	0.4384	0.5105	0.7960	0.9619	0.9920	0.9970 (94)
Useful gains	861.2338	1045.5602	1211.9012	1388.9230	1368.0405	1053.1439	711.4609	738.7994	997.7865	981.6077	864.2312	814.0099 (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	2960.7096	2875.3085	2609.6766	2190.8344	1690.5263	1123.9960	723.9501	762.1577	1207.6136	1827.4262	2435.0352	2950.9442 (97)
Space heating kWh	1562.0100	1229.5909	1039.9449	577.3762	239.9295	0.0000	0.0000	0.0000	0.0000	629.2890	1130.9789	1589.8791 (98a)
Space heating requirement - total per year (kWh/year)												7998.9984
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	1562.0100	1229.5909	1039.9449	577.3762	239.9295	0.0000	0.0000	0.0000	0.0000	629.2890	1130.9789	1589.8791 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7998.9984
Space heating per m2												(98c) / (4) = 42.0624 (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	1921.5645	1512.7210	1551.0135	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8028	0.8725	0.8217	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1542.7280	1319.7915	1274.4984	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1879.8892	1785.5627	1588.9040	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	242.7561	346.5338	233.9177	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	60.6890	86.6334	58.4794	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												205.8019 (107)
Energy for space heating												42.0624 (99)
Energy for space cooling												1.0822 (108)
Total												43.1446 (109)
Fabric Energy Efficiency (TFEE)												43.1 (109)

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

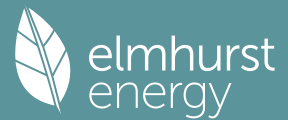
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	123.4700 (1b)	x 2.3800 (2b)	= 293.8586 (1b) - (3b)
First floor	66.7000 (1c)	x 2.3000 (2c)	= 153.4100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	190.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 447.2686 (5)

2. Ventilation rate

m3 per hour

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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	1 * 20 =	20.0000 (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) =	20.0000	Air changes per hour	0.0447 (8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50				3.8200 (17)
Infiltration rate				0.2357 (18)
Number of sides sheltered			1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =			0.2180 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Balanced mechanical ventilation with heat recovery	0.2780	0.2725	0.2671	0.2398	0.2344	0.2071	0.2071	0.2017	0.2180	0.2344	0.2453	0.2562	(22b)
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													35.0000 (23c)
Effective ac	0.6030	0.5975	0.5921	0.5648	0.5594	0.5321	0.5321	0.5267	0.5430	0.5594	0.5703	0.5812	(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 + pd (Uw = 1.30)			30.1400	1.2357	37.2452			(27)
pers door			4.0100	1.0000	4.0100			(26a)
Opening			2.0900	1.2357	2.5827			(27a)
ground floor			123.4700	0.1200	14.8164	75.0000	9260.2500	(28a)
brickwork	148.8800	29.1500	119.7300	0.2400	28.7352	150.0000	17959.5000	(29a)
timber	53.9800	5.0000	48.9800	0.1800	8.8164	9.0000	440.8200	(29a)
flat ceil line	83.4100		83.4100	0.1000	8.3410	9.0000	750.6900	(30)
raking	37.6200	2.0900	35.5300	0.1500	5.3295	9.0000	319.7700	(30)
flat roof	8.6400		8.6400	0.1700	1.4688	9.0000	77.7600	(30)
Total net area of external elements Aum(A, m2)			456.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	111.3452			(33)
blockw			75.0000			75.0000	5625.0000	(32c)
stud p			40.0000			9.0000	360.0000	(32c)
Internal Floor 1			66.7000			18.0000	1200.6000	(32d)
Internal Ceiling 1			66.7000			9.0000	600.3000	(32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	36594.6900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								192.4315 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	20.8800	0.2950	6.1596	
E3 Sill	18.9700	0.0200	0.3794	
E4 Jamb	46.8000	0.0150	0.7020	
E5 Ground floor (normal)	52.3000	0.0300	1.5690	
E6 Intermediate floor within a dwelling	37.0000	0.0030	0.1110	
E16 Corner (normal)	25.0600	0.0450	1.1277	
R1 Head of roof window	1.5600	0.2400	0.3744	
R2 Sill of roof window	1.5600	0.2400	0.3744	
R3 Jamb of roof window	5.3600	0.2400	1.2864	
E10 Eaves (insulation at ceiling level)	39.5200	0.0640	2.5293	
E17 Corner (inverted - internal area greater than external area)	7.1400	-0.0940	-0.6712	
E15 Flat roof with parapet	7.9000	0.3000	2.3700	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.3120	(36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	127.6573 (37)

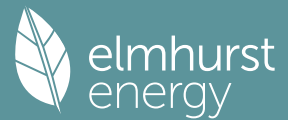
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	89.0016	88.1970	87.3925	83.3697	82.5652	78.5424	78.5424	77.7379	80.1515	82.5652	84.1743	85.7834	(38)
Average = Sum(39)m / 12 =	216.6589	215.8543	215.0498	211.0270	210.2225	206.1997	206.1997	205.3952	207.8088	210.2225	211.8316	213.4407	(39)
													210.8259
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1393	1.1351	1.1308	1.1097	1.1054	1.0843	1.0843	1.0801	1.0928	1.1054	1.1139	1.1224	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9891 (42)
Hot water usage for mixer showers													
Hot water usage for baths	72.4594	71.3500	69.7152	67.2002	64.9468	61.7943	59.3009	62.2159	63.6819	66.8043	70.0560	72.3941	(42a)
Hot water usage for other uses	31.3754	30.9018	30.2280	29.2189	28.3096	27.0577	26.1080	27.2693	27.8788	29.1192	30.4089	31.3505	(42b)
Average daily hot water use (litres/day)	45.2415	43.5964	41.9512	40.3061	38.6610	37.0158	37.0158	38.6610	40.3061	41.9512	43.5964	45.2415	(42c)
													137.0231 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	149.0763	145.8482	141.8944	136.7252	131.9173	125.8678	122.4247	128.1462	131.8669	137.8748	144.0613	148.9861	(44)
Energy content (annual)	219.4661	192.9867	202.7642	178.5973	169.9888	145.5620	135.2829	150.8304	152.9590	177.6656	194.7036	218.7970	(45)
Distribution loss (46)m = 0.15 x (45)m	32.9199	28.9480	30.4146	26.7896	25.4983	21.8343	20.2924	22.6246	22.9438	26.6498	29.2055	32.8196	(46)

Full SAP Calculation Printout



Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7614	(55)
Total storage loss													
23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034	22.8420	(56)
If cylinder contains dedicated solar storage													
23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034	22.8420	(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													
266.3319	235.3171	249.6300	223.9513	216.8546	190.9160	182.1487	197.6962	198.3130	224.5314	240.0576	265.6628	265.6628	(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	(64)
Output from w/h													
266.3319	235.3171	249.6300	223.9513	216.8546	190.9160	182.1487	197.6962	198.3130	224.5314	240.0576	265.6628	265.6628	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
110.4651	98.0324	104.9117	95.6668	94.0139	84.6826	82.4742	87.6437	87.1421	96.5665	101.0221	110.2427	110.2427	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
53.8725	47.8491	38.9135	29.4600	22.0217	18.5916	20.0889	26.1124	35.0479	44.5014	51.9397	55.3698	55.3698	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
539.7083	545.3088	531.1958	501.1508	463.2244	427.5789	403.7656	398.1651	412.2781	442.3231	480.2495	515.8950	515.8950	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	(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)													
-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	(71)
Water heating gains (Table 5)													
148.4746	145.8815	141.0104	132.8706	126.3628	117.6147	110.8524	117.8007	121.0306	129.7936	140.3085	148.1756	148.1756	(72)
Total internal gains													
857.7616	854.7456	826.8258	779.1875	727.3150	679.4914	650.4131	657.7843	684.0628	732.3243	788.2039	835.1465	835.1465	(73)

6. Solar gains

[Jan]													
	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
Southeast	7.1400	36.7938	0.7200	0.7000	0.7700	91.7565	(77)						
Southwest	1.4400	36.7938	0.7200	0.7000	0.7700	18.5055	(79)						
Northwest	21.5600	11.2829	0.7200	0.7000	0.7700	84.9640	(81)						
Southeast	2.0900	26.0000	0.7200	0.7000	1.0000	24.6486	(82)						
Solar gains	219.8747	411.9570	659.5847	972.3419	1226.5296	1277.0065	1206.5545	1008.5753	766.9604	481.5020	270.2600	183.6557	(83)
Total gains	1077.6363	1266.7026	1486.4104	1751.5294	1953.8446	1956.4979	1856.9675	1666.3595	1451.0233	1213.8263	1058.4639	1018.8022	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	46.9180	47.0928	47.2690	48.1701	48.3545	49.2978	49.2978	49.4909	48.9161	48.3545	47.9871	47.6254		
alpha	4.1279	4.1395	4.1513	4.2113	4.2236	4.2865	4.2865	4.2994	4.2611	4.2236	4.1991	4.1750		
util living area	0.9953	0.9902	0.9753	0.9253	0.8088	0.6281	0.4767	0.5445	0.8051	0.9612	0.9912	0.9963	(86)	
Living	19.6063	19.7736	20.0595	20.4402	20.7312	20.8803	20.9163	20.9084	20.7884	20.3945	19.9389	19.5890		
Non living	18.3281	18.5441	18.9089	19.3927	19.7290	19.8905	19.9165	19.9162	19.8073	19.3489	18.7691	18.3163		
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0		
24 / 9	8	0	0	0	0	0	0	0	0	0	0	0		
16 / 9	23	22	0	0	0	0	0	0	0	0	0	31		
MIT	20.4143	20.1915	20.0595	20.4402	20.7312	20.8803	20.9163	20.9084	20.7884	20.3945	19.9389	20.2009	(87)	
Th 2	19.9689	19.9723	19.9757	19.9929	19.9964	20.0137	20.0137	20.0172	20.0068	19.9964	19.9895	19.9826	(88)	
util rest of house														
0.9940	0.9876	0.9685	0.9048	0.7601	0.5473	0.3754	0.4381	0.7368	0.9465	0.9885	0.9953	(89)		
MIT 2	19.4316	19.1709	18.9089	19.3927	19.7290	19.8905	19.9165	19.9162	19.8073	19.3489	18.7691	19.2471	(90)	
Living area fraction														
MIT	19.5617	19.3061	19.0613	19.5315	19.8618	20.0216	20.0490	20.0476	19.9372	19.4874	18.9240	19.3735	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.5617	19.3061	19.0613	19.5315	19.8618	20.0216	20.0490	20.0476	19.9372	19.4874	18.9240	19.3735	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9934	0.9855	0.9605	0.8933	0.7527	0.5479	0.3791	0.4415	0.7313	0.9367	0.9843	0.9945	(94)	
Useful gains	1070.5128	1248.2846	1427.7140	1564.6873	1470.6928	1072.0387	703.9602	735.7422	1061.0950	1136.9542	1041.8564	1013.2028	(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														
3306.5902	3109.6223	2701.3046	2243.5301	1715.7840	1117.9273	711.1756	749.2000	1213.0306	1868.3322	2504.6994	3238.6348	3238.6348	(97)	
Space heating kWh														
1663.6415	1250.8189	947.5514	488.7668	182.3479	0.0000	0.0000	0.0000	0.0000	544.1453	1053.2470	1655.7214	1655.7214	(98a)	
Space heating requirement - total per year (kWh/year)												7786.2401		
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	0.0000	(98b)	

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Solar heating contribution - total per year (kWh/year)													0.0000
Space heating kWh	1663.6415	1250.8189	947.5514	488.7668	182.3479	0.0000	0.0000	0.0000	0.0000	544.1453	1053.2470	1655.7214	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7786.2401	
Space heating per m2												40.9436	(99)
													(98c) / (4) =

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 %)													347.0975	(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	1663.6415	1250.8189	947.5514	488.7668	182.3479	0.0000	0.0000	0.0000	0.0000	544.1453	1053.2470	1655.7214	(98)	
Space heating efficiency (main heating system 1)	347.0975	347.0975	347.0975	347.0975	347.0975	0.0000	0.0000	0.0000	0.0000	347.0975	347.0975	347.0975	(210)	
Space heating fuel (main heating system)	479.3009	360.3652	272.9928	140.8154	52.5350	0.0000	0.0000	0.0000	0.0000	156.7701	303.4441	477.0190	(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	266.3319	235.3171	249.6300	223.9513	216.8546	190.9160	182.1487	197.6962	198.3130	224.5314	240.0576	265.6628	(64)	
Efficiency of water heater	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	(216)	
Fuel for water heating, kWh/month	161.3040	142.5199	151.1885	135.6362	131.3381	115.6283	110.3184	119.7348	120.1083	135.9876	145.3910	160.8988	(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	33.1362	29.9295	33.1362	32.0673	33.1362	32.0673	33.1362	33.1362	32.0673	33.1362	32.0673	33.1362	(231)	
Lighting	47.1543	37.8289	34.0607	24.9544	19.2755	15.7482	17.5837	22.8560	29.6877	38.9518	43.9960	48.4648	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1													2243.2426	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													165.1117	
Water heating fuel used													1630.0539	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.7150)														
mechanical ventilation fans (SFP = 0.7150)														
Total electricity for the above, kWh/year													390.1524	(230a)
Electricity for lighting (calculated in Appendix L)													390.1524	(231)
													380.5620	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													0.0000	(233)
Wind generation													0.0000	(234)
Hydro-electric generation (Appendix N)													0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)													0.0000	(235)
Appendix Q - special features														
Energy saved or generated													-0.0000	(236)
Energy used													0.0000	(237)
Total delivered energy for all uses													4644.0110	(238)

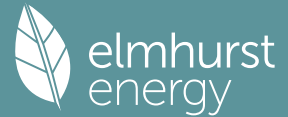
10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (high-rate cost)	1794.5941	17.5600	351.7404	(240)
Space heating - main system 1 (low-rate cost)	448.6485	0.0940	42.1730	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (electric off-peak tariff)				
High-rate fraction			0.7000	(243)
Low-rate fraction			0.3000	(244)
High-rate cost	1141.0378	19.6000	223.6434	(245)
Low-rate cost	489.0162	9.4000	45.9675	(246)
Energy for instantaneous electric shower(s)	0.0000	18.5800	0.0000	(247a)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	390.1524	18.5800	64.9292	(249)
Energy for lighting (0.90*19.60 + 0.10*9.40)	380.5620	18.5800	70.7084	(250)
Additional standing charges			7.0000	(251)
Total energy cost			806.1619	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.3600	(256)
Energy cost factor (ECF)			1.2341	(257)
SAP value		[(255) x (256)] / [(4) + 45.0] =	79.9956	

Full SAP Calculation Printout



SAP rating (Section 12)
SAP band

80 (258)
C

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1 (high-rate cost)	1794.5941	0.1635	293.4067 (261)
Space heating - main system 1 (low-rate cost)	448.6485	0.1373	61.5807 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating - high rate cost	1141.0378	0.1479	168.7930 (264)
Water heating - low rate cost	489.0162	0.1242	60.7140 (264)
Space and water heating			584.4944 (265)
Pumps, fans and electric keep-hot	390.1524	0.1432	54.1365 (267)
Energy for lighting	380.5620	0.1490	56.7113 (268)
Total CO ₂ , kg/year			695.3421 (272)
CO ₂ emissions per m ²			3.6600 (273)
EI value			96.0379
EI rating			96 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	123.4700 (1b)	x 2.3800 (2b)	= 293.8586 (1b) - (3b)
First floor	66.7000 (1c)	x 2.3000 (2c)	= 153.4100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	190.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 447.2686 (5)

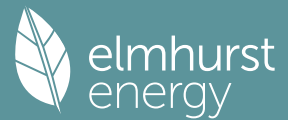
2. Ventilation rate

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	1 * 20 =	20.0000 (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) =	20.0000 / (5) =	0.0447 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.8200	(17)
Infiltration rate	0.2357	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2180 (21)
Wind speed	Jan 4.6000 Feb 4.4000 Mar 4.4000 Apr 4.1000 May 4.1000 Jun 3.7000 Jul 3.7000 Aug 3.5000 Sep 3.8000 Oct 4.2000 Nov 4.0000 Dec 4.3000	(22)
Wind factor	1.1500 1.1000 1.1000 1.0250 1.0250 0.9250 0.9250 0.8750 0.9500 1.0500 1.0000 1.0750	(22a)
Adj infilt rate	0.2507 0.2398 0.2398 0.2235 0.2235 0.2017 0.2017 0.1908 0.2071 0.2289 0.2180 0.2344	(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) =		35.0000 (23c)
Effective ac	0.5757 0.5648 0.5648 0.5485 0.5485 0.5267 0.5267 0.5158 0.5321 0.5539 0.5430 0.5594	(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 + pd (Uw = 1.30)			30.1400	1.2357	37.2452		(27)
pers door			4.0100	1.0000	4.0100		(26a)
Opening			2.0900	1.2357	2.5827		(27a)
ground floor			123.4700	0.1200	14.8164	75.0000	9260.2500 (28a)
brickwork	148.8800	29.1500	119.7300	0.2400	28.7352	150.0000	17959.5000 (29a)
timber	53.9800	5.0000	48.9800	0.1800	8.8164	9.0000	440.8200 (29a)
flat ceil line	83.4100		83.4100	0.1000	8.3410	9.0000	750.6900 (30)
raking	37.6200	2.0900	35.5300	0.1500	5.3295	9.0000	319.7700 (30)
flat roof	8.6400		8.6400	0.1700	1.4688	9.0000	77.7600 (30)
Total net area of external elements Aum(A, m ²)			456.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	111.3452		(33)
blockw			75.0000			75.0000	5625.0000 (32c)
stud p			40.0000			9.0000	360.0000 (32c)
Internal Floor 1			66.7000			18.0000	1200.6000 (32d)

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Internal Ceiling 1 66.7000 9.0000 600.3000 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 36594.6900 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 192.4315 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	20.8800	0.2950	6.1596
E3 Sill	18.9700	0.0200	0.3794
E4 Jamb	46.8000	0.0150	0.7020
E5 Ground floor (normal)	52.3000	0.0300	1.5690
E6 Intermediate floor within a dwelling	37.0000	0.0030	0.1110
E16 Corner (normal)	25.0600	0.0450	1.1277
R1 Head of roof window	1.5600	0.2400	0.3744
R2 Sill of roof window	1.5600	0.2400	0.3744
R3 Jamb of roof window	5.3600	0.2400	1.2864
E10 Eaves (insulation at ceiling level)	39.5200	0.0640	2.5293
E17 Corner (inverted - internal area greater than external area)	7.1400	-0.0940	-0.6712
E15 Flat roof with parapet	7.9000	0.3000	2.3700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.3120 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 127.6573 (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 84.9788 83.3697 83.3697 80.9561 80.9561 77.7379 77.7379 76.1288 78.5424 81.7606 80.1515 82.5652 (38)
Average = Sum(39)m / 12 = 212.6361 211.0270 211.0270 208.6134 208.6134 205.3952 205.3952 203.7861 206.1997 209.4179 207.8088 210.2225 (39)
208.3452

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1181	1.1097	1.1097	1.0970	1.0970	1.0801	1.0801	1.0716	1.0843	1.1012	1.0928	1.1054 (40)
HLP (average)												1.0956
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9891 (42)
Hot water usage for mixer showers 72.4594 71.3500 69.7152 67.2002 64.9468 61.7943 59.3009 62.2159 63.6819 66.8043 70.0560 72.3941 (42a)
Hot water usage for baths 31.3754 30.9018 30.2280 29.2189 28.3096 27.0577 26.1080 27.2693 27.8788 29.1192 30.4089 31.3505 (42b)
Hot water usage for other uses 45.2415 43.5964 41.9512 40.3061 38.6610 37.0158 37.0158 38.6610 40.3061 41.9512 43.5964 45.2415 (42c)
Average daily hot water use (litres/day) 137.0231 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	149.0763	145.8482	141.8944	136.7252	131.9173	125.8678	122.4247	128.1462	131.8669	137.8748	144.0613	148.9861 (44)
Energy content	219.4661	192.9867	202.7642	178.5973	169.9888	145.5620	135.2829	150.8304	152.9590	177.6656	194.7036	218.7970 (45)
Energy content (annual)										Total = Sum(45)m =		2139.6036
Distribution loss (46)m = 0.15 x (45)m	32.9199	28.9480	30.4146	26.7896	25.4983	21.8343	20.2924	22.6246	22.9438	26.6498	29.2055	32.8196 (46)

Water storage loss:
Store volume 250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.4100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7614 (55)
Total storage loss

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
If cylinder contains dedicated solar storage	23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034 (56)
Primary loss	23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034 (57)
Combi 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)
Total heat required for water heating calculated for each month	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)
WWHRS	266.3319	235.3171	249.6300	223.9513	216.8546	190.9160	182.1487	197.6962	198.3130	224.5314	240.0576	265.6628 (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 (63d)
Output from w/h	266.3319	235.3171	249.6300	223.9513	216.8546	190.9160	182.1487	197.6962	198.3130	224.5314	240.0576	265.6628 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	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)
	110.4651	98.0324	104.9117	95.6668	94.0139	84.6826	82.4742	87.6437	87.1421	96.5665	101.0221	110.2427 (65)

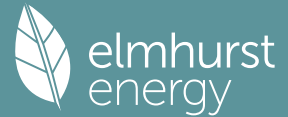
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.8725	47.8491	38.9135	29.4600	22.0217	18.5916	20.0889	26.1124	35.0479	44.5014	51.9397	55.3698 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	539.7083	545.3088	531.1958	501.1508	463.2244	427.5789	403.7656	398.1651	412.2781	442.3231	480.2495	515.8950 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238 (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)	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647 (71)
Water heating gains (Table 5)	148.4746	145.8815	141.0104	132.8706	126.3628	117.6147	110.8524	117.8007	121.0306	129.7936	140.3085	148.1756 (72)
Total internal gains	857.7616	854.7456	826.8258	779.1875	727.3150	679.4914	650.4131	657.7843	684.0628	732.3243	788.2039	835.1465 (73)

6. Solar gains

[Jan]	Area m ²	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		
Southeast			7.1400	43.0593		0.7200		0.7000		0.7700		107.3813 (77)
Southwest			1.4400	43.0593		0.7200		0.7000		0.7700		21.6567 (79)
Northwest			21.5600	13.7804		0.7200		0.7000		0.7700		103.7707 (81)
Southeast			2.0900	32.0000		0.7200		0.7000		1.0000		30.3368 (82)

Solar gains	263.1456	432.5820	684.4632	1038.2348	1270.4416	1399.3769	1308.9641	1120.8947	851.7451	536.6546	311.0256	220.8218 (83)
Total gains	1120.9071	1287.3275	1511.2890	1817.4223	1997.7566	2078.8682	1959.3772	1778.6790	1535.8080	1268.9789	1099.2295	1055.9683 (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	47.8056	48.1701	48.1701	48.7274	48.7274	49.4909	49.4909	49.8817	49.2978	48.5402	48.9161	48.3545
alpha	4.1870	4.2113	4.2113	4.2485	4.2485	4.2994	4.2994	4.3254	4.2865	4.2360	4.2611	4.2236
util living area	0.9940	0.9885	0.9701	0.9029	0.7636	0.5330	0.3838	0.4286	0.7448	0.9475	0.9884	0.9952 (86)
Living	19.7020	19.8624	20.1504	20.5307	20.7868	20.9060	20.9239	20.9222	20.8357	20.4720	20.0384	19.6866
Non living	18.4633	18.6727	19.0366	19.5088	19.7927	19.9128	19.9237	19.9304	19.8570	19.4459	18.9088	18.4515
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	7	0	0	0	0	0	0	0	0	0	0	0
16 / 9	24	18	0	0	0	0	0	0	0	0	0	31
MIT	20.4308	20.1795	20.1504	20.5307	20.7868	20.9060	20.9239	20.9222	20.8357	20.4720	20.0384	20.2561 (87)
Th 2	19.9860	19.9929	19.9929	20.0033	20.0033	20.0172	20.0172	20.0241	20.0137	19.9998	20.0068	19.9964 (88)
util rest of house	0.9924	0.9854	0.9618	0.8767	0.7065	0.4476	0.2839	0.3219	0.6648	0.9277	0.9847	0.9939 (89)
MIT 2	19.4657	19.1468	19.0366	19.5088	19.7927	19.9128	19.9237	19.9304	19.8570	19.4459	18.9088	19.3145 (90)
Living area fraction									fLA = Living area / (4) =			0.1325 (91)
MIT	19.5935	19.2836	19.1841	19.6442	19.9244	20.0444	20.0562	20.0618	19.9866	19.5818	19.0584	19.4392 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5935	19.2836	19.1841	19.6442	19.9244	20.0444	20.0562	20.0618	19.9866	19.5818	19.0584	19.4392 (93)

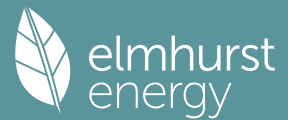
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9916	0.9826	0.9531	0.8656	0.7015	0.4500	0.2879	0.3261	0.6623	0.9170	0.9797	0.9930 (94)
Useful gains	1111.5055	1264.9731	1440.3822	1573.1162	1401.5196	935.5083	564.1678	580.0270	1017.2153	1163.6749	1076.8820	1048.5607 (95)
Ext temp.	4.7000	5.3000	7.0000	9.5000	12.4000	15.4000	17.3000	17.2000	14.6000	11.1000	7.6000	4.7000 (96)
Heat loss rate W	3166.9032	2950.9209	2571.1764	2116.2093	1569.6912	953.9306	566.1046	583.1866	1110.7233	1776.2431	2381.1591	3098.5174 (97)
Space heating kWh	1529.2159	1132.9569	841.3109	391.0270	125.1197	0.0000	0.0000	0.0000	0.0000	455.7508	939.0795	1525.1678 (98a)
Space heating requirement - total per year (kWh/year)												6939.6284
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	1529.2159	1132.9569	841.3109	391.0270	125.1197	0.0000	0.0000	0.0000	0.0000	455.7508	939.0795	1525.1678 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6939.6284
Space heating per m2										(98c) / (4) =		36.4917 (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 %)												345.9962 (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	1529.2159	1132.9569	841.3109	391.0270	125.1197	0.0000	0.0000	0.0000	0.0000	455.7508	939.0795	1525.1678 (98)
Space heating efficiency (main heating system 1)	345.9962	345.9962	345.9962	345.9962	345.9962	0.0000	0.0000	0.0000	0.0000	345.9962	345.9962	345.9962 (210)
Space heating fuel (main heating system)	441.9747	327.4478	243.1561	113.0148	36.1622	0.0000	0.0000	0.0000	0.0000	131.7213	271.4132	440.8048 (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	266.3319	235.3171	249.6300	223.9513	216.8546	190.9160	182.1487	197.6962	198.3130	224.5314	240.0576	265.6628 (64)
Efficiency of water heater	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938 (216)
Fuel for water heating, kWh/month	161.3216	142.5354	151.2050	135.6510	131.3524	115.6409	110.3305	119.7478	120.1214	136.0024	145.4068	160.9163 (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	33.1362	29.9295	33.1362	32.0673	33.1362	32.0673	33.1362	33.1362	32.0673	33.1362	32.0673	33.1362 (231)
Lighting	47.1543	37.8289	34.0607	24.9544	19.2755	15.7482	17.5837	22.8560	29.6877	38.9518	43.9960	48.4648 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											2005.6949	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											165.0938	
Water heating fuel used											1630.2315	(219)
Space cooling fuel											0.0000	(221)

Electricity for pumps and fans: (BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.7150)												
mechanical ventilation fans (SFP = 0.7150)											390.1524	(230a)
Total electricity for the above, kWh/year											390.1524	(231)
Electricity for lighting (calculated in Appendix L)											380.5620	(232)

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											0.0000	(233)
Wind generation											0.0000	(234)
Hydro-electric generation (Appendix N)											0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)											0.0000	(235)
Appendix Q - special features												
Energy saved or generated											-0.0000	(236)
Energy used											0.0000	(237)
Total delivered energy for all uses											4406.6408	(238)

10a. Fuel costs - using BEDF prices (542)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (high-rate cost)	1604.5559	26.7600	478.1577	(240)
Space heating - main system 1 (low-rate cost)	401.1390	0.1460	58.5663	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (electric off-peak tariff)				
High-rate fraction			0.7000	(243)
Low-rate fraction			0.3000	(244)
High-rate cost	1141.1621	29.8000	340.0663	(245)
Low-rate cost	489.0695	14.6000	71.4041	(246)
Energy for instantaneous electric shower(s)	0.0000	28.2800	0.0000	(247a)
Pumps, fans and electric keep-hot (0.90*29.80 + 0.10*14.60)	390.1524	28.2800	99.0675	(249)
Energy for lighting (0.90*29.80 + 0.10*14.60)	380.5620	28.2800	107.6229	(250)
Additional standing charges			4.0000	(251)
Total energy cost			1158.8848	(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 (high-rate cost)	1604.5559	0.1639	263.0214	(261)
Space heating - main system 1 (low-rate cost)	401.1390	0.1376	55.2027	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating - high rate cost	1141.1621	0.1479	168.8114	(264)
Water heating - low rate cost	489.0695	0.1242	60.7206	(264)
Space and water heating			547.7561	(265)
Pumps, fans and electric keep-hot	390.1524	0.1432	54.1365	(267)
Energy for lighting	380.5620	0.1490	56.7113	(268)
Total CO2, kg/year			658.6038	(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 (high-rate cost)	1604.5559	1.2888	2584.9119	(275)
Space heating - main system 1 (low-rate cost)	401.1390	1.4983	601.0181	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating - high rate cost	1141.1621	1.5530	1772.1875	(278)
Water heating - low rate cost	489.0695	1.4443	706.3686	(278)
Space and water heating			5664.4861	(279)
Pumps, fans and electric keep-hot	390.1524	1.5335	590.2831	(281)
Energy for lighting	380.5620	1.5547	591.6767	(282)
Total Primary energy kWh/year			6846.4460	(286)

SAP 10 EPC IMPROVEMENTS

65a Kiln ASHP AS BUILT KNA

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

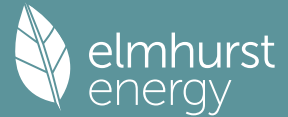
N Solar water heating Cancelled by user
U Solar photovoltaic panels Recommended
V2 Wind turbine Not applicable

Recommended measures:
U Solar photovoltaic panels SAP change + 5.6 Cost change -£ 342 CO2 change -245 kg (37.2%)

Recommended measures
Solar photovoltaic panels Typical annual savings £342 1.29 kg/m² B 86 A 97
Total Savings £342 1.29 kg/m²

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 97

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Fuel prices for cost data on this page from database revision number 542 TEST (30 Apr 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £1159	Potential £1159	Saving £0
Electricity			
Space heating	£640	£640	£0
Water heating	£411	£411	£0
Lighting	£108	£108	£0
Generated (PV)	-£0	-£342	£342
Total cost of fuels	£1159	£817	£342
Total cost of uses	£1159	£817	£342
Delivered energy	23 kWh/m²	13 kWh/m²	10 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.4 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	2 kg/m²	1 kg/m²
Primary energy	36 kWh/m²	26 kWh/m²	10 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	123.4700 (1b)	x	2.3800 (2b) = 293.8586 (1b) - (3b)
First floor	66.7000 (1c)	x	2.3000 (2c) = 153.4100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	190.1700		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 447.2686 (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	1 * 20 = 20.0000 (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) =	20.0000 / (5) = 0.0447 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.8200 (17)
Infiltration rate	0.2357 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2180 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Balanced mechanical ventilation with heat recovery	0.2780	0.2725	0.2671	0.2398	0.2344	0.2071	0.2071	0.2017	0.2180	0.2344	0.2453	0.2562 (22b)
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												35.0000 (23c)
Effective ac	0.6030	0.5975	0.5921	0.5648	0.5594	0.5321	0.5321	0.5267	0.5430	0.5594	0.5703	0.5812 (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 + pd (Uw = 1.30)			30.1400	1.2357	37.2452		(27)
pers door			4.0100	1.0000	4.0100		(26a)
Opening			2.0900	1.2357	2.5827		(27a)
ground floor			123.4700	0.1200	14.8164	75.0000	9260.2500 (28a)
brickwork	148.8800	29.1500	119.7300	0.2400	28.7352	150.0000	17959.5000 (29a)
timber	53.9800	5.0000	48.9800	0.1800	8.8164	9.0000	440.8200 (29a)
flat ceil line	83.4100		83.4100	0.1000	8.3410	9.0000	750.6900 (30)
raking	37.6200	2.0900	35.5300	0.1500	5.3295	9.0000	319.7700 (30)
flat roof	8.6400		8.6400	0.1700	1.4688	9.0000	77.7600 (30)
Total net area of external elements Aum(A, m2)			456.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		111.3452		(33)
blockw			75.0000			75.0000	5625.0000 (32c)
stud p			40.0000			9.0000	360.0000 (32c)
Internal Floor 1			66.7000			18.0000	1200.6000 (32d)
Internal Ceiling 1			66.7000			9.0000	600.3000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	36594.6900 (34)

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

192.4315 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	20.8800	0.2950	6.1596
E1 Steel lintel with perforated steel base plate	18.9700	0.0200	0.3794
E3 Sill	46.8000	0.0150	0.7020
E4 Jamb	52.3000	0.0300	1.5690
E5 Ground floor (normal)	37.0000	0.0030	0.1110
E6 Intermediate floor within a dwelling	25.0600	0.0450	1.1277
E16 Corner (normal)	1.5600	0.2400	0.3744
R1 Head of roof window	1.5600	0.2400	0.3744
R2 Sill of roof window	5.3600	0.2400	1.2864
R3 Jamb of roof window	39.5200	0.0640	2.5293
E10 Eaves (insulation at ceiling level)	7.1400	-0.0940	-0.6712
E17 Corner (inverted - internal area greater than external area)	7.9000	0.3000	2.3700
E15 Flat roof with parapet			

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

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 127.6573 (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	89.0016	88.1970	87.3925	83.3697	82.5652	78.5424	78.5424	77.7379	80.1515	82.5652	84.1743	85.7834	(38)
Heat transfer coeff	216.6589	215.8543	215.0498	211.0270	210.2225	206.1997	206.1997	205.3952	207.8088	210.2225	211.8316	213.4407	(39)
Average = Sum(39)m / 12 =												210.8259	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1393	1.1351	1.1308	1.1097	1.1054	1.0843	1.0843	1.0801	1.0928	1.1054	1.1139	1.1224	(40)
HLP (average)												1.1086	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9891 (42)
Hot water usage for mixer showers	72.4594	71.3500	69.7152	67.2002	64.9468	61.7943	59.3009	62.2159	63.6819	66.8043	70.0560	72.3941	(42a)
Hot water usage for baths	31.3754	30.9018	30.2280	29.2189	28.3096	27.0577	26.1080	27.2693	27.8788	29.1192	30.4089	31.3505	(42b)
Hot water usage for other uses	45.2415	43.5964	41.9512	40.3061	38.6610	37.0158	37.0158	38.6610	40.3061	41.9512	43.5964	45.2415	(42c)
Average daily hot water use (litres/day)												137.0231	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.0763	145.8482	141.8944	136.7252	131.9173	125.8678	122.4247	128.1462	131.8669	137.8748	144.0613	148.9861	(44)
Energy conte	219.4661	192.9867	202.7642	178.5973	169.9888	145.5620	135.2829	150.8304	152.9590	177.6656	194.7036	218.7970	(45)
Energy content (annual)										Total = Sum(45)m =		2139.6036	
Distribution loss (46)m = 0.15 x (45)m	32.9199	28.9480	30.4146	26.7896	25.4983	21.8343	20.2924	22.6246	22.9438	26.6498	29.2055	32.8196	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7614	(55)
Total storage loss	23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034	(56)
If cylinder contains dedicated solar storage	23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034	(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	266.3319	235.3171	249.6300	223.9513	216.8546	190.9160	182.1487	197.6962	198.3130	224.5314	240.0576	265.6628	(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	266.3319	235.3171	249.6300	223.9513	216.8546	190.9160	182.1487	197.6962	198.3130	224.5314	240.0576	265.6628	(64)
								Total per year (kWh/year) = Sum(64)m =				2691.4106	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	110.4651	98.0324	104.9117	95.6668	94.0139	84.6826	82.4742	87.6437	87.1421	96.5665	101.0221	110.2427	(65)

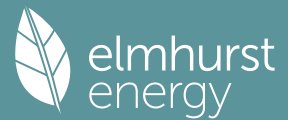
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.8725	47.8491	38.9135	29.4600	22.0217	18.5916	20.0889	26.1124	35.0479	44.5014	51.9397	55.3698	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	539.7083	545.3088	531.1958	501.1508	463.2244	427.5789	403.7656	398.1651	412.2781	442.3231	480.2495	515.8950	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	(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)	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	(71)
Water heating gains (Table 5)	148.4746	145.8815	141.0104	132.8706	126.3628	117.6147	110.8524	117.8007	121.0306	129.7936	140.3085	148.1756	(72)
Total internal gains	857.7616	854.7456	826.8258	779.1875	727.3150	679.4914	650.4131	657.7843	684.0628	732.3243	788.2039	835.1465	(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
Southeast	7.1400	36.7938	0.7200	0.7000	0.7700	91.7565 (77)

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Southwest			1.4400		36.7938		0.7200		0.7000		0.7700		18.5055 (79)
Northwest			21.5600		11.2829		0.7200		0.7000		0.7700		84.9640 (81)
Southeast			2.0900		26.0000		0.7200		0.7000		1.0000		24.6486 (82)

Solar gains	219.8747	411.9570	659.5847	972.3419	1226.5296	1277.0065	1206.5545	1008.5753	766.9604	481.5020	270.2600	183.6557 (83)
Total gains	1077.6363	1266.7026	1486.4104	1751.5294	1953.8446	1956.4979	1856.9675	1666.3595	1451.0233	1213.8263	1058.4639	1018.8022 (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	46.9180	47.0928	47.2690	48.1701	48.3545	49.2978	49.2978	49.4909	48.9161	48.3545	47.9871	47.6254
alpha	4.1279	4.1395	4.1513	4.2113	4.2236	4.2865	4.2865	4.2994	4.2611	4.2236	4.1991	4.1750
util living area												
	0.9953	0.9902	0.9753	0.9253	0.8088	0.6281	0.4767	0.5445	0.8051	0.9612	0.9912	0.9963 (86)
Living	19.6063	19.7736	20.0595	20.4402	20.7312	20.8803	20.9163	20.9084	20.7884	20.3945	19.9389	19.5890
Non living	18.3281	18.5441	18.9089	19.3927	19.7290	19.8905	19.9165	19.9162	19.8073	19.3489	18.7691	18.3163
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	8	0	0	0	0	0	0	0	0	0	0	0
16 / 9	23	22	0	0	0	0	0	0	0	0	0	31
MIT	20.4143	20.1915	20.0595	20.4402	20.7312	20.8803	20.9163	20.9084	20.7884	20.3945	19.9389	20.2009 (87)
Th 2	19.9689	19.9723	19.9757	19.9929	19.9964	20.0137	20.0137	20.0172	20.0068	19.9964	19.9895	19.9826 (88)
util rest of house												
	0.9940	0.9876	0.9685	0.9048	0.7601	0.5473	0.3754	0.4381	0.7368	0.9465	0.9885	0.9953 (89)
MIT 2	19.4316	19.1709	18.9089	19.3927	19.7290	19.8905	19.9165	19.9162	19.8073	19.3489	18.7691	19.2471 (90)
Living area fraction									fLA = Living area / (4) =			0.1325 (91)
MIT	19.5617	19.3061	19.0613	19.5315	19.8618	20.0216	20.0490	20.0476	19.9372	19.4874	18.9240	19.3735 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5617	19.3061	19.0613	19.5315	19.8618	20.0216	20.0490	20.0476	19.9372	19.4874	18.9240	19.3735 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9934	0.9855	0.9605	0.8933	0.7527	0.5479	0.3791	0.4415	0.7313	0.9367	0.9843	0.9945 (94)
Useful gains	1070.5128	1248.2846	1427.7140	1564.6873	1470.6928	1072.0387	703.9602	735.7422	1061.0950	1136.9542	1041.8564	1013.2028 (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												
	3306.5902	3109.6223	2701.3046	2243.5301	1715.7840	1117.9273	711.1756	749.2000	1213.0306	1868.3322	2504.6994	3238.6348 (97)
Space heating kWh												
	1663.6415	1250.8189	947.5514	488.7668	182.3479	0.0000	0.0000	0.0000	0.0000	544.1453	1053.2470	1655.7214 (98a)
Space heating requirement - total per year (kWh/year)												7786.2401
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												
	1663.6415	1250.8189	947.5514	488.7668	182.3479	0.0000	0.0000	0.0000	0.0000	544.1453	1053.2470	1655.7214 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7786.2401
Space heating per m2										(98c) / (4) =		40.9436 (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 %)												347.0975 (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												
	1663.6415	1250.8189	947.5514	488.7668	182.3479	0.0000	0.0000	0.0000	0.0000	544.1453	1053.2470	1655.7214 (98)
Space heating efficiency (main heating system 1)												
	347.0975	347.0975	347.0975	347.0975	347.0975	0.0000	0.0000	0.0000	0.0000	347.0975	347.0975	347.0975 (210)
Space heating fuel (main heating system)												
	479.3009	360.3652	272.9928	140.8154	52.5350	0.0000	0.0000	0.0000	0.0000	156.7701	303.4441	477.0190 (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												
	266.3319	235.3171	249.6300	223.9513	216.8546	190.9160	182.1487	197.6962	198.3130	224.5314	240.0576	265.6628 (64)
Efficiency of water heater (217)m												
	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117	165.1117 (216)
Fuel for water heating, kWh/month												
	161.3040	142.5199	151.1885	135.6362	131.3381	115.6283	110.3184	119.7348	120.1083	135.9876	145.3910	160.8988 (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												
	33.1362	29.9295	33.1362	32.0673	33.1362	32.0673	33.1362	33.1362	32.0673	33.1362	32.0673	33.1362 (231)
Lighting												
	47.1543	37.8289	34.0607	24.9544	19.2755	15.7482	17.5837	22.8560	29.6877	38.9518	43.9960	48.4648 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m												
	-40.0839	-60.9329	-93.1863	-109.8703	-121.0525	-111.9176	-110.2873	-101.7574	-86.6090	-70.8152	-45.1376	-34.1330 (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												
	-10.0026	-22.6471	-49.1600	-80.9017	-114.6303	-119.7961	-118.3642	-98.0166	-69.8541	-36.0307	-14.2722	-7.7808 (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												

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Space heating fuel - main system 1	2243.2426 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	165.1117
Water heating fuel used	1630.0539 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans: (BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.7150)	
mechanical ventilation fans (SFP = 0.7150)	390.1524 (230a)
Total electricity for the above, kWh/year	390.1524 (231)
Electricity for lighting (calculated in Appendix L)	380.5620 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1727.2394 (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	2916.7716 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	1794.5941	17.5600	351.7404 (240)
Space heating - main system 1 (low-rate cost)	448.6485	0.0940	42.1730 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			0.7000 (243)
High-rate fraction			0.3000 (244)
Low-rate fraction			223.6434 (245)
High-rate cost	1141.0378	19.6000	45.9675 (246)
Low-rate cost	489.0162	9.4000	0.0000 (247a)
Energy for instantaneous electric shower(s)	0.0000	18.5800	64.9292 (249)
Pumps, fans and electric keep-hot (0.90*19.60 + 0.10*9.40)	390.1524	18.5800	70.7084 (250)
Energy for lighting (0.90*19.60 + 0.10*9.40)	380.5620	18.5800	7.0000 (251)
Additional standing charges			
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-985.7830	18.5800	-183.1585
PV Unit electricity exported	-741.4564	5.5900	-41.4474
Total			-224.6059 (252)
Total energy cost			581.5560 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	0.8903 (257)
SAP value	85.5690
SAP rating (Section 12)	86 (258)
SAP band	B

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

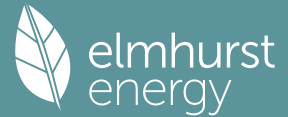
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1 (high-rate cost)	1794.5941	0.1635	293.4067 (261)
Space heating - main system 1 (low-rate cost)	448.6485	0.1373	61.5807 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	1141.0378	0.1479	168.7930 (264)
Water heating - low rate cost	489.0162	0.1242	60.7140 (264)
Space and water heating			584.4944 (265)
Pumps, fans and electric keep-hot	390.1524	0.1432	54.1365 (267)
Energy for lighting	380.5620	0.1490	56.7113 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-985.7830	0.1381	-136.1360
PV Unit electricity exported	-741.4564	0.1232	-91.3362
Total			-227.4722 (269)
Total CO2, kg/year			467.8699 (272)
CO2 emissions per m2			2.4600 (273)
EI value			97.3341
EI rating			97 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Built) (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	123.4700 (1b)	x	2.3800 (2b)	=	293.8586 (1b) - (3b)
First floor	66.7000 (1c)	x	2.3000 (2c)	=	153.4100 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	190.1700				(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	447.2686 (5)

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2. Ventilation rate

											m3 per hour		
Number of open chimneys											0 * 80 =	0.0000 (6a)	
Number of open flues											0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)	
Number of blocked chimneys											1 * 20 =	20.0000 (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) =											20.0000 / (5) =	0.0447 (8)	
Pressure test											Yes		
Pressure Test Method											Blower Door		
Measured/design AP50											3.8200 (17)		
Infiltration rate											0.2357 (18)		
Number of sides sheltered											1 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2180 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.6000	4.4000	4.4000	4.1000	4.1000	3.7000	3.7000	3.5000	3.8000	4.2000	4.0000	4.3000 (22)	
Wind factor	1.1500	1.1000	1.1000	1.0250	1.0250	0.9250	0.9250	0.8750	0.9500	1.0500	1.0000	1.0750 (22a)	
Adj infilt rate													
	0.2507	0.2398	0.2398	0.2235	0.2235	0.2017	0.2017	0.1908	0.2071	0.2289	0.2180	0.2344 (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) =													35.0000 (23c)
Effective ac	0.5757	0.5648	0.5648	0.5485	0.5485	0.5267	0.5267	0.5158	0.5321	0.5539	0.5430	0.5594 (25)	

3. Heat losses and heat loss parameter

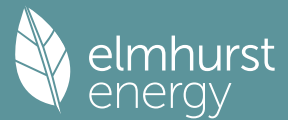
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
window + pd (Uw = 1.30)			30.1400	1.2357	37.2452			(27)
pers door			4.0100	1.0000	4.0100			(26a)
Opening			2.0900	1.2357	2.5827			(27a)
ground floor			123.4700	0.1200	14.8164	75.0000	9260.2500	(28a)
brickwork	148.8800	29.1500	119.7300	0.2400	28.7352	150.0000	17959.5000	(29a)
timber	53.9800	5.0000	48.9800	0.1800	8.8164	9.0000	440.8200	(29a)
flat ceil line	83.4100		83.4100	0.1000	8.3410	9.0000	750.6900	(30)
raking	37.6200	2.0900	35.5300	0.1500	5.3295	9.0000	319.7700	(30)
flat roof	8.6400		8.6400	0.1700	1.4688	9.0000	77.7600	(30)
Total net area of external elements Aum(A, m2)			456.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	111.3452			(33)
blockw			75.0000			75.0000	5625.0000	(32c)
stud p			40.0000			9.0000	360.0000	(32c)
Internal Floor 1			66.7000			18.0000	1200.6000	(32d)
Internal Ceiling 1			66.7000			9.0000	600.3000	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			36594.6900	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							192.4315	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E1 Steel lintel with perforated steel base plate				20.8800	0.2950		6.1596	
E3 Sill				18.9700	0.0200		0.3794	
E4 Jamb				46.8000	0.0150		0.7020	
E5 Ground floor (normal)				52.3000	0.0300		1.5690	
E6 Intermediate floor within a dwelling				37.0000	0.0030		0.1110	
E16 Corner (normal)				25.0600	0.0450		1.1277	
R1 Head of roof window				1.5600	0.2400		0.3744	
R2 Sill of roof window				1.5600	0.2400		0.3744	
R3 Jamb of roof window				5.3600	0.2400		1.2864	
E10 Eaves (insulation at ceiling level)				39.5200	0.0640		2.5293	
E17 Corner (inverted - internal area greater than external area)				7.1400	-0.0940		-0.6712	
E15 Flat roof with parapet				7.9000	0.3000		2.3700	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.3120	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	127.6573	(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	84.9788	83.3697	83.3697	80.9561	80.9561	77.7379	77.7379	76.1288	78.5424	81.7606	80.1515	82.5652 (38)
Average = Sum(39)m / 12 =	212.6361	211.0270	211.0270	208.6134	208.6134	205.3952	205.3952	203.7861	206.1997	209.4179	207.8088	210.2225 (39)
												208.3452
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1181	1.1097	1.1097	1.0970	1.0970	1.0801	1.0801	1.0716	1.0843	1.1012	1.0928	1.1054 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9891 (42)
Hot water usage for mixer showers												
	72.4594	71.3500	69.7152	67.2002	64.9468	61.7943	59.3009	62.2159	63.6819	66.8043	70.0560	72.3941 (42a)
Hot water usage for baths	31.3754	30.9018	30.2280	29.2189	28.3096	27.0577	26.1080	27.2693	27.8788	29.1192	30.4089	31.3505 (42b)
Hot water usage for other uses	45.2415	43.5964	41.9512	40.3061	38.6610	37.0158	37.0158	38.6610	40.3061	41.9512	43.5964	45.2415 (42c)
Average daily hot water use (litres/day)												137.0231 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.0763	145.8482	141.8944	136.7252	131.9173	125.8678	122.4247	128.1462	131.8669	137.8748	144.0613	148.9861	(44)
Energy content	219.4661	192.9867	202.7642	178.5973	169.9888	145.5620	135.2829	150.8304	152.9590	177.6656	194.7036	218.7970	(45)
Energy content (annual)	Total = Sum(45)m = 2139.6036												
Distribution loss (46)m = 0.15 x (45)m	32.9199	28.9480	30.4146	26.7896	25.4983	21.8343	20.2924	22.6246	22.9438	26.6498	29.2055	32.8196	(46)
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7614 (55)
Total storage loss	23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034	(56)
If cylinder contains dedicated solar storage	23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034	(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	266.3319	235.3171	249.6300	223.9513	216.8546	190.9160	182.1487	197.6962	198.3130	224.5314	240.0576	265.6628	(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	266.3319	235.3171	249.6300	223.9513	216.8546	190.9160	182.1487	197.6962	198.3130	224.5314	240.0576	265.6628	(64)
Total per year (kWh/year) = Sum(64)m = 2691.4106 (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	110.4651	98.0324	104.9117	95.6668	94.0139	84.6826	82.4742	87.6437	87.1421	96.5665	101.0221	110.2427	(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	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	179.3470	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.8725	47.8491	38.9135	29.4600	22.0217	18.5916	20.0889	26.1124	35.0479	44.5014	51.9397	55.3698	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	539.7083	545.3088	531.1958	501.1508	463.2244	427.5789	403.7656	398.1651	412.2781	442.3231	480.2495	515.8950	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	55.9238	(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)	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	-119.5647	(71)
Water heating gains (Table 5)	148.4746	145.8815	141.0104	132.8706	126.3628	117.6147	110.8524	117.8007	121.0306	129.7936	140.3085	148.1756	(72)
Total internal gains	857.7616	854.7456	826.8258	779.1875	727.3150	679.4914	650.4131	657.7843	684.0628	732.3243	788.2039	835.1465	(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			

Southeast				7.1400	43.0593	0.7200	0.7000	0.7700	107.3813 (77)			
Southwest				1.4400	43.0593	0.7200	0.7000	0.7700	21.6567 (79)			
Northwest				21.5600	13.7804	0.7200	0.7000	0.7700	103.7707 (81)			
Southeast				2.0900	32.0000	0.7200	0.7000	1.0000	30.3368 (82)			

Solar gains	263.1456	432.5820	684.4632	1038.2348	1270.4416	1399.3769	1308.9641	1120.8947	851.7451	536.6546	311.0256	220.8218 (83)
Total gains	1120.9071	1287.3275	1511.2890	1817.4223	1997.7566	2078.8682	1959.3772	1778.6790	1535.8080	1268.9789	1099.2295	1055.9683 (84)

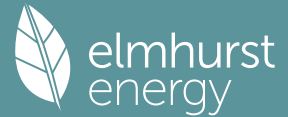
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	47.8056	48.1701	48.1701	48.7274	48.7274	49.4909	49.4909	49.8817	49.2978	48.5402	48.9161	48.3545	
alpha	4.1870	4.2113	4.2113	4.2485	4.2485	4.2994	4.2994	4.3254	4.2865	4.2360	4.2611	4.2236	
util living area	0.9940	0.9885	0.9701	0.9029	0.7636	0.5330	0.3838	0.4286	0.7448	0.9475	0.9884	0.9952	(86)
Living	19.7020	19.8624	20.1504	20.5307	20.7868	20.9060	20.9239	20.9222	20.8357	20.4720	20.0384	19.6866	
Non living	18.4633	18.6727	19.0366	19.5088	19.7927	19.9128	19.9237	19.9304	19.8570	19.4459	18.9088	18.4515	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	7	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	24	18	0	0	0	0	0	0	0	0	0	31	
MIT	20.4308	20.1795	20.1504	20.5307	20.7868	20.9060	20.9239	20.9222	20.8357	20.4720	20.0384	20.2561	(87)
Th 2	19.9860	19.9929	19.9929	20.0033	20.0033	20.0172	20.0172	20.0241	20.0137	19.9998	20.0068	19.9964	(88)
util rest of house	0.9924	0.9854	0.9618	0.8767	0.7065	0.4476	0.2839	0.3219	0.6648	0.9277	0.9847	0.9939	(89)
MIT 2	19.4657	19.1468	19.0366	19.5088	19.7927	19.9128	19.9237	19.9304	19.8570	19.4459	18.9088	19.3145	(90)
Living area fraction	19.5935	19.2836	19.1841	19.6442	19.9244	20.0444	20.0562	20.0618	19.9866	19.5818	19.0584	19.4392	(91)
MIT	19.5935	19.2836	19.1841	19.6442	19.9244	20.0444	20.0562	20.0618	19.9866	19.5818	19.0584	19.4392	(92)
Temperature adjustment	19.5935	19.2836	19.1841	19.6442	19.9244	20.0444	20.0562	20.0618	19.9866	19.5818	19.0584	19.4392	(93)
adjusted MIT	19.5935	19.2836	19.1841	19.6442	19.9244	20.0444	20.0562	20.0618	19.9866	19.5818	19.0584	19.4392	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9916	0.9826	0.9531	0.8656	0.7015	0.4500	0.2879	0.3261	0.6623	0.9170	0.9797	0.9930	(94)
Useful gains	1111.5055	1264.9731	1440.3822	1573.1162	1401.5196	935.5083	564.1678	580.0270	1017.2153	1163.6749	1076.8820	1048.5607	(95)
Ext temp.	4.7000	5.3000	7.0000	9.5000	12.4000	15.4000	17.3000	17.2000	14.6000	11.1000	7.6000	4.7000	(96)

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Heat loss rate W	3166.9032	2950.9209	2571.1764	2116.2093	1569.6912	953.9306	566.1046	583.1866	1110.7233	1776.2431	2381.1591	3098.5174 (97)
Space heating kWh	1529.2159	1132.9569	841.3109	391.0270	125.1197	0.0000	0.0000	0.0000	0.0000	455.7508	939.0795	1525.1678 (98a)
Space heating requirement - total per year (kWh/year)												6939.6284
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	1529.2159	1132.9569	841.3109	391.0270	125.1197	0.0000	0.0000	0.0000	0.0000	455.7508	939.0795	1525.1678 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6939.6284
Space heating per m2											(98c) / (4) =	36.4917 (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 %)												345.9962 (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	1529.2159	1132.9569	841.3109	391.0270	125.1197	0.0000	0.0000	0.0000	0.0000	455.7508	939.0795	1525.1678 (98)
Space heating efficiency (main heating system 1)	345.9962	345.9962	345.9962	345.9962	345.9962	0.0000	0.0000	0.0000	0.0000	345.9962	345.9962	345.9962 (210)
Space heating fuel (main heating system)	441.9747	327.4478	243.1561	113.0148	36.1622	0.0000	0.0000	0.0000	0.0000	131.7213	271.4132	440.8048 (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	266.3319	235.3171	249.6300	223.9513	216.8546	190.9160	182.1487	197.6962	198.3130	224.5314	240.0576	265.6628 (64)
Efficiency of water heater	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938	165.0938 (216)
Fuel for water heating, kWh/month	161.3216	142.5354	151.2050	135.6510	131.3524	115.6409	110.3305	119.7478	120.1214	136.0024	145.4068	160.9163 (219)
Space cooling fuel requirement	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	33.1362	29.9295	33.1362	32.0673	33.1362	32.0673	33.1362	33.1362	32.0673	33.1362	32.0673	33.1362 (231)
Lighting	47.1543	37.8289	34.0607	24.9544	19.2755	15.7482	17.5837	22.8560	29.6877	38.9518	43.9960	48.4648 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-46.6785	-62.8482	-94.5751	-112.9968	-121.9220	-117.6623	-115.2038	-108.1104	-92.4161	-76.1286	-50.4977	-40.0212 (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)	-13.1210	-24.4328	-51.7290	-88.2961	-119.3868	-133.5201	-130.0904	-111.2668	-79.4661	-42.1066	-17.6492	-10.2960 (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												2005.6949 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												165.0938
Water heating fuel used												1630.2315 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 0.7150)			
mechanical ventilation fans (SFP = 0.7150)			390.1524 (230a)
Total electricity for the above, kWh/year			390.1524 (231)
Electricity for lighting (calculated in Appendix L)			380.5620 (232)

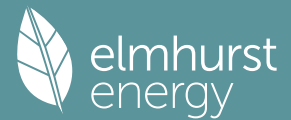
Energy saving/generation technologies (Appendices M, N and Q)

PV generation			-1860.4215 (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			2546.2193 (238)

10a. Fuel costs - using BEDF prices (542)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (high-rate cost)	1604.5559	26.7600	478.1577 (240)
Space heating - main system 1 (low-rate cost)	401.1390	0.1460	58.5663 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (electric off-peak tariff)			0.7000 (243)
High-rate fraction			0.3000 (244)
Low-rate fraction			340.0663 (245)
High-rate cost	1141.1621	29.8000	71.4041 (246)
Low-rate cost	489.0695	14.6000	0.0000 (247a)
Energy for instantaneous electric shower(s)	0.0000	28.2800	99.0675 (249)
Pumps, fans and electric keep-hot (0.90*29.80 + 0.10*14.60)	390.1524	28.2800	107.6229 (250)
Energy for lighting (0.90*29.80 + 0.10*14.60)	380.5620	28.2800	4.0000 (251)
Additional standing charges			
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1039.0606	28.2800	-293.8463
PV Unit electricity exported	-821.3609	5.8100	-47.7211

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Total	-341.5674 (252)
Total energy cost	817.3174 (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 (high-rate cost)	1604.5559	0.1639	263.0214 (261)
Space heating - main system 1 (low-rate cost)	401.1390	0.1376	55.2027 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	1141.1621	0.1479	168.8114 (264)
Water heating - low rate cost	489.0695	0.1242	60.7206 (264)
Space and water heating			547.7561 (265)
Pumps, fans and electric keep-hot	390.1524	0.1432	54.1365 (267)
Energy for lighting	380.5620	0.1490	56.7113 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1039.0606	0.1383	-143.6746
PV Unit electricity exported	-821.3609	0.1232	-101.2090
Total			-244.8836 (269)
Total CO2, kg/year			413.7202 (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 (high-rate cost)	1604.5559	1.2888	2584.9119 (275)
Space heating - main system 1 (low-rate cost)	401.1390	1.4983	601.0181 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	1141.1621	1.5530	1772.1875 (278)
Water heating - low rate cost	489.0695	1.4443	706.3686 (278)
Space and water heating			5664.4861 (279)
Pumps, fans and electric keep-hot	390.1524	1.5335	590.2831 (281)
Energy for lighting	380.5620	1.5547	591.6767 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1039.0606	1.5155	-1574.6858
PV Unit electricity exported	-821.3609	0.4521	-371.3343
Total			-1946.0202 (283)
Total Primary energy kWh/year			4900.4258 (286)