

Full SAP Calculation Printout



Property Reference	CPG-7172-23 P6		Issued on Date	13/01/2024	
Assessment Reference	SEC1 - ASHP ROI TF 0.15 improv	Prop Type Ref	DS		
Property	Plot 6, Collygree Parc, South Road, Penzance, Cornwall, TR20 9LY				
SAP Rating	98 A	DER	-0.50	TER	11.94
Environmental	100 A	% DER < TER			104.19
CO ₂ Emissions (t/year)	-0.11	DFEE	31.78	TFEE	37.13
Compliance Check	See BREL	% DFEE < TFEE			14.40
% DPER < TPER	88.18	DPER	7.38	TPER	62.44
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

	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 0.50			40.0000	0.1200	4.8000	110.0000	(28a)
External Wall 1 Render	98.8000	14.0900	84.7100	0.1500	12.7065	9.0000	762.3900 (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)			178.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.9326	(33)
Party Wall 1			30.9400	0.0000	0.0000	20.0000	618.8000 (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) = 8070.1600 (34)

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

100.8770 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	14.9700	0.0300	0.4491
E5 Ground floor (normal)	19.8000	0.0210	0.4158
E10 Eaves (insulation at ceiling level)	10.0000	0.0440	0.4400
E12 Gable (insulation at ceiling level)	9.8000	0.0510	0.4998
E6 Intermediate floor within a dwelling	19.8000	0.0800	1.5840
E2 Other lintels (including other steel lintels)	10.3100	0.0840	0.8660
E3 Sill	8.4000	0.0430	0.3612
E4 Jamb	25.2000	0.0340	0.8568
P1 Party wall - Ground floor	6.2000	0.1490	0.9238
P2 Party wall - Intermediate floor within a dwelling	6.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.2000	0.4800	2.9760
E18 Party wall between dwellings	4.9900	0.0395	0.1971

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 46.5023 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	9.8267	9.7567	9.6867	9.3368	9.2668	8.9169	8.9169	8.8469	9.0569	9.2668	9.4068	9.5467 (38)
Heat transfer coeff	56.3289	56.2589	56.1890	55.8390	55.7691	55.4191	55.4191	55.3491	55.5591	55.7691	55.9090	56.0490 (39)
Average = Sum(39)m / 12 =												55.8215
HLP	0.7041	0.7032	0.7024	0.6980	0.6971	0.6927	0.6927	0.6919	0.6945	0.6971	0.6989	0.7006 (40)
HLP (average)												0.6978
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	75.5424	74.4205	72.8406	69.9276	67.7463	65.3277	64.0212	65.5901	67.2982	69.8863	72.8593	75.2870 (42b)
Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522 (42c)
Average daily hot water use (litres/day)												106.2689 (43)
Daily hot water use	115.3945	112.8235	109.7944	105.4322	101.8018	97.9340	96.6275	99.6456	102.8029	106.8401	111.2623	115.1391 (44)
Energy conte	182.7567	160.6591	168.7499	144.3314	137.0448	120.4213	116.8626	123.3820	126.7662	144.9810	158.5135	180.2801 (45)
Energy content (annual)												Total = Sum(45)m = 1764.7487
Distribution loss (46)m = 0.15 x (45)m	27.4135	24.0989	25.3125	21.6497	20.5567	18.0632	17.5294	18.5073	19.0149	21.7472	23.7770	27.0420 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8640 (55)
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265 (64)
Total per year (kWh/year)												2354.0047 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	100.8037	89.5817	96.1465	86.7358	85.6045	78.7857	78.8940	81.0616	80.8954	88.2433	91.4513	99.9802 (65)

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

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

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a 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	39.7968	39.8463	39.8959	40.1459	40.1963	40.4501	40.4501	40.5013	40.3482	40.1963	40.0957	39.9956	
alpha	3.6531	3.6564	3.6597	3.6764	3.6798	3.6967	3.6967	3.7001	3.6899	3.6798	3.6730	3.6664	
util living area	0.9014	0.8497	0.7788	0.6564	0.5127	0.3665	0.2656	0.2948	0.4613	0.6981	0.8505	0.9126	(86)
Living	20.1241	20.3247	20.5346	20.7424	20.8573	20.9034	20.9135	20.9121	20.8858	20.7327	20.4092	20.0782	
Non living	19.3021	19.5487	19.8034	20.0505	20.1787	20.2294	20.2383	20.2381	20.2120	20.0454	19.6599	19.2478	
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	20.5519	20.3247	20.5346	20.7424	20.8573	20.9034	20.9135	20.9121	20.8858	20.7327	20.4092	20.2072	(87)
Th 2	20.3372	20.3380	20.3387	20.3426	20.3434	20.3473	20.3473	20.3480	20.3457	20.3434	20.3418	20.3403	(88)
util rest of house	0.8914	0.8358	0.7598	0.6308	0.4812	0.3307	0.2268	0.2538	0.4215	0.6686	0.8344	0.9035	(89)
MIT 2	19.9245	19.5487	19.8034	20.0505	20.1787	20.2294	20.2383	20.2381	20.2120	20.0454	19.6599	19.4447	(90)
Living area fraction									FLA = Living area / (4) =				0.4205 (91)
MIT	20.1884	19.8750	20.1108	20.3414	20.4640	20.5128	20.5222	20.5215	20.4954	20.3344	19.9750	19.7653	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1884	19.8750	20.1108	20.3414	20.4640	20.5128	20.5222	20.5215	20.4954	20.3344	19.9750	19.7653	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8890	0.8253	0.7529	0.6307	0.4871	0.3399	0.2372	0.2648	0.4307	0.6682	0.8247	0.8946	(94)
Useful gains	580.3408	624.4276	623.7926	575.0672	467.9030	323.4851	216.5419	226.8694	345.2728	477.2151	535.2887	558.1565	(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	894.9744	842.4770	764.7794	638.8788	488.7618	327.6842	217.3657	228.1224	355.3204	542.8805	719.8292	872.4199	(97)
Space heating kWh	234.0874	146.5292	104.8942	45.9444	15.5190	0.0000	0.0000	0.0000	0.0000	48.8550	132.8691	233.8120	(98a)
Space heating requirement - total per year (kWh/year)												962.5103	
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	234.0874	146.5292	104.8942	45.9444	15.5190	0.0000	0.0000	0.0000	0.0000	48.8550	132.8691	233.8120	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												962.5103	
Space heating per m2										(98c) / (4) =		12.0314	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from main system(s)													0.0000 (201)
Efficiency of main space heating system 1 (in %)													1.0000 (202)
Efficiency of main space heating system 2 (in %)													400.1646 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (207)
													0.0000 (208)
Space heating requirement	234.0874	146.5292	104.8942	45.9444	15.5190	0.0000	0.0000	0.0000	0.0000	48.8550	132.8691	233.8120	(98)
Space heating efficiency (main heating system 1)	400.1646	400.1646	400.1646	400.1646	400.1646	0.0000	0.0000	0.0000	0.0000	400.1646	400.1646	400.1646	(210)
Space heating fuel (main heating system)	58.4978	36.6172	26.2128	11.4814	3.8781	0.0000	0.0000	26.2128	0.0000	12.2087	33.2036	58.4290	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	232.8031	205.8623	218.7963	192.7634	187.0912	168.8533	166.9090	173.4284	175.1982	195.0274	206.9455	230.3265	(64)
Efficiency of water heater (217)m	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	204.6600	(216)
Fuel for water heating, kWh/month	113.7512	100.5875	106.9072	94.1871	91.4156	82.5043	81.5543	84.7398	85.6045	95.2934	101.1167	112.5410	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	11.8300	10.6852	11.8300	11.4484	11.8300	11.4484	11.8300	11.4484	11.8300	11.4484	11.8300	11.8300	(231)
Lighting	22.6332	18.1572	16.3485	11.9776	9.2519	7.5588	8.4399	10.9704	14.2495	18.6961	21.1172	23.2622	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.5984	-61.3703	-92.2861	-106.6884	-117.0162	-109.5834	-108.1057	-101.1305	-87.8308	-71.1215	-46.3529	-35.5276	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-17.9116	-40.6478	-87.4947	-141.0941	-193.6239	-197.3280	-194.1408	-160.1991	-112.2678	-61.0494	-24.7975	-13.8768	(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													240.5286 (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	-510.3607	(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	240.5286	0.1570	37.7563 (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			199.7445 (265)
Pumps, fans and electric keep-hot	139.2889	0.1387	19.3211 (267)
Energy for lighting	182.6625	0.1443	26.3638 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-978.6118	0.1339	-131.0767
PV Unit electricity exported	-1244.4315	0.1241	-154.4852
Total			-285.5619 (269)
Total CO2, kg/year			-40.1325 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-0.5000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	240.5286	1.5811	380.2928 (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			2129.4653 (279)
Pumps, fans and electric keep-hot	139.2889	1.5128	210.7162 (281)
Energy for lighting	182.6625	1.5338	280.1739 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-978.6118	1.4950	-1463.0183
PV Unit electricity exported	-1244.4315	0.4556	-566.9781
Total			-2029.9964 (283)
Total Primary energy kWh/year			590.3590 (286)
Dwelling Primary energy Rate (DPER)			7.3800 (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/a 0.50			40.0000	0.1300	5.2000		(28a)
External Wall 1 Render	98.8000	14.0900	84.7100	0.1800	15.2478		(29a)
External Roof 1 Horz	40.0000		40.0000	0.1100	4.4000		(30)
Total net area of external elements Aum(A, m2)			178.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	40.6739	(33)
Party Wall 1			30.9400	0.0000	0.0000		(32)

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

100.8770 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	14.9700	0.0900	1.3473
E5 Ground floor (normal)	19.8000	0.1600	3.1680
E10 Eaves (insulation at ceiling level)	10.0000	0.0600	0.6000
E12 Gable (insulation at ceiling level)	9.8000	0.0600	0.5880
E6 Intermediate floor within a dwelling	19.8000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.3100	0.0500	0.5155
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	25.2000	0.0500	1.2600
P1 Party wall - Ground floor	6.2000	0.0800	0.4960
P2 Party wall - Intermediate floor within a dwelling	6.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.2000	0.1200	0.7440
E18 Party wall between dwellings	4.9900	0.0600	0.2994

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

Point Thermal bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 50.1121 \quad (37)$$

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

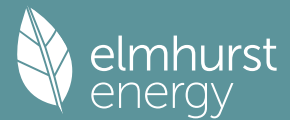
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	39.1323	38.8916	38.6557	37.5476	37.3403	36.3751	36.3751	36.1964	36.7469	37.3403	37.7597	38.1982 (38)
Average = Sum(39)m / 12 =	89.2444	89.0038	88.7678	87.6597	87.4524	86.4872	86.4872	86.3085	86.8590	87.4524	87.8718	88.3103 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1156	1.1125	1.1096	1.0957	1.0932	1.0811	1.0811	1.0789	1.0857	1.0932	1.0984	1.1039 (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	75.5424	74.4205	72.8406	69.9276	67.7463	65.3277	64.0212	65.5901	67.2982	69.8863	72.8593	75.2870	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	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	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	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	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	31.6444 (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	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	0.0000 (59)
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	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	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	237.6635	210.2523	223.6567	197.4670	191.9516	173.5569	171.7694	178.2888	179.9019	199.8878	211.6491	235.1869	235.1869 (64)
													Total per year (kWh/year) = Sum(64)m = 2411.2319 (64)
12Total per year (kWh/year)													2411 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	104.6920	93.0937	100.0348	90.4987	89.4928	82.5485	82.7823	84.9500	84.6583	92.1316	95.2142	103.8686	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
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
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
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
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
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
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
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

6. Solar gains

[Jan]	Area		Solar flux		Specific data		FF		Access factor		Gains	
	m2		Table 6a		g		Specific data		Table 6d		W	
			W/m2		or Table 6b		or Table 6c					
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
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

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	25.1188	25.1867	25.2536	25.5729	25.6335	25.9196	25.9196	25.9732	25.8086	25.6335	25.5112	25.3845
alpha	2.6746	2.6791	2.6836	2.7049	2.7089	2.7280	2.7280	2.7315	2.7206	2.7089	2.7007	2.6923
util living area	0.9376	0.9125	0.8767	0.8049	0.6981	0.5518	0.4236	0.4602	0.6457	0.8254	0.9107	0.9432
MIT	18.7163	19.0267	19.4585	20.0280	20.4975	20.8145	20.9340	20.9156	20.6994	20.1027	19.3335	18.6708
Th 2	19.9881	19.9906	19.9930	20.0043	20.0064	20.0163	20.0163	20.0181	20.0125	20.0064	20.0021	19.9977
util rest of house	0.9290	0.9007	0.8597	0.7773	0.6541	0.4858	0.3389	0.3748	0.5835	0.7949	0.8967	0.9353
MIT 2	17.3369	17.7263	18.2657	18.9686	19.5206	19.8697	19.9785	19.9669	19.7572	19.0744	18.1249	17.2855
Living area fraction	FLA = Living area / (4) =											0.4205 (91)
MIT	17.9170	18.2731	18.7673	19.4141	19.9314	20.2670	20.3802	20.3658	20.1534	19.5068	18.6331	17.8680
Temperature adjustment												0.0000
adjusted MIT	17.9170	18.2731	18.7673	19.4141	19.9314	20.2670	20.3802	20.3658	20.1534	19.5068	18.6331	17.8680

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9058	0.8754	0.8347	0.7587	0.6505	0.5034	0.3712	0.4062	0.5931	0.7771	0.8725	0.9131
Useful gains	580.0471	637.7703	654.6622	645.2545	576.8363	439.8319	311.1917	321.7436	443.9612	529.6369	551.7741	561.1208
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	1215.2390	1190.2570	1088.9397	921.6613	719.8539	490.1204	326.9430	342.2848	525.7912	778.9186	1013.4382	1207.0285
Space heating kWh	472.5828	371.2711	323.1025	199.0129	106.4051	0.0000	0.0000	0.0000	0.0000	185.4656	332.3982	480.5553
Space heating requirement - total per year (kWh/year)												2470.7935
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
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	472.5828	371.2711	323.1025	199.0129	106.4051	0.0000	0.0000	0.0000	0.0000	185.4656	332.3982	480.5553
Space heating requirement after solar contribution - total per year (kWh/year)												2470.7935
Space heating per m2												(98c) / (4) = 30.8849 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												
Efficiency of main space heating system 1 (in %)												
Efficiency of main space heating system 2 (in %)												
Efficiency of secondary/supplementary heating system, %												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	472.5828	371.2711	323.1025	199.0129	106.4051	0.0000	0.0000	0.0000	0.0000	185.4656	332.3982	480.5553
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
Space heating fuel (main heating system)	512.0074	402.2439	350.0569	215.6153	115.2818	0.0000	0.0000	0.0000	0.0000	200.9378	360.1280	520.6450
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
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
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
Water heating												235.1869 (64)
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
Efficiency of water heater												79.8000 (216)

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(217)m	85.5706	85.3209	84.8839	84.0773	82.7926	79.8000	79.8000	79.8000	79.8000	83.8922	85.0676	85.6267	(217)
Fuel for water heating, kWh/month													
(233a)m	277.7396	246.4254	263.4853	234.8637	231.8463	217.4898	215.2499	223.4195	225.4409	238.2675	248.8010	274.6652	(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												2676.9161	(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												2897.6942	(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												3879.8146	(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	2676.9161	0.2100	562.1524 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2897.6942	0.2100	608.5158 (264)
Space and water heating			1170.6682 (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			955.0903 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9400 (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	2676.9161	1.1300	3024.9152 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2897.6942	1.1300	3274.3944 (278)
Space and water heating			6299.3096 (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			4995.0017 (286)
Target Primary Energy Rate (TPER)			62.4400 (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	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	27.6795	27.7001	27.7203	27.8158	27.8337	27.9175	27.9175	27.9330	27.8851	27.8337	27.7974	27.7597		
alpha	2.8453	2.8467	2.8480	2.8544	2.8556	2.8612	2.8612	2.8622	2.8590	2.8556	2.8532	2.8506		
util living area	0.9495	0.9206	0.8787	0.7957	0.6761	0.5246	0.3983	0.4397	0.6335	0.8318	0.9238	0.9556	(86)	
MIT	18.8298	19.1743	19.6196	20.1674	20.5982	20.8598	20.9528	20.9363	20.7509	20.1796	19.4081	18.7537	(87)	
Th 2	20.0731	20.0737	20.0743	20.0772	20.0777	20.0802	20.0802	20.0807	20.0793	20.0777	20.0766	20.0755	(88)	
util rest of house	0.9426	0.9101	0.8627	0.7687	0.6337	0.4633	0.3220	0.3615	0.5744	0.8033	0.9119	0.9495	(89)	
MIT 2	18.0923	18.4290	18.8614	19.3830	19.7739	19.9933	20.0587	20.0500	19.9128	19.4069	18.6654	18.0194	(90)	
Living area fraction	18.4024	18.7424	19.1803	19.7128	20.1205	20.3576	20.4347	20.4227	20.2652	19.7318	18.9777	18.3281	(91)	
MIT	18.4024	18.7424	19.1803	19.7128	20.1205	20.3576	20.4347	20.4227	20.2652	19.7318	18.9777	18.3281	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.4024	18.7424	19.1803	19.7128	20.1205	20.3576	20.4347	20.4227	20.2652	19.7318	18.9777	18.3281	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	524.3196	598.0054	628.8647	630.6466	562.7027	424.3291	296.7269	307.4094	427.5226	504.1090	507.3180	502.3549	(94)	
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	1142.1270	1120.2344	1025.4379	871.4180	678.1864	462.3265	307.9172	322.8355	495.6266	735.4728	957.8708	1140.9084	(97)	
Space heating kWh	459.6487	350.9379	295.0505	173.3555	85.9199	0.0000	0.0000	0.0000	0.0000	172.1347	324.3980	475.0838	(98a)	
Space heating requirement - total per year (kWh/year)													2336.5290	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)	
Solar heating contribution - total per year (kWh/year)													0.0000	
Space heating kWh	459.6487	350.9379	295.0505	173.3555	85.9199	0.0000	0.0000	0.0000	0.0000	172.1347	324.3980	475.0838	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)													2336.5290	
Space heating per m2													(98c) / (4) =	29.2066 (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	754.7996	594.2039	609.9234	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8281	0.8801	0.8560	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	625.0334	522.9686	522.0817	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh						978.3372	937.7884	873.0146	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	254.3787	308.6259	261.0941	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						63.5947	77.1565	65.2735	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												206.0247 (107)
Energy for space heating												29.2066 (99)
Energy for space cooling												2.5753 (108)
Total												31.7819 (109)
Fabric Energy Efficiency (DFEE)												31.8 (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 0.50			40.0000	0.1300	5.2000		(28a)
External Wall 1 Render	98.8000	14.0900	84.7100	0.1800	15.2478		(29a)
External Roof 1 Horz	40.0000		40.0000	0.1100	4.4000		(30)
Total net area of external elements Aum(A, m2)			178.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 40.6739		(33)
Party Wall 1			30.9400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.8770 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E16 Corner (normal)				14.9700	0.0900	1.3473	
E5 Ground floor (normal)				19.8000	0.1600	3.1680	
E10 Eaves (insulation at ceiling level)				10.0000	0.0600	0.6000	
E12 Gable (insulation at ceiling level)				9.8000	0.0600	0.5880	
E6 Intermediate floor within a dwelling				19.8000	0.0000	0.0000	
E2 Other lintels (including other steel lintels)				10.3100	0.0500	0.5155	

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E3 Sill	8.4000	0.0500	0.4200	
E4 Jamb	25.2000	0.0500	1.2600	
P1 Party wall - Ground floor	6.2000	0.0800	0.4960	
P2 Party wall - Intermediate floor within a dwelling	6.2000	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	6.2000	0.1200	0.7440	
E18 Party wall between dwellings	4.9900	0.0600	0.2994	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.4382 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		50.1121 (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 =	89.2444	89.0038	88.7678	87.6597	87.4524	86.4872	86.4872	86.3085	86.8590	87.4524	87.8718	88.3103 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1156	1.1125	1.1096	1.0957	1.0932	1.0811	1.0811	1.0789	1.0857	1.0932	1.0984	1.1039 (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	(42b)
Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522	(42c)
Average daily hot water use (litres/day)													62.4644 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	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)	
Distribution loss (46)m = 0.15 x (45)m	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)	
Total = Sum(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)	
Total per year (kWh/year) = Sum(64)m =													881.7897 (64)
Electric shower(s)	52.4656	46.7473	51.0463	48.7128	49.6269	47.3393	48.9172	49.6269	48.7128	51.0463	50.0864	52.4656 (64a)	
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 (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	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.0636	129.6061	117.0636	120.9657	117.0636	120.9657	117.0636	117.0636	120.9657	117.0636	120.9657	117.0636	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)
Water heating gains (Table 5)	48.4565	47.2361	45.3522	41.8420	39.5270	37.1507	35.9841	37.4083	39.0098	41.6212	45.0142	48.0634	(72)
Total internal gains	444.9035	458.5028	438.3381	426.5140	404.8763	391.9091	377.1581	376.3052	387.5470	398.4723	421.1879	434.8282	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	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	25.1188	25.1867	25.2536	25.5729	25.6335	25.9196	25.9196	25.9732	25.8086	25.6335	25.5112	25.3845
alpha	2.6746	2.6791	2.6836	2.7049	2.7089	2.7280	2.7280	2.7315	2.7206	2.7089	2.7007	2.6923
util living area	0.9559	0.9339	0.9026	0.8364	0.7350	0.5893	0.4582	0.4994	0.6893	0.8613	0.9348	0.9606 (86)
MIT	18.5126	18.8406	19.2969	19.9096	20.4230	20.7810	20.9198	20.8966	20.6435	19.9761	19.1551	18.4643 (87)
Th 2	19.9881	19.9906	19.9930	20.0043	20.0064	20.0163	20.0163	20.0181	20.0125	20.0064	20.0021	19.9977 (88)
util rest of house	0.9494	0.9245	0.8883	0.8116	0.6928	0.5222	0.3688	0.4097	0.6283	0.8348	0.9239	0.9548 (89)
MIT 2	17.7235	18.0467	18.4942	19.0904	19.5665	19.8795	19.9799	19.9684	19.7724	19.1665	18.3684	17.6823 (90)
Living area fraction									FLA = Living area / (4) =			0.4205 (91)
MIT	18.0553	18.3805	18.8317	19.4349	19.9266	20.2586	20.3751	20.3587	20.1387	19.5069	18.6992	18.0112 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0553	18.3805	18.8317	19.4349	19.9266	20.2586	20.3751	20.3587	20.1387	19.5069	18.6992	18.0112 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9332	0.9055	0.8682	0.7952	0.6891	0.5397	0.4026	0.4422	0.6367	0.8192	0.9058	0.9396 (94)
Useful gains	508.7167	574.3267	600.9621	607.2269	553.3410	429.6609	307.2554	316.3483	426.6402	488.4939	491.0738	488.5979 (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	1227.5846	1199.8189	1094.6596	923.4827	719.4400	489.3943	326.4993	341.6663	524.5144	778.9290	1019.2421	1219.6669 (97)
Space heating kWh	534.8377	420.3308	367.3110	227.7042	123.5777	0.0000	0.0000	0.0000	0.0000	216.0838	380.2812	543.9153 (98a)
Space heating requirement - total per year (kWh/year)												2814.0415
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	534.8377	420.3308	367.3110	227.7042	123.5777	0.0000	0.0000	0.0000	0.0000	216.0838	380.2812	543.9153 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2814.0415
Space heating per m2											(98c) / (4) =	35.1755 (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	812.9801	640.0056	655.9447	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7604	0.8237	0.7964	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	618.1676	527.1503	522.4194	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	189.1259	236.2564	199.9989	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	47.2815	59.0641	49.9997	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												156.3453 (107)
Energy for space heating												35.1755 (99)
Energy for space cooling												1.9543 (108)
Total												37.1298 (109)
Fabric Energy Efficiency (TFEE)												37.1 (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)+(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 0.50			40.0000	0.1200	4.8000	110.0000	4400.0000	(28a)				
External Wall 1 Render	98.8000	14.0900	84.7100	0.1500	12.7065	9.0000	762.3900	(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)			178.8000					(31)				
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 36.9326			(33)				
Party Wall 1			30.9400	0.0000	0.0000	20.0000	618.8000	(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) = 8070.1600	(34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.8770	(35)				
List of Thermal Bridges												
K1 Element				Length	Psi-value		Total					
E16 Corner (normal)				14.9700	0.0300		0.4491					
E5 Ground floor (normal)				19.8000	0.0210		0.4158					
E10 Eaves (insulation at ceiling level)				10.0000	0.0440		0.4400					
E12 Gable (insulation at ceiling level)				9.8000	0.0510		0.4998					
E6 Intermediate floor within a dwelling				19.8000	0.0800		1.5840					
E2 Other lintels (including other steel lintels)				10.3100	0.0840		0.8660					
E3 Sill				8.4000	0.0430		0.3612					
E4 Jamb				25.2000	0.0340		0.8568					
P1 Party wall - Ground floor				6.2000	0.1490		0.9238					
P2 Party wall - Intermediate floor within a dwelling				6.2000	0.0000		0.0000					
P4 Party wall - Roof (insulation at ceiling level)				6.2000	0.4800		2.9760					
E18 Party wall between dwellings				4.9900	0.0395		0.1971					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.5696	(36)				
Point Thermal bridges							(36a) = 0.0000					
Total fabric heat loss							(33) + (36) + (36a) = 46.5023	(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 =	56.3289	56.2589	56.1890	55.8390	55.7691	55.4191	55.4191	55.3491	55.5591	55.7691	55.9090	56.0490 (39)
HLP	0.7041	0.7032	0.7024	0.6980	0.6971	0.6927	0.6927	0.6919	0.6945	0.6971	0.6989	0.7006 (40)
HLP (average)												0.6978
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)													36.9538 (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)	182.2624	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												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	3.6531	3.6564	3.6597	3.6764	3.6798	3.6967	3.6967	3.7001	3.6899	3.6798	3.6730	3.6664
util living area	0.8793	0.8308	0.7551	0.6391	0.5003	0.3610	0.2614	0.2893	0.4512	0.6769	0.8297	0.8928 (86)
Living	20.2072	20.3750	20.5746	20.7573	20.8618	20.9040	20.9137	20.9124	20.8880	20.7511	20.4567	20.1597
Non living	19.4038	19.6091	19.8500	20.0668	20.1832	20.2300	20.2384	20.2383	20.2139	20.0653	19.7164	19.3481
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	20.5944	20.3750	20.5746	20.7573	20.8618	20.9040	20.9137	20.9124	20.8880	20.7511	20.4567	20.2772 (87)
Th 2	20.3372	20.3380	20.3387	20.3426	20.3434	20.3473	20.3473	20.3480	20.3457	20.3434	20.3418	20.3403 (88)
util rest of house	0.8677	0.8160	0.7353	0.6134	0.4692	0.3257	0.2231	0.2490	0.4120	0.6471	0.8123	0.8822 (89)
MIT 2	19.9651	19.6091	19.8500	20.0668	20.1832	20.2300	20.2384	20.2383	20.2139	20.0653	19.7164	19.5269 (90)
Living area fraction	FLA = Living area / (4) =											0.4205 (91)
MIT	20.2297	19.9312	20.1547	20.3572	20.4686	20.5134	20.5223	20.5217	20.4974	20.3537	20.0277	19.8424 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2297	19.9312	20.1547	20.3572	20.4686	20.5134	20.5223	20.5217	20.4974	20.3537	20.0277	19.8424 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	615.7647	645.4870	640.6020	581.3211	469.7559	323.7229	216.5932	226.9606	346.0897	484.7492	555.0021	592.4450 (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	897.3036	845.6379	767.2425	639.7574	489.0140	327.7163	217.3729	228.1351	355.4315	543.9525	722.7752	876.7407 (97)	
Space heating kWh	209.4650	134.5014	94.2205	42.0741	14.3280	0.0000	0.0000	0.0000	0.0000	44.0473	120.7966	211.5160 (98a)	
Space heating requirement - total per year (kWh/year)												870.9489	
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	209.4650	134.5014	94.2205	42.0741	14.3280	0.0000	0.0000	0.0000	0.0000	44.0473	120.7966	211.5160 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												870.9489	
Space heating per m2												(98c) / (4) =	10.8869 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												400.1646 (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)	209.4650	134.5014	94.2205	42.0741	14.3280	0.0000	0.0000	0.0000	0.0000	44.0473	120.7966	211.5160	(98)
Space heating fuel (main heating system)	400.1646	400.1646	400.1646	400.1646	400.1646	0.0000	0.0000	0.0000	0.0000	400.1646	400.1646	400.1646	(210)
Space heating efficiency (main heating system 2)	52.3447	33.6115	23.5454	10.5142	3.5805	0.0000	0.0000	0.0000	0.0000	11.0073	30.1867	52.8572	(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	-41.4974	-61.2513	-92.0850	-106.5665	-116.9655	-109.5834	-108.1057	-101.1305	-87.8308	-71.0452	-46.2748	-35.4540	(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	-18.0126	-40.7668	-87.6957	-141.2160	-193.6745	-197.3280	-194.1408	-160.1991	-112.2678	-61.1258	-24.8757	-13.9504	(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												217.6477	(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												-533.2416	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	217.6477	16.4900	35.8901	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1150.2026	16.4900	189.6684	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	139.2889	16.4900	22.9687	(249)
Energy for lighting	182.6625	16.4900	30.1210	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-977.7901	16.4900	-161.2376	
PV Unit electricity exported	-1245.2532	5.5900	-69.6097	
Total			-230.8472	(252)
Total energy cost			47.8011	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.1377	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	97.7684	
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	217.6477	0.1569	34.1596	(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			196.1478	(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	-977.7901	0.1339	-130.9521	

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PV Unit electricity exported	-1245.2532	0.1242	-154.6263
Total			-285.5783 (269)
Total CO2, kg/year			-43.7456 (272)
CO2 emissions per m2			-0.5500 (273)
EI value			100.4690
EI rating			100 (274)
EI band			A

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

1. Overall dwelling characteristics

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

2. Ventilation rate

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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.20)			11.9700	1.1450	13.7061		(27)	
Door			2.1200	1.0000	2.1200		(26a)	
Floor 1 P/a 0.50			40.0000	0.1200	4.8000	110.0000	4400.0000 (28a)	
External Wall 1 Render	98.8000	14.0900	84.7100	0.1500	12.7065	9.0000	762.3900 (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)			178.8000				(31)	
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	36.9326			(33)	
Party Wall 1			30.9400	0.0000	0.0000	20.0000	618.8000 (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) =				8070.1600 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.8770 (35)	
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E16 Corner (normal)				14.9700	0.0300	0.4491		
E5 Ground floor (normal)				19.8000	0.0210	0.4158		
E10 Eaves (insulation at ceiling level)				10.0000	0.0440	0.4400		
E12 Gable (insulation at ceiling level)				9.8000	0.0510	0.4998		
E6 Intermediate floor within a dwelling				19.8000	0.0800	1.5840		
E2 Other lintels (including other steel lintels)				10.3100	0.0840	0.8660		
E3 Sill				8.4000	0.0430	0.3612		
E4 Jamb				25.2000	0.0340	0.8568		
P1 Party wall - Ground floor				6.2000	0.1490	0.9238		
P2 Party wall - Intermediate floor within a dwelling				6.2000	0.0000	0.0000		
P4 Party wall - Roof (insulation at ceiling level)				6.2000	0.4800	2.9760		
E18 Party wall between dwellings				4.9900	0.0395	0.1971		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.5696 (36)	

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util living area	0.8088	0.7593	0.6893	0.5848	0.4687	0.3347	0.2737	0.2753	0.3849	0.5715	0.7282	0.8140 (86)
Living	20.4751	20.5757	20.6864	20.7995	20.8708	20.9056	20.9121	20.9122	20.8999	20.8336	20.6765	20.4846
Non living	19.7231	19.8442	19.9734	20.1049	20.1831	20.2240	20.2306	20.2316	20.2170	20.1448	19.9682	19.7370
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	20.7315	20.5757	20.6864	20.7995	20.8708	20.9056	20.9121	20.9122	20.8999	20.8336	20.6765	20.5567 (87)
Th 2	20.3256	20.3287	20.3295	20.3333	20.3341	20.3403	20.3411	20.3418	20.3380	20.3318	20.3303	20.3264 (88)
util rest of house	0.7902	0.7383	0.6653	0.5575	0.4375	0.3018	0.2367	0.2374	0.3459	0.5352	0.7012	0.7949 (89)
MIT 2	20.0854	19.8442	19.9734	20.1049	20.1831	20.2240	20.2306	20.2316	20.2170	20.1448	19.9682	19.8432 (90)
Living area fraction									fLA = Living area / (4) =			0.4205 (91)
MIT	20.3571	20.1518	20.2732	20.3969	20.4723	20.5106	20.5172	20.5178	20.5042	20.4344	20.2660	20.1433 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3571	20.1518	20.2732	20.3969	20.4723	20.5106	20.5172	20.5178	20.5042	20.4344	20.2660	20.1433 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.7912	0.7325	0.6632	0.5602	0.4441	0.3103	0.2467	0.2476	0.3557	0.5409	0.6985	0.7893 (94)
Useful gains	593.4620	608.4544	609.5991	569.4615	463.9349	333.5860	240.5851	234.7424	315.9083	428.0728	509.8193	558.1887 (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	766.4124	733.8209	694.2240	611.9583	479.6083	336.8872	241.6728	235.8121	320.9101	456.5080	596.1333	718.8380 (97)
Space heating kWh	128.6751	84.2463	62.9609	30.5976	11.6610	0.0000	0.0000	0.0000	0.0000	21.1558	62.1460	119.5231 (98a)
Space heating requirement - total per year (kWh/year)												520.9660
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	128.6751	84.2463	62.9609	30.5976	11.6610	0.0000	0.0000	0.0000	0.0000	21.1558	62.1460	119.5231 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												520.9660
Space heating per m2												6.5121 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												400.4010 (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	128.6751	84.2463	62.9609	30.5976	11.6610	0.0000	0.0000	0.0000	0.0000	21.1558	62.1460	119.5231 (98)
Space heating efficiency (main heating system 1)	400.4010	400.4010	400.4010	400.4010	400.4010	0.0000	0.0000	0.0000	0.0000	400.4010	400.4010	400.4010 (210)
Space heating fuel (main heating system)	32.1366	21.0405	15.7245	7.6417	2.9123	0.0000	0.0000	0.0000	0.0000	5.2837	15.5210	29.8509 (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	11.8300	11.4484	11.8300	11.4484	11.8300 (231)
Lighting	22.6332	18.1572	16.3485	11.9776	9.2519	7.5588	8.4399	10.9704	14.2495	18.6961	21.1172	23.2622 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-52.7961	-68.4144	-100.7676	-116.6437	-123.5830	-119.8836	-113.2134	-110.3132	-98.0808	-80.4481	-56.3855	-44.1982 (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	-28.5975	-51.8341	-108.2547	-177.4244	-225.0539	-255.5678	-220.8712	-201.4735	-145.8547	-80.1996	-36.9457	-21.3233 (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												130.1111 (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	-1035.8629 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	130.1111	25.1600	32.7359 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1150.2026	25.1600	289.3910 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	139.2889	25.1600	35.0451 (249)
Energy for lighting	182.6625	25.1600	45.9579 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.7277	25.1600	-272.9175
PV Unit electricity exported	-1553.4003	5.8100	-90.2526
Total			-363.1700 (252)
Total energy cost			39.9599 (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	130.1111	0.1569	20.4157 (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			182.4039 (265)
Pumps, fans and electric keep-hot	139.2889	0.1387	19.3211 (267)
Energy for lighting	182.6625	0.1443	26.3638 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.7277	0.1345	-145.8956
PV Unit electricity exported	-1553.4003	0.1251	-194.2795
Total			-340.1751 (269)
Total CO2, kg/year			-112.0863 (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	130.1111	1.5809	205.6878 (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			1954.8603 (279)
Pumps, fans and electric keep-hot	139.2889	1.5128	210.7162 (281)
Energy for lighting	182.6625	1.5338	280.1739 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1084.7277	1.4971	-1623.9112
PV Unit electricity exported	-1553.4003	0.4591	-713.1146
Total			-2337.0258 (283)
Total Primary energy kWh/year			108.7245 (286)

SAP 10 EPC IMPROVEMENTS

SEC1 - ASHP ROI TF 0.15 improv

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

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.7	-£ 69	-40 kg (35.9%)

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

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

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

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

	Current	Potential	Saving
Electricity	£403	£322	£81
Space heating	£68	£88	-£20
Water heating	£289	£188	£102
Lighting	£46	£46	£0
Generated (PV)	-£363	-£351	-£12
Total cost of fuels	£40	-£29	£69
Total cost of uses	£40	-£29	£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												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												81.0000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.1492	0.1481	0.1471	0.1417	0.1407	0.1354	0.1354	0.1343	0.1375	0.1407	0.1428	0.1449 (25)

3. Heat losses and heat loss parameter

Element	Gross 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 0.50			40.0000	0.1200	4.8000	110.0000	4400.0000 (28a)
External Wall 1 Render	98.8000	14.0900	84.7100	0.1500	12.7065	9.0000	762.3900 (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)			178.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.9326	(33)
Party Wall 1			30.9400	0.0000	0.0000	20.0000	618.8000 (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) =	8070.1600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		100.8770 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	14.9700	0.0300	0.4491
E5 Ground floor (normal)	19.8000	0.0210	0.4158
E10 Eaves (insulation at ceiling level)	10.0000	0.0440	0.4400
E12 Gable (insulation at ceiling level)	9.8000	0.0510	0.4998
E6 Intermediate floor within a dwelling	19.8000	0.0800	1.5840
E2 Other lintels (including other steel lintels)	10.3100	0.0840	0.8660
E3 Sill	8.4000	0.0430	0.3612
E4 Jamb	25.2000	0.0340	0.8568
P1 Party wall - Ground floor	6.2000	0.1490	0.9238
P2 Party wall - Intermediate floor within a dwelling	6.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.2000	0.4800	2.9760
E18 Party wall between dwellings	4.9900	0.0395	0.1971
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.5696 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	46.5023 (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 =	56.3289	56.2589	56.1890	55.8390	55.7691	55.4191	55.4191	55.3491	55.5591	55.7691	55.9090	56.0490 (39)
HLP	0.7041	0.7032	0.7024	0.6980	0.6971	0.6927	0.6927	0.6919	0.6945	0.6971	0.6989	0.7006 (40)
HLP (average)												0.6978
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hot water usage for other uses	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)
Average daily hot water use (litres/day)	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)
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 (43)
Water storage loss:												250.0000 (47)
Store volume												1.6000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8640 (55)
Enter (49) or (54) in (55)												
Total storage loss	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (56)
If cylinder contains dedicated solar storage	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	232.8031	205.8623	217.4006	186.0098	174.2969	156.2465	153.8821	161.3320	169.7954	193.6317	206.9455	230.3265 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												599.3060 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												599.3060
Solar input	-0.0000	-16.2478	-57.1859	-77.6199	-99.9149	-91.8832	-91.1420	-80.4420	-56.3516	-28.5186	-0.0000	-0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	232.8031	189.6145	160.2146	108.3899	74.3819	64.3633	62.7401	80.8900	113.4438	165.1131	206.9455	230.3265 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	100.8037	89.5817	95.0299	81.3329	75.3691	68.7003	68.4724	71.3845	76.5731	87.1267	91.4513	99.9802 (65)

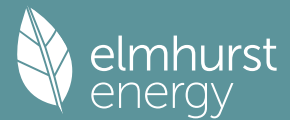
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	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	39.7968	39.8463	39.8959	40.1459	40.1963	40.4501	40.4501	40.5013	40.3482	40.1963	40.0957	39.9956	
alpha	3.6531	3.6564	3.6597	3.6764	3.6798	3.6967	3.6967	3.7001	3.6899	3.6798	3.6730	3.6664	
util living area	0.8793	0.8308	0.7558	0.6428	0.5063	0.3661	0.2654	0.2935	0.4542	0.6778	0.8297	0.8928 (86)	
Living	20.2072	20.3750	20.5734	20.7542	20.8596	20.9034	20.9135	20.9122	20.8873	20.7503	20.4567	20.1597	
Non living	19.4038	19.6091	19.8487	20.0635	20.1810	20.2295	20.2383	20.2381	20.2134	20.0645	19.7164	19.3481	
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	20.5944	20.3750	20.5734	20.7542	20.8596	20.9034	20.9135	20.9122	20.8873	20.7503	20.4567	20.2772 (87)	
Th 2	20.3372	20.3380	20.3387	20.3426	20.3434	20.3473	20.3473	20.3480	20.3457	20.3434	20.3418	20.3403 (88)	
util rest of house	0.8677	0.8160	0.7361	0.6170	0.4751	0.3303	0.2265	0.2527	0.4148	0.6480	0.8123	0.8822 (89)	
MIT 2	19.9651	19.6091	19.8487	20.0635	20.1810	20.2295	20.2383	20.2381	20.2134	20.0645	19.7164	19.5269 (90)	
Living area fraction									FLA = Living area / (4) =				
MIT	20.2297	19.9312	20.1534	20.3539	20.4664	20.5129	20.5222	20.5216	20.4968	20.3529	20.0277	19.8424 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2297	19.9312	20.1534	20.3539	20.4664	20.5129	20.5222	20.5216	20.4968	20.3529	20.0277	19.8424 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8657	0.8061	0.7303	0.6175	0.4810	0.3395	0.2370	0.2636	0.4240	0.6484	0.8034	0.8735 (94)
Useful gains	615.7647	645.4870	640.1203	580.0360	468.8621	323.5034	216.5454	226.8905	345.8518	484.4386	555.0021	592.4450 (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	897.3036	845.6379	767.1722	639.5772	488.8924	327.6867	217.3662	228.1254	355.3992	543.9084	722.7752	876.7407 (97)
Space heating kWh	209.4650	134.5014	94.5266	42.8697	14.9025	0.0000	0.0000	0.0000	0.0000	44.2455	120.7966	211.5160 (98a)
Space heating requirement - total per year (kWh/year)												872.8234
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	209.4650	134.5014	94.5266	42.8697	14.9025	0.0000	0.0000	0.0000	0.0000	44.2455	120.7966	211.5160 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												872.8234
Space heating per m2										(98c) / (4) =		10.9103 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													400.1646 (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	209.4650	134.5014	94.5266	42.8697	14.9025	0.0000	0.0000	0.0000	0.0000	44.2455	120.7966	211.5160 (98)	
Space heating efficiency (main heating system 1)	400.1646	400.1646	400.1646	400.1646	400.1646	0.0000	0.0000	0.0000	0.0000	400.1646	400.1646	400.1646 (210)	
Space heating fuel (main heating system)	52.3447	33.6115	23.6219	10.7130	3.7241	0.0000	0.0000	0.0000	0.0000	11.0568	30.1867	52.8572 (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	-41.6088	-61.1794	-90.3869	-101.9827	-108.1333	-100.5251	-99.1500	-94.5157	-84.8795	-70.5439	-46.4441	-35.5436 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-17.9012	-40.8387	-89.3939	-145.7998	-202.5068	-206.3863	-203.0964	-166.8139	-115.2191	-61.6270	-24.7063	-13.8608 (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												218.1161 (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	-777.5941 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	218.1161	16.4900	35.9673 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	825.3817	16.4900	136.1054 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	139.2889	16.4900	22.9687 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	182.6625	16.4900	30.1210 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-934.8931	16.4900	-154.1639
PV Unit electricity exported	-1288.1502	5.5900	-72.0076
Total			-226.1715 (252)
Total energy cost			12.1831 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.0351 (257)
SAP value		99.4312
SAP rating (Section 12)		99 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	218.1161	0.1569	34.2254 (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			154.8895 (265)
Pumps, fans and electric keep-hot	219.2889	0.1387	30.4181 (267)
Energy for lighting	182.6625	0.1443	26.3638 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-934.8931	0.1344	-125.6676
PV Unit electricity exported	-1288.1502	0.1238	-159.5027
Total			-285.1704 (269)
Total CO2, kg/year			-73.4990 (272)
CO2 emissions per m2			-0.9200 (273)
EI value			100.7879
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 0.50			40.0000	0.1200	4.8000	110.0000	4400.0000 (28a)
External Wall 1 Render	98.8000	14.0900	84.7100	0.1500	12.7065	9.0000	762.3900 (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)			178.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.9326		(33)
Party Wall 1			30.9400	0.0000	0.0000	20.0000	618.8000 (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) = 8070.1600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.8770 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	14.9700	0.0300	0.4491
E5 Ground floor (normal)	19.8000	0.0210	0.4158
E10 Eaves (insulation at ceiling level)	10.0000	0.0440	0.4400
E12 Gable (insulation at ceiling level)	9.8000	0.0510	0.4998
E6 Intermediate floor within a dwelling	19.8000	0.0800	1.5840
E2 Other lintels (including other steel lintels)	10.3100	0.0840	0.8660
E3 Sill	8.4000	0.0430	0.3612
E4 Jamb	25.2000	0.0340	0.8568
P1 Party wall - Ground floor	6.2000	0.1490	0.9238
P2 Party wall - Intermediate floor within a dwelling	6.2000	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.2000	0.4800	2.9760
E18 Party wall between dwellings	4.9900	0.0395	0.1971
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.5696 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 46.5023 (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	57.3787	57.0988	57.0288	56.6789	56.6089	56.0490	55.9790	55.9090	56.2589	56.8188	56.9588	57.3087 (39)
Average = Sum(39)m / 12 =												56.6730

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7172	0.7137	0.7129	0.7085	0.7076	0.7006	0.6997	0.6989	0.7032	0.7102	0.7120	0.7164 (40)
HLP (average)												0.7084
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	Specific data or Table 6b	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)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
tau	39.0687	39.2602	39.3084	39.5511	39.6000	39.9956	40.0456	40.0957	39.8463	39.4537	39.3567	39.1164
alpha	3.6046	3.6173	3.6206	3.6367	3.6400	3.6664	3.6697	3.6730	3.6564	3.6302	3.6238	3.6078
util living area	0.8088	0.7593	0.6900	0.5882	0.4742	0.3389	0.2776	0.2791	0.3873	0.5723	0.7282	0.8140 (86)
Living	20.4751	20.5757	20.6856	20.7973	20.8691	20.9051	20.9119	20.9120	20.8995	20.8332	20.6765	20.4846
Non living	19.7231	19.8442	19.9725	20.1025	20.1815	20.2236	20.2305	20.2314	20.2168	20.1444	19.9682	19.7370
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	20.7315	20.5757	20.6856	20.7973	20.8691	20.9051	20.9119	20.9120	20.8995	20.8332	20.6765	20.5567 (87)
Th 2	20.3256	20.3287	20.3295	20.3333	20.3341	20.3403	20.3411	20.3418	20.3380	20.3318	20.3303	20.3264 (88)
util rest of house	0.7902	0.7393	0.6660	0.5608	0.4428	0.3057	0.2401	0.2406	0.3481	0.5360	0.7012	0.7949 (89)
MIT 2	20.0854	19.8442	19.9725	20.1025	20.1815	20.2236	20.2305	20.2314	20.2168	20.1444	19.9682	19.8432 (90)
Living area fraction												FLA = Living area / (4) = 0.4205 (91)
MIT	20.3571	20.1518	20.2723	20.3947	20.4706	20.5102	20.5170	20.5176	20.5039	20.4341	20.2660	20.1433 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3571	20.1518	20.2723	20.3947	20.4706	20.5102	20.5170	20.5176	20.5039	20.4341	20.2660	20.1433 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.7912	0.7325	0.6639	0.5634	0.4493	0.3143	0.2502	0.2509	0.3580	0.5417	0.6985	0.7893 (94)

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Useful gains	593.4620	608.4544	609.2546	568.5366	463.2347	333.4219	240.5226	234.6838	315.7852	427.9115	509.8193	558.1887 (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												
Space heating kWh	766.4124	733.8209	694.1742	611.8291	479.5126	336.8649	241.6641	235.8039	320.8932	456.4854	596.1333	718.8380 (97)
Space heating requirement - total per year (kWh/year)	128.6751	84.2463	63.1802	31.1705	12.1107	0.0000	0.0000	0.0000	0.0000	21.2590	62.1460	119.5231 (98a)
Solar heating kWh												522.3111
Solar heating contribution - total per year (kWh/year)	-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 kWh												0.0000
Space heating requirement after solar contribution - total per year (kWh/year)	128.6751	84.2463	63.1802	31.1705	12.1107	0.0000	0.0000	0.0000	0.0000	21.2590	62.1460	119.5231 (98c)
Space heating per m2												522.3111 (98c) / (4) = 6.5289 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												400.4010 (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	128.6751	84.2463	63.1802	31.1705	12.1107	0.0000	0.0000	0.0000	0.0000	21.2590	62.1460	119.5231 (98)
Space heating efficiency (main heating system 1)	400.4010	400.4010	400.4010	400.4010	400.4010	0.0000	0.0000	0.0000	0.0000	400.4010	400.4010	400.4010 (210)
Space heating fuel (main heating system)	32.1366	21.0405	15.7792	7.7848	3.0247	0.0000	0.0000	0.0000	0.0000	5.3094	15.5210	29.8509 (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	-52.8517	-68.0303	-97.9527	-109.5803	-112.2899	-106.3267	-102.2739	-100.5918	-92.9938	-79.1337	-56.3940	-44.3379 (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	-28.5419	-52.2183	-111.0696	-184.4878	-236.3470	-269.1247	-231.8107	-211.1949	-150.9417	-81.5140	-36.9371	-21.1836 (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												130.4470 (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												-1359.0056 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	130.4470	25.1600	32.8205 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	746.7240	25.1600	187.8758 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	139.2889	25.1600	35.0451 (249)
Pump for solar water heating	80.0000	25.1600	20.1280 (249)
Energy for lighting	182.6625	25.1600	45.9579 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1022.7567	25.1600	-257.3256
PV Unit electricity exported	-1615.3712	5.8100	-93.8531
Total			-351.1787 (252)

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Total energy cost -29.3515 (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	130.4470	0.1569	20.4629 (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			130.4983 (265)
Pumps, fans and electric keep-hot	219.2889	0.1387	30.4181 (267)
Energy for lighting	182.6625	0.1443	26.3638 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1022.7567	0.1351	-138.2066
PV Unit electricity exported	-1615.3712	0.1247	-201.4312
Total			-339.6378 (269)
Total CO2, kg/year			-152.3576 (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	130.4470	1.5807	206.1984 (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			1360.0067 (279)
Pumps, fans and electric keep-hot	219.2889	1.5128	331.7402 (281)
Energy for lighting	182.6625	1.5338	280.1739 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1022.7567	1.4994	-1533.5677
PV Unit electricity exported	-1615.3712	0.4577	-739.3402
Total			-2272.9078 (283)
Total Primary energy kWh/year			-300.9871 (286)