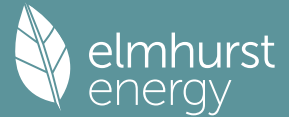


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Property Reference	CPG-7172-23 P5		Issued on Date	13/01/2024	
Assessment Reference	SEC1 - ASHP ROI TF 0.15 improv	Prop Type Ref	DS		
Property	Plot 5, Collygree Parc, South Road, Penzance, Cornwall, TR20 9LY				
SAP Rating	98 A	DER	-0.56	TER	10.92
Environmental	101 A	% DER < TER			105.13
CO ₂ Emissions (t/year)	-0.12	DFEE	30.34	TFEE	32.38
Compliance Check	See BREL	% DFEE < TFEE			6.29
% DPER < TPER	88.07	DPER	6.79	TPER	56.94
Assessor Details	Mr. Stuart Thomas			Assessor ID	V220-0003
Client	Cornwall Planning Group, CPG				

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

1. Overall dwelling characteristics

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

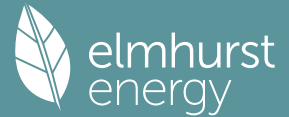
2. Ventilation rate

	m3 per hour											
Number of open chimneys	0 * 80 =											0.0000 (6a)
Number of open flues	0 * 20 =											0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)
Number of blocked chimneys	0 * 20 =											0.0000 (6f)
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)
Number of passive vents	0 * 10 =											0.0000 (7b)
Number of flueless gas fires	0 * 40 =											0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =											0.0000 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												1.0000 (17)
Infiltration rate												0.0500 (18)
Number of sides sheltered												2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.0425 (21)
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.0542	0.0531	0.0521	0.0468	0.0457	0.0404	0.0404	0.0393	0.0425	0.0457	0.0478	0.0499 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.1492	0.1481	0.1471	0.1417	0.1407	0.1354	0.1354	0.1343	0.1375	0.1407	0.1428	0.1449 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			11.9700	1.1450	13.7061		(27)
Door			2.1200	1.0000	2.1200		(26a)
Floor 1 P/a 0.3			40.0000	0.1200	4.8000	110.0000	4400.0000 (28a)
External Wall 1 Render	58.8800	14.0900	44.7900	0.1500	6.7185	9.0000	403.1100 (29a)
External Roof 1 Horz	40.0000		40.0000	0.0900	3.6000	9.0000	360.0000 (30)
Total net area of external elements Aum(A, m ²)			138.8800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	30.9446			(33)
Party Wall 1			70.8600	0.0000	0.0000	20.0000	1417.2000 (32)
Internal Wall 1 GF			34.1300			9.0000	307.1700 (32c)
Internal Wall 2 FF			60.2000			9.0000	541.8000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)
Internal Ceiling 1			40.0000			9.0000	360.0000 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				8509.2800 (34)

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

106.3660 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	4.9900	0.0300	0.1497
E5 Ground floor (normal)	11.8000	0.0210	0.2478
E10 Eaves (insulation at ceiling level)	10.0000	0.0440	0.4400
E12 Gable (insulation at ceiling level)	1.8000	0.0510	0.0918
E6 Intermediate floor within a dwelling	11.8000	0.0800	0.9440
P1 Party wall - Ground floor	14.2000	0.1490	2.1158
P2 Party wall - Intermediate floor within a dwelling	14.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	14.2000	0.4800	6.8160
E18 Party wall between dwellings	14.9700	0.0395	0.5913
E2 Other lintels (including other steel lintels)	9.4100	0.0840	0.7904
E3 Sill	8.4000	0.0430	0.3612
E4 Jamb	21.0000	0.0340	0.7140

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

Point Thermal bridges	(36a) =	13.2621 (36)
Total fabric heat loss	(33) + (36) + (36a) =	44.2067 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	9.8267	9.7567	9.6867	9.3368	9.2668	8.9169	8.9169	8.8469	9.0569	9.2668	9.4068	9.5467 (38)
Average = Sum(39)m / 12 =	54.0333	53.9634	53.8934	53.5435	53.4735	53.1235	53.1235	53.0536	53.2635	53.4735	53.6134	53.7534 (39)
HLP	0.6754	0.6745	0.6737	0.6693	0.6684	0.6640	0.6640	0.6632	0.6658	0.6684	0.6702	0.6719 (40)
HLP (average)												0.6691
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4629 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	75.5424	74.4205	72.8406	69.9276	67.7463	65.3277	64.0212	65.5901	67.2982	69.8863	72.8593	75.2870 (42b)
Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522 (42c)
Average daily hot water use (litres/day)												106.2689 (43)
Daily hot water use	115.3945	112.8235	109.7944	105.4322	101.8018	97.9340	96.6275	99.6456	102.8029	106.8401	111.2623	115.1391 (44)
Energy conte	182.7567	160.6591	168.7499	144.3314	137.0448	120.4213	116.8626	123.3820	126.7662	144.9810	158.5135	180.2801 (45)
Energy content (annual)												Total = Sum(45)m = 1764.7487
Distribution loss (46)m = 0.15 x (45)m	27.4135	24.0989	25.3125	21.6497	20.5567	18.0632	17.5294	18.5073	19.0149	21.7472	23.7770	27.0420 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (64)
Total per year (kWh/year)												2354.0047 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	100.8037	89.5817	96.1465	86.7358	85.6045	78.7857	78.8940	81.0616	80.8954	88.2433	91.4513	99.9802 (65)

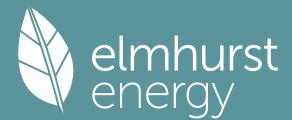
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0636	129.6061	117.0636	120.9657	117.0636	120.9657	117.0636	117.0636	120.9657	117.0636	120.9657	117.0636 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)
Water heating gains (Table 5)	135.4889	133.3061	129.2291	120.4664	115.0598	109.4245	106.0403	108.9538	112.3547	118.6066	127.0158	134.3821 (72)
Total internal gains	531.9359	544.5728	522.2150	505.1384	480.4092	464.1829	447.2142	447.8506	460.8919	475.4577	503.1895	521.1468 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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Northeast			4.4100		11.2829		0.7600		0.7000		0.7700		18.3445 (75)
Southwest			7.5600		36.7938		0.7600		0.7000		0.7700		102.5514 (79)

Solar gains	120.8959	212.0238	306.2851	406.6304	480.2215	487.6405	465.6048	409.0375	340.7732	238.6953	145.9151	102.7437	(83)
Total gains	652.8318	756.5965	828.5001	911.7688	960.6306	951.8234	912.8190	856.8881	801.6650	714.1530	649.1046	623.8905	(84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.7450	43.8017	43.8586	44.1452	44.2030	44.4942	44.4942	44.5529	44.3773	44.2030	44.0876	43.9728	
alpha	3.9163	3.9201	3.9239	3.9430	3.9469	3.9663	3.9663	3.9702	3.9585	3.9469	3.9392	3.9315	
util living area	0.9023	0.8478	0.7730	0.6450	0.4984	0.3533	0.2552	0.2834	0.4469	0.6883	0.8486	0.9139	(86)
Living	20.2357	20.4237	20.6126	20.7906	20.8811	20.9140	20.9204	20.9196	20.9016	20.7801	20.4954	20.1922	
Non living	19.4601	19.6906	19.9187	20.1293	20.2293	20.2662	20.2718	20.2720	20.2537	20.1224	19.7855	19.4090	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6090	20.4237	20.6126	20.7906	20.8811	20.9140	20.9204	20.9196	20.9016	20.7801	20.4954	20.3052	(87)
Th 2	20.3626	20.3634	20.3642	20.3680	20.3688	20.3727	20.3727	20.3735	20.3711	20.3688	20.3673	20.3657	(88)
util rest of house	0.8922	0.8338	0.7538	0.6196	0.4681	0.3197	0.2191	0.2453	0.4090	0.6588	0.8323	0.9047	(89)
MIT 2	20.0028	19.6906	19.9187	20.1293	20.2293	20.2662	20.2718	20.2720	20.2537	20.1224	19.7855	19.5814	(90)
Living area fraction									FLA = Living area / (4) =			0.4205	(91)
MIT	20.2577	19.9989	20.2105	20.4074	20.5034	20.5386	20.5445	20.5443	20.5262	20.3990	20.0840	19.8857	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2577	19.9989	20.2105	20.4074	20.5034	20.5386	20.5445	20.5443	20.5262	20.3990	20.0840	19.8857	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8904	0.8252	0.7490	0.6212	0.4746	0.3287	0.2290	0.2557	0.4184	0.6603	0.8244	0.8971	(94)
Useful gains	581.2820	624.3108	620.5274	566.3693	455.9350	312.8283	209.0758	219.1321	335.4266	471.5409	535.1378	559.7060	(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	862.2482	814.7859	738.9038	616.1439	470.7482	315.4814	209.5473	219.8708	342.2798	523.9847	696.1189	843.1615	(97)
Space heating kWh	209.0389	127.9993	88.0720	35.8377	11.0210	0.0000	0.0000	0.0000	0.0000	39.0182	115.9064	210.8909	(98a)
Space heating requirement - total per year (kWh/year)												837.7843	
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	209.0389	127.9993	88.0720	35.8377	11.0210	0.0000	0.0000	0.0000	0.0000	39.0182	115.9064	210.8909	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												837.7843	
Space heating per m2										(98c) / (4) =		10.4723	(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 %)													399.4914 (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	209.0389	127.9993	88.0720	35.8377	11.0210	0.0000	0.0000	0.0000	0.0000	39.0182	115.9064	210.8909	(98)
Space heating efficiency (main heating system 1)	399.4914	399.4914	399.4914	399.4914	399.4914	0.0000	0.0000	0.0000	0.0000	399.4914	399.4914	399.4914	(210)
Space heating fuel (main heating system)	52.3263	32.0406	22.0460	8.9708	2.7588	0.0000	0.0000	0.0000	0.0000	9.7670	29.0135	52.7898	(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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water heating requirement	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265	(64)
Efficiency of water heater (217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	(216)
Fuel for water heating, kWh/month	113.7512	100.5875	106.9072	94.1871	91.4156	82.5043	81.5543	84.7398	85.6045	95.2934	101.1167	112.5410	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.8300	10.6852	11.8300	11.4484	11.8300	11.4484	11.8300	11.8300	11.4484	11.8300	11.4484	11.8300	(231)
Lighting	22.6332	18.1572	16.3485	11.9776	9.2519	7.5588	8.4399	10.9704	14.2495	18.6961	21.1172	23.2622	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-41.4971	-61.1886	-91.9713	-106.3713	-116.8254	-109.5834	-108.1057	-101.1305	-87.8308	-70.9661	-46.2442	-35.4531	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-18.0129	-40.8295	-87.8094	-141.4112	-193.8147	-197.3280	-194.1408	-160.1991	-112.2678	-61.2049	-24.9063	-13.9513	(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													209.7128 (211)

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	204.6600	
Water heating fuel used	1150.2026	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)		
mechanical ventilation fans (SFP = 0.5720)	139.2889	(230a)
Total electricity for the above, kWh/year	139.2889	(231)
Electricity for lighting (calculated in Appendix L)	182.6625	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2223.0433	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	-541.1765	(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	209.7128	0.1573	32.9898 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1150.2026	0.1408	161.9882 (264)
Space and water heating			194.9780 (265)
Pumps, fans and electric keep-hot	139.2889	0.1387	19.3211 (267)
Energy for lighting	182.6625	0.1443	26.3638 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-977.1675	0.1339	-130.8627
PV Unit electricity exported	-1245.8758	0.1242	-154.7223
Total			-285.5850 (269)
Total CO2, kg/year			-44.9221 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-0.5600 (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	209.7128	1.5823	331.8306 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1150.2026	1.5208	1749.1725 (278)
Space and water heating			2081.0030 (279)
Pumps, fans and electric keep-hot	139.2889	1.5128	210.7162 (281)
Energy for lighting	182.6625	1.5338	280.1739 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-977.1675	1.4949	-1460.7814
PV Unit electricity exported	-1245.8758	0.4558	-567.8522
Total			-2028.6336 (283)
Total Primary energy kWh/year			543.2595 (286)
Dwelling Primary energy Rate (DPER)			6.7900 (287)

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

 1. Overall dwelling characteristics

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

 2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1503 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000 (17)	
Infiltration rate	0.4003 (18)	

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Number of sides sheltered

2 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.3403 \quad (21)$$

	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												
Effective ac	0.4338	0.4253	0.4168	0.3743	0.3658	0.3232	0.3232	0.3147	0.3403	0.3658	0.3828	0.3998 (22b)
	0.5941	0.5904	0.5869	0.5700	0.5669	0.5522	0.5522	0.5495	0.5579	0.5669	0.5733	0.5799 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Semi-glazed door			2.1200	1.0000	2.1200		(26a)
TER Opening Type (Uw = 1.20)			11.9700	1.1450	13.7061		(27)
Floor 1 P/s 0.3			40.0000	0.1300	5.2000		(28a)
External Wall 1 Render	58.8800	14.0900	44.7900	0.1800	8.0622		(29a)
External Roof 1 Horz	40.0000		40.0000	0.1100	4.4000		(30)
Total net area of external elements Aum(A, m2)			138.8800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 33.4883		(33)
Party Wall 1			70.8600	0.0000	0.0000		(32)

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

106.3660 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	4.9900	0.0900	0.4491
E5 Ground floor (normal)	11.8000	0.1600	1.8880
E10 Eaves (insulation at ceiling level)	10.0000	0.0600	0.6000
E12 Gable (insulation at ceiling level)	1.8000	0.0600	0.1080
E6 Intermediate floor within a dwelling	11.8000	0.0000	0.0000
P1 Party wall - Ground floor	14.2000	0.0800	1.1360
P2 Party wall - Intermediate floor within a dwelling	14.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	14.2000	0.1200	1.7040
E18 Party wall between dwellings	14.9700	0.0600	0.8982
E2 Other lintels (including other steel lintels)	9.4100	0.0500	0.4705
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	21.0000	0.0500	1.0500

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

Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	42.2121 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	39.1323	38.8916	38.6557	37.5476	37.3403	36.3751	36.3751	36.1964	36.7469	37.3403	37.7597	38.1982 (38)
Average = Sum(39)m / 12 =	81.3444	81.1038	80.8678	79.7597	79.5524	78.5872	78.5872	78.4085	78.9590	79.5524	79.9718	80.4103 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0168	1.0138	1.0108	0.9970	0.9944	0.9823	0.9823	0.9801	0.9870	0.9944	0.9996	1.0051 (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	2.4629 (42)											
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	75.5424	74.4205	72.8406	69.9276	67.7463	65.3277	64.0212	65.5901	67.2982	69.8863	72.8593	75.2870 (42b)
Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522 (42c)
Average daily hot water use (litres/day)												106.2689 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	115.3945	112.8235	109.7944	105.4322	101.8018	97.9340	96.6275	99.6456	102.8029	106.8401	111.2623	115.1391 (44)
Energy content (annual)	182.7567	160.6591	168.7499	144.3314	137.0448	120.4213	116.8626	123.3820	126.7662	144.9810	158.5135	180.2801 (45)
Distribution loss (46)m = 0.15 x (45)m	27.4135	24.0989	25.3125	21.6497	20.5567	18.0632	17.5294	18.5073	19.0149	21.7472	23.7770	27.0420 (46)

Water storage loss:

Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903 (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	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	237.6635	210.2523	223.6567	197.4670	191.9516	173.5569	171.7694	178.2888	179.9019	199.8878	211.6491	235.1869 (62)
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	237.6635	210.2523	223.6567	197.4670	191.9516	173.5569	171.7694	178.2888	179.9019	199.8878	211.6491	235.1869 (64)
Total per year (kWh/year)												2411.2319 (64)
Electric shower(s)												2411 (64)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	104.6920	93.0937	100.0348	90.4987	89.4928	82.5485	82.7823	84.9500	84.6583	92.1316	95.2142	103.8686 (65)
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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	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0636	129.6061	117.0636	120.9657	117.0636	120.9657	117.0636	117.0636	120.9657	117.0636	120.9657	117.0636	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)
Water heating gains (Table 5)	140.7151	138.5323	134.4553	125.6926	120.2861	114.6508	111.2665	114.1800	117.5809	123.8328	132.2420	139.6083	(72)
Total internal gains	540.1621	552.7990	530.4412	513.3646	488.6354	469.4091	452.4404	453.0769	466.1181	483.6839	511.4157	529.3730	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W				
Northeast	4.4100	11.2829	0.6300	0.6300	0.7000	0.7700	15.2066 (75)					
Southwest	7.5600	36.7938	0.6300	0.6300	0.7000	0.7700	85.0097 (79)					
Solar gains	100.2164	175.7565	253.8942	337.0752	398.0783	404.2283	385.9619	339.0705	282.4830	197.8658	120.9559	85.1691 (83)
Total gains	640.3785	728.5555	784.3355	850.4398	886.7137	873.6374	838.4023	792.1474	748.6011	681.5497	632.3716	614.5421 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													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	29.0578	29.1440	29.2290	29.6351	29.7124	30.0773	30.0773	30.1458	29.9356	29.7124	29.5565	29.3954	
alpha	2.9372	2.9429	2.9486	2.9757	2.9808	3.0052	3.0052	3.0097	2.9957	2.9808	2.9704	2.9597	
util living area	0.9388	0.9118	0.8729	0.7937	0.6775	0.5235	0.3950	0.4311	0.6214	0.8161	0.9097	0.9446 (86)	
MIT	19.0544	19.3501	19.7437	20.2494	20.6399	20.8814	20.9620	20.9500	20.7933	20.2980	19.6137	19.0126 (87)	
Th 2	20.0694	20.0719	20.0743	20.0858	20.0880	20.0981	20.0981	20.0999	20.0942	20.0880	20.0836	20.0791 (88)	
util rest of house	0.9304	0.9001	0.8558	0.7661	0.6348	0.4625	0.3201	0.3547	0.5621	0.7856	0.8958	0.9370 (89)	
MIT 2	17.8047	18.1752	18.6654	19.2869	19.7410	20.0047	20.0762	20.0695	19.9194	19.3592	18.5187	17.7584 (90)	
Living area fraction	fLA = Living area / (4) =												0.4205 (91)
MIT	18.3302	18.6692	19.1188	19.6916	20.1190	20.3733	20.4487	20.4398	20.2869	19.7539	18.9792	18.2858 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.3302	18.6692	19.1188	19.6916	20.1190	20.3733	20.4487	20.4398	20.2869	19.7539	18.9792	18.2858 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9104	0.8786	0.8352	0.7530	0.6363	0.4818	0.3498	0.3843	0.5754	0.7730	0.8754	0.9178 (94)	
Useful gains	582.9931	640.0764	655.0816	640.3448	564.2208	420.8875	293.2732	304.3925	430.7676	526.8542	553.6033	564.0351 (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	1141.2767	1116.7375	1020.4542	860.7388	669.7511	453.7111	302.4580	316.7515	488.5080	728.2170	949.9986	1132.6418 (97)	
Space heating kWh	415.3630	320.3163	271.8373	158.6837	78.5145	0.0000	0.0000	0.0000	0.0000	149.8139	285.4046	423.0434 (98a)	
Space heating requirement - total per year (kWh/year)													2102.9767
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	415.3630	320.3163	271.8373	158.6837	78.5145	0.0000	0.0000	0.0000	0.0000	149.8139	285.4046	423.0434 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)													2102.9767
Space heating per m2													(98c) / (4) = 26.2872 (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	415.3630	320.3163	271.8373	158.6837	78.5145	0.0000	0.0000	0.0000	0.0000	149.8139	285.4046	423.0434 (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)	450.0141	347.0382	294.5149	171.9217	85.0645	0.0000	0.0000	0.0000	0.0000	162.3119	309.2141	458.3353 (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	237.6635	210.2523	223.6567	197.4670	191.9516	173.5569	171.7694	178.2888	179.9019	199.8878	211.6491	235.1869 (64)	
Efficiency of water heater													79.8000 (216)

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(217)m	85.2988	85.0011	84.4984	83.5740	82.2190	79.8000	79.8000	79.8000	79.8000	83.4221	84.7309	85.3602	(217)
Fuel for water heating, kWh/month													
	278.6246	247.3526	264.6875	236.2781	233.4637	217.4898	215.2499	223.4195	225.4409	239.6100	249.7897	275.5228	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	24.3235	19.5132	17.5695	12.8722	9.9428	8.1234	9.0702	11.7898	15.3137	20.0924	22.6944	24.9995	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.2969	-52.5119	-75.3791	-84.6330	-91.1561	-85.0432	-83.9913	-79.3464	-71.1273	-59.9927	-40.9790	-32.2535	(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	-21.2710	-44.7299	-88.8765	-133.4482	-176.4177	-177.2501	-175.1642	-148.3248	-108.7361	-63.9544	-28.3952	-16.8217	(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												2278.4147	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2906.9293	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												196.3046	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1977.1002	(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												3490.5483	(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	2278.4147	0.2100	478.4671 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2906.9293	0.2100	610.4551 (264)
Space and water heating			1088.9222 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	196.3046	0.1443	28.3328 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-793.7104	0.1346	-106.8461
PV Unit electricity exported	-1183.3898	0.1259	-148.9938
Total			-255.8399 (269)
Total CO2, kg/year			873.3444 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9200 (273)

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

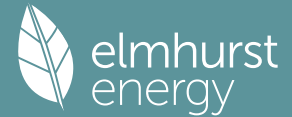
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2278.4147	1.1300	2574.6086 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2906.9293	1.1300	3284.8301 (278)
Space and water heating			5859.4386 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	196.3046	1.5338	301.0985 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-793.7104	1.4975	-1188.5970
PV Unit electricity exported	-1183.3898	0.4622	-546.9101
Total			-1735.5071 (283)
Total Primary energy kWh/year			4555.1308 (286)
Target Primary Energy Rate (TPER)			56.9400 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.0000 (1b)	x 2.3700 (2b)	= 94.8000 (1b) - (3b)
First floor	40.0000 (1c)	x 2.6200 (2c)	= 104.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 199.6000 (5)

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Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000	(61)
Total heat required for water heating calculated for each month	91.7409	80.2234	83.9218	71.7920	68.0054	59.6548	58.1716	61.7003	63.6353	72.8185	79.5545	90.5711	881.7897	(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	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	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	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	0.0000	(63d)
Output from w/h	91.7409	80.2234	83.9218	71.7920	68.0054	59.6548	58.1716	61.7003	63.6353	72.8185	79.5545	90.5711	881.7897	(64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =												882	(64)
Electric shower(s)	52.4656	46.7473	51.0463	48.7128	49.6269	47.3393	48.9172	49.6269	48.7128	51.0463	50.0864	52.4656	596.7935	(64a)
Heat gains from water heating, kWh/month	36.0516	31.7427	33.7420	30.1262	29.4081	26.7485	26.7722	27.8318	28.0870	30.9662	32.4102	35.7592		(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0636	129.6061	117.0636	120.9657	117.0636	120.9657	117.0636	117.0636	120.9657	117.0636	120.9657	117.0636	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)
Water heating gains (Table 5)	48.4565	47.2361	45.3522	41.8420	39.5270	37.1507	35.9841	37.4083	39.0098	41.6212	45.0142	48.0634	(72)
Total internal gains	444.9035	458.5028	438.3381	426.5140	404.8763	391.9091	377.1581	376.3052	387.5470	398.4723	421.1879	434.8282	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
Northeast	4.4100	11.2829	0.7600	0.7000	0.7700	18.3445 (75)							
Southwest	7.5600	36.7938	0.7600	0.7000	0.7700	102.5514 (79)							
Solar gains	120.8959	212.0238	306.2851	406.6304	480.2215	487.6405	465.6048	409.0375	340.7732	238.6953	145.9151	102.7437	(83)
Total gains	565.7995	670.5266	744.6232	833.1444	885.0978	879.5496	842.7629	785.3426	728.3201	637.1676	567.1030	537.5718	(84)

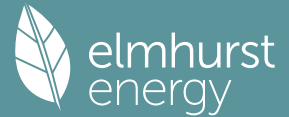
7. Mean internal temperature (heating season)

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	30.0370	30.0600	30.0826	30.1892	30.2092	30.3028	30.3028	30.3202	30.2667	30.2092	30.1688	30.1265		
alpha	3.0025	3.0040	3.0055	3.0126	3.0139	3.0202	3.0202	3.0213	3.0178	3.0139	3.0113	3.0084		
util living area	0.9530	0.9244	0.8820	0.7968	0.6733	0.5181	0.3908	0.4324	0.6294	0.8340	0.9275	0.9590	(86)	
MIT	18.9857	19.3199	19.7451	20.2616	20.6569	20.8866	20.9638	20.9503	20.7903	20.2647	19.5343	18.9117	(87)	
Th 2	20.0970	20.0976	20.0982	20.1011	20.1017	20.1042	20.1042	20.1047	20.1032	20.1017	20.1006	20.0994	(88)	
util rest of house	0.9464	0.9142	0.8661	0.7697	0.6309	0.4578	0.3169	0.3562	0.5705	0.8055	0.9160	0.9532	(89)	
MIT 2	18.2577	18.5843	18.9967	19.4873	19.8438	20.0346	20.0880	20.0811	19.9644	19.5021	18.8012	18.1868	(90)	
Living area fraction	18.5638	18.8936	19.3114	19.8129	20.1857	20.3929	20.4563	20.4466	20.3117	19.8227	19.1095	18.4917	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.5638	18.8936	19.3114	19.8129	20.1857	20.3929	20.4563	20.4466	20.3117	19.8227	19.1095	18.4917	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Useful gains	527.4499	601.9350	632.9155	633.3372	562.0768	420.2950	292.0443	303.1494	426.0400	506.8529	510.6485	505.2279	(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	1122.4559	1100.3505	1006.6343	854.4356	663.9534	451.8582	300.7976	315.4608	485.1037	721.6219	940.9285	1121.3042	(97)		
Space heating kWh	442.6845	334.9352	278.0468	159.1908	75.7962	0.0000	0.0000	0.0000	0.0000	159.7881	309.8016	458.3608	(98a)		
Space heating requirement - total per year (kWh/year)													2218.6040		
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	442.6845	334.9352	278.0468	159.1908	75.7962	0.0000	0.0000	0.0000	0.0000	159.7881	309.8016	458.3608	(98c)		
Space heating requirement after solar contribution - total per year (kWh/year)													2218.6040		
Space heating per m2													(98c) / (4) =	27.7326	(99)

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8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	733.2210	577.2166	592.4769	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8472	0.8965	0.8738	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	621.2030	517.4786	517.7325	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	978.3372	937.7884	873.0146	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	257.1367	312.7104	264.3299	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	64.2842	78.1776	66.0825	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												208.5443 (107)
Energy for space heating												27.7326 (99)
Energy for space cooling												2.6068 (108)
Total												30.3394 (109)
Fabric Energy Efficiency (DFEE)												30.3 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.0000 (1b)	x 2.3700 (2b)	= 94.8000 (1b) - (3b)
First floor	40.0000 (1c)	x 2.6200 (2c)	= 104.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 199.6000 (5)

2. Ventilation rate

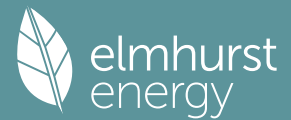
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	30.0000 / (5) = 0.1503 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4003 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3403 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4338	0.4253	0.4168	0.3743	0.3658	0.3232	0.3232	0.3147	0.3403	0.3658	0.3828	0.3998 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5941	0.5904	0.5869	0.5700	0.5669	0.5522	0.5522	0.5495	0.5579	0.5669	0.5733	0.5799 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Semi-glazed door			2.1200	1.0000	2.1200		(26a)
TER Opening Type (Uw = 1.20)			11.9700	1.1450	13.7061		(27)
Floor 1 P/a 0.3			40.0000	0.1300	5.2000		(28a)
External Wall 1 Render	58.8800	14.0900	44.7900	0.1800	8.0622		(29a)
External Roof 1 Horz	40.0000		40.0000	0.1100	4.4000		(30)
Total net area of external elements Aum(A, m2)			138.8800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	33.4883	(33)
Party Wall 1			70.8600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							106.3660 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				4.9900	0.0900	0.4491	
E5 Ground floor (normal)				11.8000	0.1600	1.8880	
E10 Eaves (insulation at ceiling level)				10.0000	0.0600	0.6000	
E12 Gable (insulation at ceiling level)				1.8000	0.0600	0.1080	
E6 Intermediate floor within a dwelling				11.8000	0.0000	0.0000	
P1 Party wall - Ground floor				14.2000	0.0800	1.1360	

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P2 Party wall - Intermediate floor within a dwelling	14.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	14.2000	0.1200	1.7040
E18 Party wall between dwellings	14.9700	0.0600	0.8982
E2 Other lintels (including other steel lintels)	9.4100	0.0500	0.4705
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	21.0000	0.0500	1.0500

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 8.7238 (36)
 Total fabric heat loss (33) + (36) + (36a) = 42.2121 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	39.1323	38.8916	38.6557	37.5476	37.3403	36.3751	36.3751	36.1964	36.7469	37.3403	37.7597	38.1982 (38)
Average = Sum(39)m / 12 =	81.3444	81.1038	80.8678	79.7597	79.5524	78.5872	78.5872	78.4085	78.9590	79.5524	79.9718	80.4103 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0168	1.0138	1.0108	0.9970	0.9944	0.9823	0.9823	0.9801	0.9870	0.9944	0.9996	1.0051 (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													2.4629 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	28.2963	27.8761	27.2843	26.1931	25.3761	24.4701	23.9808	24.5684	25.2083	26.1777	27.2913	28.2006	28.2006 (42b)
Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522	39.8522 (42c)
Average daily hot water use (litres/day)													62.4644 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy cont	68.1485	66.2791	64.2381	61.6978	59.4316	57.0764	56.5871	58.6239	60.7129	63.1315	65.6943	68.0528 (44)	
Energy content (annual)	107.9305	94.3805	98.7316	84.4612	80.0063	70.1821	68.4372	72.5886	74.8651	85.6688	93.5935	106.5542 (45)	
Distribution loss (46)m = 0.15 x (45)m	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	91.7409	80.2234	83.9218	71.7920	68.0054	59.6548	58.1716	61.7003	63.6353	72.8185	79.5545	90.5711 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
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	91.7409	80.2234	83.9218	71.7920	68.0054	59.6548	58.1716	61.7003	63.6353	72.8185	79.5545	90.5711 (64)	
12Total per year (kWh/year)													881.7897 (64)
Electric shower(s)	52.4656	46.7473	51.0463	48.7128	49.6269	47.3393	48.9172	49.6269	48.7128	51.0463	50.0864	52.4656	52.4656 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													596.7935 (64a)
Heat gains from water heating, kWh/month	36.0516	31.7427	33.7420	30.1262	29.4081	26.7485	26.7722	27.8318	28.0870	30.9662	32.4102	35.7592	35.7592 (65)

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

Metabolic gains (Table 5), Watts													
(66)m	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0636	129.6061	117.0636	120.9657	117.0636	120.9657	117.0636	117.0636	120.9657	117.0636	120.9657	117.0636	117.0636 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	209.7582 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)
Water heating gains (Table 5)	48.4565	47.2361	45.3522	41.8420	39.5270	37.1507	35.9841	37.4083	39.0098	41.6212	45.0142	48.0634	48.0634 (72)
Total internal gains	444.9035	458.5028	438.3381	426.5140	404.8763	391.9091	377.1581	376.3052	387.5470	398.4723	421.1879	434.8282	434.8282 (73)

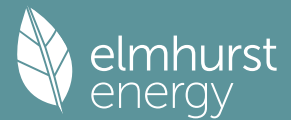
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	4.4100	11.2829	0.6300	0.7000	0.7700	15.2066 (75)						
Southwest	7.5600	36.7938	0.6300	0.7000	0.7700	85.0097 (79)						
Solar gains	100.2164	175.7565	253.8942	337.0752	398.0783	404.2283	385.9619	339.0705	282.4830	197.8658	120.9559	85.1691 (83)
Total gains	545.1199	634.2593	692.2323	763.5892	802.9546	796.1374	763.1200	715.3757	670.0300	596.3381	542.1439	519.9973 (84)

7. Mean internal temperature (heating season)

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

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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	29.0578	29.1440	29.2290	29.6351	29.7124	30.0773	30.0773	30.1458	29.9356	29.7124	29.5565	29.3954
alpha	2.9372	2.9429	2.9486	2.9757	2.9808	3.0052	3.0052	3.0097	2.9957	2.9808	2.9704	2.9597
util living area	0.9579	0.9348	0.9011	0.8283	0.7174	0.5622	0.4292	0.4702	0.6678	0.8555	0.9356	0.9627 (86)
MIT	18.8514	19.1666	19.5870	20.1396	20.5758	20.8560	20.9524	20.9367	20.7471	20.1788	19.4378	18.8065 (87)
Th 2	20.0694	20.0719	20.0743	20.1085	20.0880	20.0981	20.0981	20.0999	20.0942	20.0880	20.0836	20.0791 (88)
util rest of house	0.9518	0.9256	0.8868	0.8034	0.6759	0.4994	0.3493	0.3892	0.6088	0.8291	0.9250	0.9573 (89)
MIT 2	18.1067	18.4171	18.8286	19.3648	19.7655	20.0084	20.0764	20.0695	19.9245	19.4138	18.6960	18.0693 (90)
Living area fraction									FLA = Living area / (4) =			0.4205 (91)
MIT	18.4198	18.7322	19.1475	19.6906	20.1062	20.3648	20.4448	20.4341	20.2704	19.7355	19.0079	18.3793 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4198	18.7322	19.1475	19.6906	20.1062	20.3648	20.4448	20.4341	20.2704	19.7355	19.0079	18.3793 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9378	0.9093	0.8699	0.7913	0.6768	0.5187	0.3808	0.4202	0.6211	0.8174	0.9095	0.9443 (94)
Useful gains	511.2324	576.7201	602.1882	604.2589	543.4371	412.9813	290.5942	300.5806	416.1313	487.4314	493.0983	491.0084 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1148.5695	1121.8466	1022.7764	860.6547	668.7331	453.0417	302.1523	316.3097	487.2110	726.7482	952.3001	1140.1593 (97)
Space heating kWh	474.1788	366.3250	312.9176	184.6050	93.2203	0.0000	0.0000	0.0000	0.0000	178.0517	330.6253	482.9683 (98a)
Space heating requirement - total per year (kWh/year)												2422.8919
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	474.1788	366.3250	312.9176	184.6050	93.2203	0.0000	0.0000	0.0000	0.0000	178.0517	330.6253	482.9683 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2422.8919
Space heating per m2											(98c) / (4) =	30.2861 (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	738.7201	581.5456	595.9047	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8120	0.8692	0.8452	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	599.8380	505.4836	503.6294	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	880.8425	844.6992	791.2351	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	202.3232	252.3764	213.9787	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	50.5808	63.0941	53.4947	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												167.1696 (107)
Energy for space heating												30.2861 (99)
Energy for space cooling												2.0896 (108)
Total												32.3758 (109)
Fabric Energy Efficiency (TFEE)												32.4 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.0000 (1b)	x 2.3700 (2b)	= 94.8000 (1b) - (3b)
First floor	40.0000 (1c)	x 2.6200 (2c)	= 104.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	199.6000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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Measured/design AP50												1.0000 (17)
Infiltration rate												0.0500 (18)
Number of sides sheltered												2 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.0425 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	0.0542	0.0531	0.0521	0.0468	0.0457	0.0404	0.0404	0.0393	0.0425	0.0457	0.0478	0.0499 (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) =												81.0000 (23c)
Effective ac	0.1492	0.1481	0.1471	0.1417	0.1407	0.1354	0.1354	0.1343	0.1375	0.1407	0.1428	0.1449 (25)

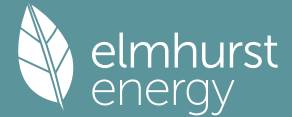
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (Uw = 1.20)			11.9700	1.1450	13.7061			(27)				
Door			2.1200	1.0000	2.1200			(26a)				
Floor 1 P/a 0.3			40.0000	0.1200	4.8000	110.0000	4400.0000	(28a)				
External Wall 1 Render	58.8800	14.0900	44.7900	0.1500	6.7185	9.0000	403.1100	(29a)				
External Roof 1 Horz	40.0000		40.0000	0.0900	3.6000	9.0000	360.0000	(30)				
Total net area of external elements Aum (A, m2)			138.8800					(31)				
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 30.9446			(33)				
Party Wall 1			70.8600	0.0000	0.0000	20.0000	1417.2000	(32)				
Internal Wall 1 GF			34.1300			9.0000	307.1700	(32c)				
Internal Wall 2 FF			60.2000			9.0000	541.8000	(32c)				
Internal Floor 1			40.0000			18.0000	720.0000	(32d)				
Internal Ceiling 1			40.0000			9.0000	360.0000	(32e)				
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 8509.2800	(34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							106.3660	(35)				
List of Thermal Bridges												
K1 Element				Length	Psi-value		Total					
E16 Corner (normal)				4.9900	0.0300		0.1497					
E5 Ground floor (normal)				11.8000	0.0210		0.2478					
E10 Eaves (insulation at ceiling level)				10.0000	0.0440		0.4400					
E12 Gable (insulation at ceiling level)				1.8000	0.0510		0.0918					
E6 Intermediate floor within a dwelling				11.8000	0.0800		0.9440					
P1 Party wall - Ground floor				14.2000	0.1490		2.1158					
P2 Party wall - Intermediate floor within a dwelling				14.2000	0.0000		0.0000					
P4 Party wall - Roof (insulation at ceiling level)				14.2000	0.4800		6.8160					
E18 Party wall between dwellings				14.9700	0.0395		0.5913					
E2 Other lintels (including other steel lintels)				9.4100	0.0840		0.7904					
E3 Sill				8.4000	0.0430		0.3612					
E4 Jamb				21.0000	0.0340		0.7140					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.2621	(36)				
Point Thermal bridges							(36a) = 0.0000					
Total fabric heat loss							(33) + (36) + (36a) = 44.2067	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	9.8267	9.7567	9.6867	9.3368	9.2668	8.9169	8.9169	8.8469	9.0569	9.2668	9.4068	9.5467 (38)
Average = Sum(39)m / 12 =	54.0333	53.9634	53.8934	53.5435	53.4735	53.1235	53.1235	53.0536	53.2635	53.4735	53.6134	53.7534 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6754	0.6745	0.6737	0.6693	0.6684	0.6640	0.6640	0.6632	0.6658	0.6684	0.6702	0.6719 (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												2.4629 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												75.2870 (42b)
Hot water usage for other uses												39.8522 (42c)
Average daily hot water use (litres/day)												106.2689 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	115.3945	112.8235	109.7944	105.4322	101.8018	97.9340	96.6275	99.6456	102.8029	106.8401	111.2623	115.1391 (44)
Energy content (annual)	182.7567	160.6591	168.7499	144.3314	137.0448	120.4213	116.8626	123.3820	126.7662	144.9810	158.5135	180.2801 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1764.7487
Water storage loss:	27.4135	24.0989	25.3125	21.6497	20.5567	18.0632	17.5294	18.5073	19.0149	21.7472	23.7770	27.0420 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)

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Output from w/h	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (64)
	Total per year (kWh/year) = Sum(64)m =											2354.0047 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	100.8037	89.5817	96.1465	86.7358	85.6045	78.7857	78.8940	81.0616	80.8954	88.2433	91.4513	99.9802 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.8578	22.9666	18.6777	14.1402	10.5700	8.9236	9.6423	12.5334	16.8223	21.3598	24.9301	26.5764 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.5232	330.9219	322.3573	304.1245	281.1088	259.4772	245.0260	241.6274	250.1919	268.4248	291.4405	313.0720 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)
Water heating gains (Table 5)	135.4889	133.3061	129.2291	120.4664	115.0598	109.4245	106.0403	108.9538	112.3547	118.6066	127.0158	134.3821 (72)
Total internal gains	590.3671	588.6919	571.7614	540.2283	508.2358	479.3226	462.2058	464.6119	480.8662	509.8884	544.8836	575.5277 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
Northeast	4.4100	11.2829	0.7600	0.7000	0.7700	18.3445 (75)						
Southwest	7.5600	36.7938	0.7600	0.7000	0.7700	102.5514 (79)						
Solar gains	120.8959	212.0238	306.2851	406.6304	480.2215	487.6405	465.6048	409.0375	340.7732	238.6953	145.9151	102.7437 (83)
Total gains	711.2630	800.7156	878.0465	946.8588	988.4573	966.9632	927.8107	873.6493	821.6393	748.5837	690.7987	678.2714 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	43.7450	43.8017	43.8586	44.1452	44.2030	44.4942	44.4942	44.5529	44.3773	44.2030	44.0876	43.9728
alpha	3.9163	3.9201	3.9239	3.9430	3.9469	3.9663	3.9663	3.9702	3.9585	3.9469	3.9392	3.9315
util living area	0.8791	0.8279	0.7481	0.6271	0.4859	0.3480	0.2511	0.2781	0.4369	0.6662	0.8266	0.8932 (86)
Living	20.3150	20.4707	20.6485	20.8030	20.8845	20.9145	20.9205	20.9198	20.9032	20.7958	20.5397	20.2703
Non living	19.5569	19.7468	19.9603	20.1428	20.2327	20.2666	20.2718	20.2721	20.2551	20.1393	19.8379	19.5049
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.6496	20.4707	20.6485	20.8030	20.8845	20.9145	20.9205	20.9198	20.9032	20.7958	20.5397	20.3724 (87)
Th 2	20.3626	20.3634	20.3642	20.3680	20.3688	20.3727	20.3727	20.3735	20.3711	20.3688	20.3673	20.3657 (88)
util rest of house	0.8674	0.8129	0.7282	0.6017	0.4561	0.3149	0.2156	0.2406	0.3996	0.6365	0.8090	0.8825 (89)
MIT 2	20.0414	19.7468	19.9603	20.1428	20.2327	20.2666	20.2718	20.2721	20.2551	20.1393	19.8379	19.6600 (90)
Living area fraction	FLA = Living area / (4) =											0.4205 (91)
MIT	20.2971	20.0512	20.2497	20.4204	20.5068	20.5390	20.5446	20.5445	20.5276	20.4153	20.1330	19.9596 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2971	20.0512	20.2497	20.4204	20.5068	20.5390	20.5446	20.5445	20.5276	20.4153	20.1330	19.9596 (93)

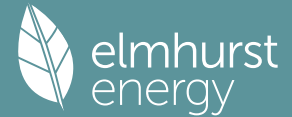
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.8661	0.8050	0.7244	0.6038	0.4627	0.3237	0.2254	0.2509	0.4090	0.6388	0.8021	0.8751 (94)	
Ext temp.	616.0337	644.5636	636.0861	571.7388	457.3701	312.9905	209.1073	219.1897	336.0318	478.1678	554.0705	593.5500 (95)	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Space heating kWh	864.3785	817.6087	741.0180	616.8439	470.9303	315.5019	209.5514	219.8784	342.3568	524.8593	698.7453	847.1306 (97)	
Space heating requirement - total per year (kWh/year)	184.7685	116.2863	78.0694	32.4757	10.0888	0.0000	0.0000	0.0000	0.0000	34.7384	104.1659	188.6639 (98a)	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Space heating contribution - total per year (kWh/year)	184.7685	116.2863	78.0694	32.4757	10.0888	0.0000	0.0000	0.0000	0.0000	34.7384	104.1659	188.6639 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												749.2570	
Space heating per m2												(98c) / (4) =	9.3657 (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 %)												399.4914 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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Space heating efficiency (main heating system 1)	184.7685	116.2863	78.0694	32.4757	10.0888	0.0000	0.0000	0.0000	0.0000	34.7384	104.1659	188.6639	(98)
Space heating fuel (main heating system)	399.4914	399.4914	399.4914	399.4914	399.4914	0.0000	0.0000	0.0000	0.0000	399.4914	399.4914	399.4914	(210)
Space heating efficiency (main heating system 2)	46.2509	29.1086	19.5422	8.1293	2.5254	0.0000	0.0000	0.0000	0.0000	8.6957	26.0746	47.2260	(211)
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	(212)
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	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265	(64)
Efficiency of water heater (217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	(216)
Fuel for water heating, kWh/month	113.7512	100.5875	106.9072	94.1871	91.4156	82.5043	81.5543	84.7398	85.6045	95.2934	101.1167	112.5410	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.8300	10.6852	11.8300	11.4484	11.8300	11.4484	11.8300	11.8300	11.4484	11.8300	11.4484	11.8300	(231)
Lighting	22.6332	18.1572	16.3485	11.9776	9.2519	7.5588	8.4399	10.9704	14.2495	18.6961	21.1172	23.2622	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-41.3956	-61.0708	-91.7804	-106.2645	-116.7856	-109.5834	-108.1057	-101.1305	-87.8308	-70.8975	-46.1670	-35.3783	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-18.1144	-40.9473	-88.0004	-141.5180	-193.8545	-197.3280	-194.1408	-160.1991	-112.2678	-61.2734	-24.9835	-14.0261	(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												187.5527	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												204.6600	(216)
Water heating fuel used												1150.2026	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)													
mechanical ventilation fans (SFP = 0.5720)												139.2889	(230a)
Total electricity for the above, kWh/year												139.2889	(231)
Electricity for lighting (calculated in Appendix L)												182.6625	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2223.0433	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												-563.3366	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	187.5527	16.4900	30.9274	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1150.2026	16.4900	189.6684	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	139.2889	16.4900	22.9687	(249)
Energy for lighting	182.6625	16.4900	30.1210	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-976.3900	16.4900	-161.0067	
PV Unit electricity exported	-1246.6533	5.5900	-69.6879	
Total			-230.6946	(252)
Total energy cost			42.9910	(255)

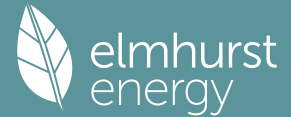
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.1238	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	97.9930	
SAP rating (Section 12)		98	(258)
SAP band		A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	187.5527	0.1573	29.4998	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1150.2026	0.1408	161.9882	(264)
Space and water heating			191.4880	(265)
Pumps, fans and electric keep-hot	139.2889	0.1387	19.3211	(267)
Energy for lighting	182.6625	0.1443	26.3638	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-976.3900	0.1339	-130.7444	

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PV Unit electricity exported	-1246.6533	0.1242	-154.8567
Total			-285.6011 (269)
Total CO2, kg/year			-48.4282 (272)
CO2 emissions per m2			-0.6100 (273)
EI value			100.5191
EI rating			101 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.0000 (1b)	x 2.3700 (2b)	= 94.8000 (1b) - (3b)
First floor	40.0000 (1c)	x 2.6200 (2c)	= 104.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 199.6000 (5)

2. Ventilation rate

	m3 per hour												
Number of open chimneys	0 * 80 =											0.0000 (6a)	
Number of open flues	0 * 20 =											0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =											0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =											0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =											0.0000 (6e)	
Number of blocked chimneys	0 * 20 =											0.0000 (6f)	
Number of intermittent extract fans	0 * 10 =											0.0000 (7a)	
Number of passive vents	0 * 10 =											0.0000 (7b)	
Number of flueless gas fires	0 * 40 =											0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) =											0.0000 (8)	
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												1.0000 (17)	
Infiltration rate												0.0500 (18)	
Number of sides sheltered												2 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =											0.8500 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =											0.0425 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	6.6000	6.2000	6.1000	5.6000	5.5000	4.7000	4.6000	4.5000	5.0000	5.8000	6.0000	6.5000	(22)
Wind factor	1.6500	1.5500	1.5250	1.4000	1.3750	1.1750	1.1500	1.1250	1.2500	1.4500	1.5000	1.6250	(22a)
Adj infilt rate	0.0701	0.0659	0.0648	0.0595	0.0584	0.0499	0.0489	0.0478	0.0531	0.0616	0.0638	0.0691	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													81.0000 (23c)
Effective ac	0.1651	0.1609	0.1598	0.1545	0.1534	0.1449	0.1439	0.1428	0.1481	0.1566	0.1587	0.1641	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Window (Uw = 1.20)			11.9700	1.1450	13.7061		(27)
Door			2.1200	1.0000	2.1200		(26a)
Floor 1 P/a 0.3			40.0000	0.1200	4.8000	110.0000	4400.0000 (28a)
External Wall 1 Render	58.8800	14.0900	44.7900	0.1500	6.7185	9.0000	403.1100 (29a)
External Roof 1 Horz	40.0000		40.0000	0.0900	3.6000	9.0000	360.0000 (30)
Total net area of external elements Aum(A, m2)			138.8800				
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	30.9446			
Party Wall 1			70.8600	0.0000	0.0000	20.0000	1417.2000 (32)
Internal Wall 1 GF			34.1300			9.0000	307.1700 (32c)
Internal Wall 2 FF			60.2000			9.0000	541.8000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)
Internal Ceiling 1			40.0000			9.0000	360.0000 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =			8509.2800 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						106.3660 (35)	
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				4.9900	0.0300	0.1497	
E5 Ground floor (normal)				11.8000	0.0210	0.2478	
E10 Eaves (insulation at ceiling level)				10.0000	0.0440	0.4400	
E12 Gable (insulation at ceiling level)				1.8000	0.0510	0.0918	
E6 Intermediate floor within a dwelling				11.8000	0.0800	0.9440	
P1 Party wall - Ground floor				14.2000	0.1490	2.1158	
P2 Party wall - Intermediate floor within a dwelling				14.2000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)				14.2000	0.4800	6.8160	
E18 Party wall between dwellings				14.9700	0.0395	0.5913	
E2 Other lintels (including other steel lintels)				9.4100	0.0840	0.7904	
E3 Sill				8.4000	0.0430	0.3612	
E4 Jamb				21.0000	0.0340	0.7140	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						13.2621 (36)	

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util living area	0.8051	0.7529	0.6797	0.5718	0.4547	0.3224	0.2631	0.2647	0.3716	0.5583	0.7202	0.8106 (86)
Living	20.5561	20.6471	20.7433	20.8365	20.8908	20.9152	20.9194	20.9194	20.9112	20.8617	20.7317	20.5632
Non living	19.8419	19.9511	20.0625	20.1705	20.2296	20.2599	20.2644	20.2653	20.2544	20.1995	20.0547	19.8526
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.7729	20.6471	20.7433	20.8365	20.8908	20.9152	20.9194	20.9194	20.9112	20.8617	20.7317	20.6243 (87)
Th 2	20.3510	20.3541	20.3548	20.3587	20.3595	20.3657	20.3665	20.3673	20.3634	20.3572	20.3556	20.3517 (88)
util rest of house												
	0.7863	0.7317	0.6557	0.5451	0.4249	0.2917	0.2288	0.2294	0.3349	0.5230	0.6932	0.7912 (89)
MIT 2	20.1480	19.9511	20.0625	20.1705	20.2296	20.2599	20.2644	20.2653	20.2544	20.1995	20.0547	19.9425 (90)
Living area fraction									fLA = Living area / (4) =			0.4205 (91)
MIT	20.4108	20.2438	20.3487	20.4506	20.5077	20.5355	20.5398	20.5403	20.5306	20.4779	20.3394	20.2292 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4108	20.2438	20.3487	20.4506	20.5077	20.5355	20.5398	20.5403	20.5306	20.4779	20.3394	20.2292 (93)

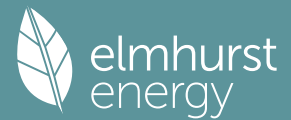
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.7881	0.7280	0.6555	0.5490	0.4319	0.2999	0.2382	0.2391	0.3446	0.5297	0.6924	0.7873 (94)
Useful gains	591.1986	604.6980	602.5149	558.1509	451.1901	322.3815	232.3410	226.7162	305.9989	419.2487	505.3982	556.7785 (95)
Ext temp.	7.0000	7.3000	8.1000	9.6000	12.0000	14.5000	16.2000	16.3000	14.8000	12.4000	9.8000	7.6000 (96)
Heat loss rate W	738.7079	709.3589	670.4129	590.0886	462.0790	324.4274	232.9747	227.3397	309.2413	440.4347	576.1164	694.7731 (97)
Space heating kWh	109.7469	70.3321	50.5161	22.9952	8.1013	0.0000	0.0000	0.0000	0.0000	15.7624	50.9171	102.6680 (98a)
Space heating requirement - total per year (kWh/year)												431.0392
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	109.7469	70.3321	50.5161	22.9952	8.1013	0.0000	0.0000	0.0000	0.0000	15.7624	50.9171	102.6680 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												431.0392
Space heating per m2												5.3880 (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 %)												399.7474 (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	109.7469	70.3321	50.5161	22.9952	8.1013	0.0000	0.0000	0.0000	0.0000	15.7624	50.9171	102.6680 (98)
Space heating efficiency (main heating system 1)	399.7474	399.7474	399.7474	399.7474	399.7474	0.0000	0.0000	0.0000	0.0000	399.7474	399.7474	399.7474 (210)
Space heating fuel (main heating system)	27.4541	17.5941	12.6370	5.7524	2.0266	0.0000	0.0000	0.0000	0.0000	3.9431	12.7373	25.6832 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (64)
Efficiency of water heater												204.6600 (216)
(217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600 (217)
Fuel for water heating, kWh/month	113.7512	100.5875	106.9072	94.1871	91.4156	82.5043	81.5543	84.7398	85.6045	95.2934	101.1167	112.5410 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	11.8300	10.6852	11.8300	11.4484	11.8300	11.4484	11.8300	11.4484	11.8300	11.4484	11.8300	11.8300 (231)
Lighting	22.6332	18.1572	16.3485	11.9776	9.2519	7.5588	8.4399	10.9704	14.2495	18.6961	21.1172	23.2622 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-52.6714	-68.2387	-100.4822	-116.3547	-123.4132	-119.8836	-113.2134	-110.3132	-98.0808	-80.3385	-56.2775	-44.1110 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-28.7222	-52.0099	-108.5401	-177.7134	-225.2237	-255.5678	-220.8712	-201.4735	-145.8547	-80.3092	-37.0537	-21.4105 (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												107.8279 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												204.6600
Water heating fuel used												1150.2026 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)												
mechanical ventilation fans (SFP = 0.5720)												139.2889 (230a)
Total electricity for the above, kWh/year												139.2889 (231)
Electricity for lighting (calculated in Appendix L)												182.6625 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2638.1280 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)

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Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	-1058.1461 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	107.8279	25.1600	27.1295 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1150.2026	25.1600	289.3910 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	139.2889	25.1600	35.0451 (249)
Energy for lighting	182.6625	25.1600	45.9579 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1083.3783	25.1600	-272.5780
PV Unit electricity exported	-1554.7497	5.8100	-90.3310
Total			-362.9089 (252)
Total energy cost			34.6145 (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	107.8279	0.1573	16.9596 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1150.2026	0.1408	161.9882 (264)
Space and water heating			178.9478 (265)
Pumps, fans and electric keep-hot	139.2889	0.1387	19.3211 (267)
Energy for lighting	182.6625	0.1443	26.3638 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1083.3783	0.1345	-145.6944
PV Unit electricity exported	-1554.7497	0.1251	-194.5039
Total			-340.1983 (269)
Total CO2, kg/year			-115.5655 (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	107.8279	1.5822	170.6095 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1150.2026	1.5208	1749.1725 (278)
Space and water heating			1919.7820 (279)
Pumps, fans and electric keep-hot	139.2889	1.5128	210.7162 (281)
Energy for lighting	182.6625	1.5338	280.1739 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1083.3783	1.4970	-1621.8164
PV Unit electricity exported	-1554.7497	0.4592	-713.9414
Total			-2335.7578 (283)
Total Primary energy kWh/year			74.9142 (286)

SAP 10 EPC IMPROVEMENTS

SEC1 - ASHP ROI TF 0.15 improv

Current energy efficiency rating:	A 98
Current environmental impact rating:	A 101

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.7	-£ 69	-40 kg (34.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£69	0.50 kg/m²	A 100 A 101
Total Savings	£69	0.50 kg/m²	

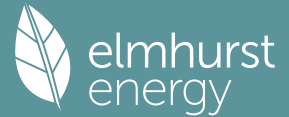
Potential energy efficiency rating:	A 100
Potential environmental impact rating:	A 101

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

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

	Current	Potential	Saving
	£398	£316	£81
Electricity			
Space heating	£62	£82	-£20
Water heating	£289	£188	£102
Lighting	£46	£46	£0
Generated (PV)	-£363	-£351	-£12
Total cost of fuels	£35	-£35	£69
Total cost of uses	£34	-£35	£70

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Delivered energy	-13 kWh/m ²	-17 kWh/m ²	4 kWh/m ²
Carbon dioxide emissions	-0.1 tonnes	-0.2 tonnes	0.0 tonnes
CO2 emissions per m ²	-1 kg/m ²	-2 kg/m ²	1 kg/m ²
Primary energy	1 kWh/m ²	-4 kWh/m ²	5 kWh/m ²

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

1. Overall dwelling characteristics

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

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		1.0000 (17)
Infiltration rate		0.0500 (18)
Number of sides sheltered		2 (19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0425 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.0542	0.0531	0.0521	0.0468	0.0457	0.0404	0.0404	0.0393	0.0425	0.0457	0.0478	0.0499 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.1492	0.1481	0.1471	0.1417	0.1407	0.1354	0.1354	0.1343	0.1375	0.1407	0.1428	0.1449 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			11.9700	1.1450	13.7061		(27)
Door			2.1200	1.0000	2.1200		(26a)
Floor 1 P/a 0.3			40.0000	0.1200	4.8000	110.0000	4400.0000 (28a)
External Wall 1 Render	58.8800	14.0900	44.7900	0.1500	6.7185	9.0000	403.1100 (29a)
External Roof 1 Horz	40.0000		40.0000	0.0900	3.6000	9.0000	360.0000 (30)
Total net area of external elements Aum(A, m ²)			138.8800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9446		(33)
Party Wall 1			70.8600	0.0000	0.0000	20.0000	1417.2000 (32)
Internal Wall 1 GF			34.1300			9.0000	307.1700 (32c)
Internal Wall 2 FF			60.2000			9.0000	541.8000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)
Internal Ceiling 1			40.0000			9.0000	360.0000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8509.2800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		106.3660 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	4.9900	0.0300	0.1497
E5 Ground floor (normal)	11.8000	0.0210	0.2478
E10 Eaves (insulation at ceiling level)	10.0000	0.0440	0.4400
E12 Gable (insulation at ceiling level)	1.8000	0.0510	0.0918
E6 Intermediate floor within a dwelling	11.8000	0.0800	0.9440
P1 Party wall - Ground floor	14.2000	0.1490	2.1158
P2 Party wall - Intermediate floor within a dwelling	14.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	14.2000	0.4800	6.8160
E18 Party wall between dwellings	14.9700	0.0395	0.5913
E2 Other lintels (including other steel lintels)	9.4100	0.0840	0.7904
E3 Sill	8.4000	0.0430	0.3612
E4 Jamb	21.0000	0.0340	0.7140

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		13.2621 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.2067 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	9.8267	9.7567	9.6867	9.3368	9.2668	8.9169	8.9169	8.8469	9.0569	9.2668	9.4068	9.5467 (38)
Average = Sum(39)m / 12 =	54.0333	53.9634	53.8934	53.5435	53.4735	53.1235	53.1235	53.0536	53.2635	53.4735	53.6134	53.7534 (39)
HLP	0.6754	0.6745	0.6737	0.6693	0.6684	0.6640	0.6640	0.6632	0.6658	0.6684	0.6702	0.6719 (40)
HLP (average)												0.6691
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4629 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												75.5424 (42b)
Hot water usage for other uses												39.8522 (42c)
Average daily hot water use (litres/day)												106.2689 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	115.3945	112.8235	109.7944	105.4322	101.8018	97.9340	96.6275	99.6456	102.8029	106.8401	111.2623	115.1391 (44)
Energy content (annual)	182.7567	160.6591	168.7499	144.3314	137.0448	120.4213	116.8626	123.3820	126.7662	144.9810	158.5135	180.2801 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1764.7487
Water storage loss:												27.4135 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss												26.7840 (56)
If cylinder contains dedicated solar storage												26.7840 (57)
Primary loss												23.2624 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month												232.8031 (62)
WWHRS												0.0000 (63a)
PV diverter												-0.0000 (63b)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												599.3060 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												599.3060 (63c)
Solar input	-0.0000	-16.2478	-57.1859	-77.6199	-99.9149	-91.8832	-91.1420	-80.4420	-56.3516	-28.5186	-0.0000	-0.0000 (63a)
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 (63b)
Output from w/h												232.8031 (64)
Electric shower(s)												0.0000 (64a)
Heat gains from water heating, kWh/month												100.8037 (65)
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =												0.0000 (64a)

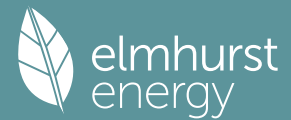
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	25.8578	22.9666	18.6777	14.1402	10.5700	8.9236	9.6423	12.5334	16.8223	21.3598	24.9301	26.5764 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	327.5232	330.9219	322.3573	304.1245	281.1088	259.4772	245.0260	241.6274	250.1919	268.4248	291.4405	313.0720 (68)
Pumps, fans	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)
Total internal gains	135.4889	133.3061	127.7283	112.9624	101.3025	95.4171	92.0328	95.9469	106.3515	117.1058	127.0158	134.3821 (72)
	590.3671	588.6919	570.2606	532.7243	494.4785	465.3152	448.1984	451.6049	474.8630	508.3876	544.8836	575.5277 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	4.4100	11.2829	0.7600	0.7000	0.7700	18.3445 (75)
Southwest	7.5600	36.7938	0.7600	0.7000	0.7700	102.5514 (79)

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Solar gains	120.8959	212.0238	306.2851	406.6304	480.2215	487.6405	465.6048	409.0375	340.7732	238.6953	145.9151	102.7437 (83)
Total gains	711.2630	800.7156	876.5457	939.3548	974.7000	952.9557	913.8032	860.6424	815.6361	747.0829	690.7987	678.2714 (84)

7. Mean internal temperature (heating season)

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	43.7450	43.8017	43.8586	44.1452	44.2030	44.4942	44.4942	44.5529	44.3773	44.2030	44.0876	43.9728	
alpha	3.9163	3.9201	3.9239	3.9430	3.9469	3.9663	3.9663	3.9702	3.9585	3.9469	3.9392	3.9315	
util living area	0.8791	0.8279	0.7488	0.6309	0.4920	0.3529	0.2549	0.2822	0.4398	0.6671	0.8266	0.8932 (86)	
Living	20.3150	20.4707	20.6475	20.8005	20.8829	20.9141	20.9205	20.9197	20.9028	20.7951	20.5397	20.2703	
Non living	19.5569	19.7468	19.9591	20.1400	20.2311	20.2663	20.2718	20.2720	20.2547	20.1386	19.8379	19.5049	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6496	20.4707	20.6475	20.8005	20.8829	20.9141	20.9205	20.9197	20.9028	20.7951	20.5397	20.3724 (87)	
Th 2	20.3626	20.3634	20.3642	20.3680	20.3688	20.3727	20.3727	20.3735	20.3711	20.3688	20.3673	20.3657 (88)	
util rest of house	0.8674	0.8129	0.7289	0.6054	0.4620	0.3194	0.2189	0.2442	0.4024	0.6375	0.8090	0.8825 (89)	
MIT 2	20.0414	19.7468	19.9591	20.1400	20.2311	20.2663	20.2718	20.2720	20.2547	20.1386	19.8379	19.6600 (90)	
Living area fraction										FLA = Living area / (4) =		0.4205 (91)	
MIT	20.2971	20.0512	20.2486	20.4178	20.5052	20.5387	20.5445	20.5444	20.5272	20.4147	20.1330	19.9596 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2971	20.0512	20.2486	20.4178	20.5052	20.5387	20.5445	20.5444	20.5272	20.4147	20.1330	19.9596 (93)	

8. Space heating requirement

Utilisation	0.8661	0.8050	0.7252	0.6075	0.4685	0.3283	0.2288	0.2546	0.4118	0.6397	0.8021	0.8751 (94)
Useful gains	616.0337	644.5636	635.6431	570.6404	456.6795	312.8408	209.0779	219.1455	335.8560	477.8964	554.0705	593.5500 (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	864.3785	817.6087	740.9581	616.7009	470.8427	315.4830	209.5475	219.8726	342.3344	524.8236	698.7453	847.1306 (97)
Space heating kWh	184.7685	116.2863	78.3543	33.1636	10.5374	0.0000	0.0000	0.0000	0.0000	34.9138	104.1659	188.6639 (98a)
Space heating requirement - total per year (kWh/year)												750.8538
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	184.7685	116.2863	78.3543	33.1636	10.5374	0.0000	0.0000	0.0000	0.0000	34.9138	104.1659	188.6639 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												750.8538
Space heating per m2										(98c) / (4) =		9.3857 (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 %)												399.4914 (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	184.7685	116.2863	78.3543	33.1636	10.5374	0.0000	0.0000	0.0000	0.0000	34.9138	104.1659	188.6639 (98)
Space heating efficiency (main heating system 1)	399.4914	399.4914	399.4914	399.4914	399.4914	0.0000	0.0000	0.0000	0.0000	399.4914	399.4914	399.4914 (210)
Space heating fuel (main heating system)	46.2509	29.1086	19.6135	8.3015	2.6377	0.0000	0.0000	0.0000	0.0000	8.7396	26.0746	47.2260 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	232.8031	189.6145	160.2146	108.3899	74.3819	64.3633	62.7401	80.8900	113.4438	165.1131	206.9455	230.3265 (64)
Efficiency of water heater (217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600 (216)
Fuel for water heating, kWh/month	113.7512	92.6485	78.2833	52.9610	36.3442	31.4489	30.6558	39.5241	55.4304	80.6768	101.1167	112.5410 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	18.6245	16.8222	18.6245	18.0237	18.6245	18.0237	18.6245	18.6245	18.0237	18.6245	18.0237	18.6245 (231)
Lighting	22.6332	18.1572	16.3485	11.9776	9.2519	7.5588	8.4399	10.9704	14.2495	18.6961	21.1172	23.2622 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-41.5090	-60.9979	-90.0621	-101.6429	-107.9179	-100.5251	-99.1500	-94.5157	-84.8795	-70.3919	-46.3387	-35.4694 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-18.0010	-41.0202	-89.7187	-146.1395	-202.7221	-206.3863	-203.0964	-166.8139	-115.2191	-61.7790	-24.8118	-13.9349 (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												187.9524 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												204.6600

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Water heating fuel used	825.3817 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)	
mechanical ventilation fans (SFP = 0.5720)	139.2889 (230a)
pump for solar water heating	80.0000 (230g)
Total electricity for the above, kWh/year	219.2889 (231)
Electricity for lighting (calculated in Appendix L)	182.6625 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2223.0433 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	-807.7577 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	187.9524	16.4900	30.9934 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	825.3817	16.4900	136.1054 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	139.2889	16.4900	22.9687 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	182.6625	16.4900	30.1210 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-933.4002	16.4900	-153.9177
PV Unit electricity exported	-1289.6431	5.5900	-72.0911
Total			-226.0087 (252)
Total energy cost			7.3718 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.0212 (257)
SAP value		99.6558
SAP rating (Section 12)		100 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	187.9524	0.1573	29.5561 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	825.3817	0.1462	120.6641 (264)
Space and water heating			150.2202 (265)
Pumps, fans and electric keep-hot	219.2889	0.1387	30.4181 (267)
Energy for lighting	182.6625	0.1443	26.3638 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-933.4002	0.1344	-125.4469
PV Unit electricity exported	-1289.6431	0.1239	-159.7468
Total			-285.1937 (269)
Total CO2, kg/year			-78.1916 (272)
CO2 emissions per m2			-0.9800 (273)
EI value			100.8382
EI rating			101 (274)
EI band			A

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

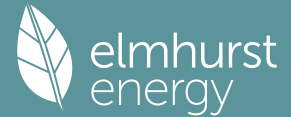
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	40.0000 (1b)	x 2.3700 (2b)	= 94.8000 (1b) - (3b)
First floor	40.0000 (1c)	x 2.6200 (2c)	= 104.8000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	199.6000 (5)

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 1.0000 (17)
 Infiltration rate 0.0500 (18)
 Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.0425 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	6.6000	6.2000	6.1000	5.6000	5.5000	4.7000	4.6000	4.5000	5.0000	5.8000	6.0000	6.5000 (22)
Wind factor	1.6500	1.5500	1.5250	1.4000	1.3750	1.1750	1.1500	1.1250	1.2500	1.4500	1.5000	1.6250 (22a)
Adj infilt rate	0.0701	0.0659	0.0648	0.0595	0.0584	0.0499	0.0489	0.0478	0.0531	0.0616	0.0638	0.0691 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												81.0000 (23c)
Effective ac	0.1651	0.1609	0.1598	0.1545	0.1534	0.1449	0.1439	0.1428	0.1481	0.1566	0.1587	0.1641 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Window (Uw = 1.20)			11.9700	1.1450	13.7061		(27)
Door			2.1200	1.0000	2.1200		(26a)
Floor 1 P/a 0.3			40.0000	0.1200	4.8000	110.0000	4400.0000 (28a)
External Wall 1 Render	58.8800	14.0900	44.7900	0.1500	6.7185	9.0000	403.1100 (29a)
External Roof 1 Horz	40.0000		40.0000	0.0900	3.6000	9.0000	360.0000 (30)
Total net area of external elements Aum(A, m2)			138.8800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9446		(33)
Party Wall 1			70.8600	0.0000	0.0000	20.0000	1417.2000 (32)
Internal Wall 1 GF			34.1300			9.0000	307.1700 (32c)
Internal Wall 2 FF			60.2000			9.0000	541.8000 (32c)
Internal Floor 1			40.0000			18.0000	720.0000 (32d)
Internal Ceiling 1			40.0000			9.0000	360.0000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	8509.2800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							106.3660 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	4.9900	0.0300	0.1497
E5 Ground floor (normal)	11.8000	0.0210	0.2478
E10 Eaves (insulation at ceiling level)	10.0000	0.0440	0.4400
E12 Gable (insulation at ceiling level)	1.8000	0.0510	0.0918
E6 Intermediate floor within a dwelling	11.8000	0.0800	0.9440
P1 Party wall - Ground floor	14.2000	0.1490	2.1158
P2 Party wall - Intermediate floor within a dwelling	14.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	14.2000	0.4800	6.8160
E18 Party wall between dwellings	14.9700	0.0395	0.5913
E2 Other lintels (including other steel lintels)	9.4100	0.0840	0.7904
E3 Sill	8.4000	0.0430	0.3612
E4 Jamb	21.0000	0.0340	0.7140

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.2621 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 44.2067 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	10.8765	10.5965	10.5265	10.1766	10.1066	9.5467	9.4768	9.4068	9.7567	10.3166	10.4565	10.8065 (38)
Heat transfer coeff	55.0831	54.8032	54.7332	54.3833	54.3133	53.7534	53.6834	53.6134	53.9634	54.5232	54.6632	55.0131 (39)
Average = Sum(39)m / 12 =												54.3774

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6885	0.6850	0.6842	0.6798	0.6789	0.6719	0.6710	0.6702	0.6745	0.6815	0.6833	0.6877 (40)
HLP (average)												0.6797
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

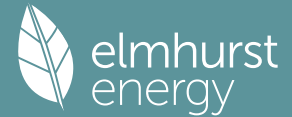
4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4629 (42)

Hot water usage for mixer showers	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	75.5424	74.4205	72.8406	69.9276	67.7463	65.3277	64.0212	65.5901	67.2982	69.8863	72.8593	75.2870 (42b)
Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522 (42c)
Average daily hot water use (litres/day)												106.2689 (43)

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

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Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	232.8031	205.8623	217.4006	186.0098	174.2969	156.2465	153.8821	161.3320	169.7954	193.6317	206.9455	230.3265 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												760.2870 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												760.2870
Solar input	-9.5843	-27.8777	-72.6433	-95.7729	-112.5478	-111.8749	-100.3437	-97.4999	-74.4755	-44.6636	-13.0032	-0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Output from w/h	223.2188	177.9846	144.7572	90.2369	61.7490	44.3716	53.5384	63.8320	95.3198	148.9680	193.9423	230.3265 (64)
												Total per year (kWh/year) = Sum(64)m = 1528.2453 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	100.8037	89.5817	95.0299	81.3329	75.3691	68.7003	68.4724	71.3845	76.5731	87.1267	91.4513	99.9802 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717	147.7717 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.8578	22.9666	18.6777	14.1402	10.5700	8.9236	9.6423	12.5334	16.8223	21.3598	24.9301	26.5764 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	327.5232	330.9219	322.3573	304.1245	281.1088	259.4772	245.0260	241.6274	250.1919	268.4248	291.4405	313.0720 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400	52.2400 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)
Water heating gains (Table 5)	135.4889	133.3061	127.7283	112.9624	101.3025	95.4171	92.0328	95.9469	106.3515	117.1058	127.0158	134.3821 (72)
Total internal gains	590.3671	588.6919	570.2606	532.7243	494.4785	465.3152	448.1984	451.6049	474.8630	508.3876	544.8836	575.5277 (73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast			4.4100	15.8649	0.7600	0.7000	0.7700	25.7941 (75)				
Southwest			7.5600	48.0626	0.7600	0.7000	0.7700	133.9596 (79)				
Solar gains	159.7537	241.9825	347.4510	476.3894	536.4903	595.5914	513.2000	483.6134	407.1773	281.5525	184.9883	131.6282 (83)
Total gains	750.1208	830.6744	917.7116	1009.1137	1030.9688	1060.9066	961.3984	935.2183	882.0402	789.9402	729.8719	707.1560 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	42.9113	43.1305	43.1857	43.4635	43.5195	43.9728	44.0301	44.0876	43.8017	43.3520	43.2409	42.9659
alpha	3.8608	3.8754	3.8790	3.8976	3.9013	3.9315	3.9353	3.9392	3.9201	3.8901	3.8827	3.8644
util living area	0.8051	0.7529	0.6805	0.5753	0.4602	0.3265	0.2669	0.2683	0.3740	0.5592	0.7202	0.8106 (86)
Living	20.5561	20.6471	20.7425	20.8347	20.8895	20.9149	20.9192	20.9193	20.9110	20.8614	20.7317	20.5632
Non living	19.8419	19.9511	20.0617	20.1686	20.2284	20.2597	20.2643	20.2652	20.2542	20.1991	20.0547	19.8526
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.7729	20.6471	20.7425	20.8347	20.8895	20.9149	20.9192	20.9193	20.9110	20.8614	20.7317	20.6243 (87)
Th 2	20.3510	20.3541	20.3548	20.3587	20.3595	20.3657	20.3665	20.3673	20.3634	20.3572	20.3556	20.3517 (88)
util rest of house	0.7863	0.7317	0.6565	0.5485	0.4302	0.2954	0.2321	0.2326	0.3371	0.5238	0.6932	0.7912 (89)
MIT 2	20.1480	19.9511	20.0617	20.1686	20.2284	20.2597	20.2643	20.2652	20.2542	20.1991	20.0547	19.9425 (90)
Living area fraction										FLA = Living area / (4) = 0.4205 (91)		
MIT	20.4108	20.2438	20.3480	20.4487	20.5064	20.5352	20.5397	20.5403	20.5304	20.4776	20.3394	20.2292 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4108	20.2438	20.3480	20.4487	20.5064	20.5352	20.5397	20.5403	20.5304	20.4776	20.3394	20.2292 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.7881	0.7280	0.6562	0.5524	0.4371	0.3038	0.2416	0.2424	0.3468	0.5306	0.6924	0.7873 (94)

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Useful gains	591.1986	604.6980	602.2090	557.3849	450.6583	322.2716	232.3019	226.6795	305.9124	419.1166	505.3982	556.7785 (95)
Ext temp.	7.0000	7.3000	8.1000	9.6000	12.0000	14.5000	16.2000	16.3000	14.8000	12.4000	9.8000	7.6000 (96)
Heat loss rate W	738.7079	709.3589	670.3718	589.9891	462.0111	324.4134	232.9696	227.3348	309.2302	440.4174	576.1164	694.7731 (97)
Space heating kWh	109.7469	70.3321	50.7132	23.4750	8.4464	0.0000	0.0000	0.0000	0.0000	15.8478	50.9171	102.6680 (98a)
Space heating requirement - total per year (kWh/year)												432.1466
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	109.7469	70.3321	50.7132	23.4750	8.4464	0.0000	0.0000	0.0000	0.0000	15.8478	50.9171	102.6680 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												432.1466
Space heating per m2												(98c) / (4) = 5.4018 (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 %)												399.7474 (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	109.7469	70.3321	50.7132	23.4750	8.4464	0.0000	0.0000	0.0000	0.0000	15.8478	50.9171	102.6680 (98)
Space heating efficiency (main heating system 1)	399.7474	399.7474	399.7474	399.7474	399.7474	0.0000	0.0000	0.0000	0.0000	399.7474	399.7474	399.7474 (210)
Space heating fuel (main heating system)	27.4541	17.5941	12.6863	5.8725	2.1129	0.0000	0.0000	0.0000	0.0000	3.9645	12.7373	25.6832 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	223.2188	177.9846	144.7572	90.2369	61.7490	44.3716	53.5384	63.8320	95.3198	148.9680	193.9423	230.3265 (64)
Efficiency of water heater (217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600 (216)
Fuel for water heating, kWh/month	109.0681	86.9660	70.7306	44.0911	30.1715	21.6807	26.1597	31.1893	46.5747	72.7881	94.7632	112.5410 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	18.6245	16.8222	18.6245	18.0237	18.6245	18.0237	18.6245	18.6245	18.0237	18.6245	18.0237	18.6245 (231)
Lighting	22.6332	18.1572	16.3485	11.9776	9.2519	7.5588	8.4399	10.9704	14.2495	18.6961	21.1172	23.2622 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-52.7278	-67.8503	-97.6416	-109.2468	-112.0836	-106.3267	-102.2739	-100.5918	-92.9938	-79.0177	-56.2861	-44.2525 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-28.6658	-52.3983	-111.3808	-184.8213	-236.5533	-269.1247	-231.8107	-211.1949	-150.9417	-81.6300	-37.0450	-21.2690 (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												108.1049 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												204.6600
Water heating fuel used												746.7240 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.5720)												
mechanical ventilation fans (SFP = 0.5720)												139.2889 (230a)
pump for solar water heating												80.0000 (230g)
Total electricity for the above, kWh/year												219.2889 (231)
Electricity for lighting (calculated in Appendix L)												182.6625 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2638.1280 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												-1381.3477 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	108.1049	25.1600	27.1992 (240)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	746.7240	25.1600	187.8758 (247)	
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)	
Pumps, fans and electric keep-hot	139.2889	25.1600	35.0451 (249)	
Pump for solar water heating	80.0000	25.1600	20.1280 (249)	
Energy for lighting	182.6625	25.1600	45.9579 (250)	
Additional standing charges			0.0000 (251)	
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1021.2926	25.1600	-256.9572	
PV Unit electricity exported	-1616.8354	5.8100	-93.9381	
Total			-350.8954 (252)	

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Total energy cost

-34.6894 (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	108.1049	0.1572	16.9986 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	746.7240	0.1474	110.0354 (264)
Space and water heating			127.0341 (265)
Pumps, fans and electric keep-hot	219.2889	0.1387	30.4181 (267)
Energy for lighting	182.6625	0.1443	26.3638 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1021.2926	0.1351	-137.9891
PV Unit electricity exported	-1616.8354	0.1247	-201.6729
Total			-339.6620 (269)
Total CO2, kg/year			-155.8460 (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	108.1049	1.5821	171.0310 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	746.7240	1.5452	1153.8083 (278)
Space and water heating			1324.8393 (279)
Pumps, fans and electric keep-hot	219.2889	1.5128	331.7402 (281)
Energy for lighting	182.6625	1.5338	280.1739 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1021.2926	1.4994	-1531.2980
PV Unit electricity exported	-1616.8354	0.4578	-740.2306
Total			-2271.5286 (283)
Total Primary energy kWh/year			-334.7753 (286)