Full SAP Calculation Printout

Property Reference	001_Copy	**Issued on Date**	06/03/2024
Assessment Reference	00001_Copy	**Prop Type Ref**	
Property	3 Gyles Court, Newquay, TR7 3ER		

SAP Rating	100 A	**DER**	-1.57	**TER**	9.43
Environmental	101 A	**% DER < TER**			116.65
CO_2 Emissions (t/year)	-0.21	**DFEE**	37.36	**TFEE**	42.52
Compliance Check	See BREL	**% DFEE < TFEE**			12.14
% DPER < TPER	90.66	**DPER**	4.71	**TPER**	50.45

Assessor Details	Mr. David Barsted	**Assessor ID**	AV66-0001
Client	SAP04579, Mr Shoesmith, Mrs Shoesmith		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	68.9600 (1b)	x	2.3000 (2b)	=	158.6080	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	158.6080	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		0.6000 (17)
Infiltration rate		0.0300 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0300 (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	0.0382	0.0375	0.0367	0.0330	0.0323	0.0285	0.0285	0.0278	0.0300	0.0323	0.0338	0.0352	(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) =	79.2000 (23c)

Effective ac	0.1422	0.1415	0.1407	0.1370	0.1362	0.1325	0.1325	0.1317	0.1340	0.1362	0.1377	0.1392	(25)

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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)			8.8400	1.1450	10.1221			(27)
Front Door			2.0500	1.2000	2.4600			(26)
French Doors (Uw = 1.20)			3.2000	1.1450	3.6641			(27)
Heatloss Floor 1			68.9600	0.1100	7.5856	110.0000	7585.6000	(28a)
External Wall 1	81.4000	14.0900	67.3100	0.1600	10.7696	190.0000	12788.9000	(29a)
Cold Roof	68.9600		68.9600	0.1100	7.5856	9.0000	620.6400	(30)
Total net area of external elements Aum(A, m2)			219.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.1871			(33)
Internal Wall 1			62.7400			9.0000	564.6600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21559.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	312.6421 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.4000	0.0280	0.2632

E3 Sill	5.6000	0.0270	0.1512	
E4 Jamb	18.9800	0.0210	0.3986	
E5 Ground floor (normal)	35.3900	0.1620	5.7332	
E10 Eaves (insulation at ceiling level)	23.8000	0.0720	1.7136	
E12 Gable (insulation at ceiling level)	11.5900	0.1740	2.0167	
E16 Corner (normal)	9.2000	0.0480	0.4416	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7180 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.9051 (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	7.4455	7.4062	7.3669	7.1707	7.1314	6.9351	6.9351	6.8959	7.0136	7.1314	7.2099	7.2884	(38)
Heat transfer coeff	60.3505	60.3113	60.2720	60.0757	60.0365	59.8402	59.8402	59.8010	59.9187	60.0365	60.1150	60.1935	(39)

Average = Sum(39)m / 12 = 60.0659

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8752	0.8746	0.8740	0.8712	0.8706	0.8678	0.8678	0.8672	0.8689	0.8706	0.8717	0.8729	(40)
HLP (average)												0.8710	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2206 (42)

Hot water usage for mixer showers

108.5082	106.8775	104.5013	99.9549	96.5997	92.8581	90.7313	93.0895	95.6746	99.6920	104.3361	108.0924	(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	(42b)

Hot water usage for other uses

39.3382	37.9077	36.4772	35.0468	33.6163	32.1858	32.1858	33.6163	35.0468	36.4772	37.9077	39.3382	(42c)

Average daily hot water use (litres/day) 135.8029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.8464	144.7852	140.9785	135.0016	130.2160	125.0439	122.9171	126.7058	130.7214	136.1692	142.2438	147.4306	(44)
Energy conte	234.1525	206.1722	216.6788	184.8105	175.2958	153.7560	148.6576	156.8883	161.1925	184.7803	202.6523	230.8407	(45)
Energy content (annual)										Total = Sum(45)m =		2255.8776	
Distribution loss (46)m = 0.15 x (45)m	35.1229	30.9258	32.5018	27.7216	26.2944	23.0634	22.2986	23.5332	24.1789	27.7171	30.3979	34.6261	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6210 (55)

Total storage loss

19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(56)

If cylinder contains dedicated solar storage

19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(57)
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)
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)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

276.6659	244.5714	259.1922	225.9525	217.8092	194.8980	191.1710	199.4017	202.3345	227.2937	243.7943	273.3541	(62)
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)
-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)
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)
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)

WWHRS
PV diverter
Solar input
FGHRS

Output from w/h

276.6659	244.5714	259.1922	225.9525	217.8092	194.8980	191.1710	199.4017	202.3345	227.2937	243.7943	273.3541	(64)

Total per year (kWh/year) = Sum(64)m = 2756.4386 (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

111.8664	99.2716	106.0564	94.3631	92.2966	84.0375	83.4394	86.1761	86.5101	95.4502	100.2955	110.7653	(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	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0898	20.5081	16.6783	12.6266	9.4385	7.9684	8.6101	11.1918	15.0216	19.0733	22.2614	23.7315	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	290.8324	293.8503	286.2452	270.0549	249.6175	230.4092	217.5770	214.5590	222.1641	238.3544	258.7918	278.0001	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	(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)	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	(71)
Water heating gains (Table 5)	150.3581	147.7256	142.5489	131.0598	124.0545	116.7187	112.1497	115.8281	120.1529	128.2933	139.2993	148.8780	(72)
Total internal gains	559.2368	557.0406	540.4290	508.6978	478.0671	450.0529	433.2933	436.5354	452.2951	480.6776	515.3091	545.5662	(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	
East	5.0900	19.6403	0.6300	0.7000	0.7700	30.5518	(76)
South	2.6200	46.7521	0.6300	0.7000	0.7700	37.4347	(78)
West	1.1300	19.6403	0.6300	0.7000	0.7700	6.7826	(80)
South	3.2000	46.7521	0.6300	0.7000	0.7700	45.7217	(78)

Solar gains	120.4908	209.2228	293.7570	371.4868	419.2969	416.6974	401.6326	366.5430	321.1074	233.5534	145.1203	102.5568	(83)
Total gains	679.7276	766.2634	834.1860	880.1846	897.3639	866.7503	834.9259	803.0784	773.4026	714.2310	660.4294	648.1230	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	99.2341	99.2987	99.3634	99.6880	99.7532	100.0804	100.0804	100.1461	99.9493	99.7532	99.6229	99.4930	
alpha	7.6156	7.6199	7.6242	7.6459	7.6502	7.6720	7.6720	7.6764	7.6633	7.6502	7.6415	7.6329	
util living area	0.9832	0.9601	0.9035	0.7847	0.6159	0.4414	0.3153	0.3425	0.5325	0.8170	0.9600	0.9877	(86)
Living	20.6143	20.7202	20.8371	20.9225	20.9535	20.9590	20.9594	20.9594	20.9578	20.9178	20.7545	20.5822	
Non living	19.7527	19.8820	20.0177	20.1089	20.1365	20.1428	20.1429	20.1435	20.1411	20.1072	19.9278	19.7145	
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	20.8027	20.7202	20.8371	20.9225	20.9535	20.9590	20.9594	20.9594	20.9578	20.9178	20.7545	20.6407	(87)
Th 2	20.1887	20.1892	20.1896	20.1921	20.1926	20.1950	20.1950	20.1955	20.1940	20.1926	20.1916	20.1906	(88)
util rest of house	0.9777	0.9483	0.8791	0.7438	0.5649	0.3861	0.2577	0.2826	0.4713	0.7707	0.9460	0.9835	(89)
MIT 2	20.0149	19.8820	20.0177	20.1089	20.1365	20.1428	20.1429	20.1435	20.1411	20.1072	19.9278	19.8003	(90)
Living area fraction										fLA = Living area / (4) =		0.5006	(91)
MIT	20.4092	20.3016	20.4279	20.5162	20.5455	20.5514	20.5517	20.5519	20.5499	20.5130	20.3416	20.2210	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4092	20.3016	20.4279	20.5162	20.5455	20.5514	20.5517	20.5519	20.5499	20.5130	20.3416	20.2210	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9793	0.9501	0.8868	0.7607	0.5874	0.4106	0.2832	0.3091	0.4985	0.7899	0.9489	0.9837	(94)
Useful gains	665.6864	728.0358	739.7683	669.5391	527.0933	355.9030	236.4571	248.2670	385.5192	564.1646	626.7105	637.5443	(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	972.2011	928.8890	839.4611	697.8494	531.0537	356.1313	236.4677	248.2880	386.4710	595.1400	796.0206	964.3584	(97)
Space heating kWh	228.0469	134.9734	74.1715	20.3834	2.9465	0.0000	0.0000	0.0000	0.0000	23.0457	121.9032	243.1497	(98a)
Space heating requirement - total per year (kWh/year)												848.6204	
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	228.0469	134.9734	74.1715	20.3834	2.9465	0.0000	0.0000	0.0000	0.0000	23.0457	121.9032	243.1497	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												848.6204	
Space heating per m2											(98c) / (4) =	12.3060	(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 %) 258.1154 (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	228.0469	134.9734	74.1715	20.3834	2.9465	0.0000	0.0000	0.0000	0.0000	23.0457	121.9032	243.1497	(98)
Space heating efficiency (main heating system 1)	258.1154	258.1154	258.1154	258.1154	258.1154	0.0000	0.0000	0.0000	0.0000	258.1154	258.1154	258.1154	(210)
Space heating fuel (main heating system)	88.3508	52.2919	28.7358	7.8970	1.1416	0.0000	0.0000	0.0000	0.0000	8.9285	47.2282	94.2019	(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	276.6659	244.5714	259.1922	225.9525	217.8092	194.8980	191.1710	199.4017	202.3345	227.2937	243.7943	273.3541	(64)
Efficiency of water heater												280.5803	(216)
(217)m	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	(217)
Fuel for water heating, kWh/month	98.6049	87.1663	92.3772	80.5304	77.6281	69.4625	68.1342	71.0676	72.1129	81.0085	86.8893	97.4246	(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	21.9810	19.8538	21.9810	21.2719	21.9810	21.2719	21.9810	21.9810	21.2719	21.9810	21.2719	21.9810	(231)
Lighting	20.2103	16.2135	14.5984	10.6954	8.2615	6.7497	7.5364	9.7961	12.7241	16.6948	18.8567	20.7720	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.6719	-66.5262	-102.3257	-118.0747	-128.1648	-119.8758	-118.0199	-110.9998	-96.0567	-76.4192	-48.8721	-36.8667	(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	-19.6746	-49.1484	-118.9607	-210.1087	-302.0787	-312.6378	-304.8044	-242.3852	-158.1577	-78.2669	-28.2848	-14.7522	(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												328.7756	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												280.5803	
Water heating fuel used												982.4064	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.3375)

mechanical ventilation fans (SFP = 1.3375)	258.8086	(230a)
Total electricity for the above, kWh/year	258.8086	(231)
Electricity for lighting (calculated in Appendix L)	163.1089	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2905.1336	(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	-1172.0340	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	328.7756	16.4900	54.2151	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	982.4064	16.4900	161.9988	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	258.8086	16.4900	42.6775	(249)
Energy for lighting	163.1089	16.4900	26.8967	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1065.8734	16.4900	-175.7625	
PV Unit electricity exported	-1839.2601	5.5900	-102.8146	
Total			-278.5772	(252)
Total energy cost			7.2109	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.0228	(257)
SAP value		99.6307	
SAP rating (Section 12)		100	(258)
SAP band		A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	328.7756	0.1586	52.1451	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	982.4064	0.1411	138.5891	(264)
Space and water heating			190.7341	(265)
Pumps, fans and electric keep-hot	258.8086	0.1387	35.8999	(267)
Energy for lighting	163.1089	0.1443	23.5417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1065.8734	0.1338	-142.6391	
PV Unit electricity exported	-1839.2601	0.1222	-224.7353	
Total			-367.3744	(269)
Total CO2, kg/year			-117.1987	(272)
CO2 emissions per m2			-1.7000	(273)
EI value			101.3781	
EI rating			101	(274)
EI band			A	

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		68.9600	(1b) x	2.3000	(2b) =	158.6080	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.9600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		158.6080	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)

Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 0.6000 (17)
Infiltration rate 0.0300 (18)
Number of sides sheltered 0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.0300 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	6.6000	6.2000	5.9000	5.2000	5.2000	4.7000	4.7000	4.7000	5.1000	6.0000	6.2000	6.6000	(22)
Wind factor	1.6500	1.5500	1.4750	1.3000	1.3000	1.1750	1.1750	1.1750	1.2750	1.5000	1.5500	1.6500	(22a)
Adj infilt rate	0.0495	0.0465	0.0442	0.0390	0.0390	0.0352	0.0352	0.0352	0.0382	0.0450	0.0465	0.0495	(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) = 79.2000 (23c)

Effective ac	0.1535	0.1505	0.1482	0.1430	0.1430	0.1392	0.1392	0.1392	0.1422	0.1490	0.1505	0.1535	(25)

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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)			8.8400	1.1450	10.1221			(27)
Front Door			2.0500	1.2000	2.4600			(26)
French Doors (Uw = 1.20)			3.2000	1.1450	3.6641			(27)
Heatloss Floor 1			68.9600	0.1100	7.5856	110.0000	7585.6000	(28a)
External Wall 1	81.4000	14.0900	67.3100	0.1600	10.7696	190.0000	12788.9000	(29a)
Cold Roof	68.9600		68.9600	0.1100	7.5856	9.0000	620.6400	(30)
Total net area of external elements Aum(A, m2)			219.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.1871			(33)
Internal Wall 1			62.7400			9.0000	564.6600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 21559.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 312.6421 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.4000	0.0280	0.2632
E3 Sill	5.6000	0.0270	0.1512
E4 Jamb	18.9800	0.0210	0.3986
E5 Ground floor (normal)	35.3900	0.1620	5.7332
E10 Eaves (insulation at ceiling level)	23.8000	0.0720	1.7136
E12 Gable (insulation at ceiling level)	11.5900	0.1740	2.0167
E16 Corner (normal)	9.2000	0.0480	0.4416

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7180 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.9051 (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	8.0343	7.8773	7.7595	7.4847	7.4847	7.2884	7.2884	7.2884	7.4455	7.7988	7.8773	8.0343	(38)
Heat transfer coeff	60.9394	60.7823	60.6646	60.3898	60.3898	60.1935	60.1935	60.1935	60.3505	60.7038	60.7823	60.9394	(39)
Average = Sum(39)m / 12 =												60.5435	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8837	0.8814	0.8797	0.8757	0.8757	0.8729	0.8729	0.8729	0.8752	0.8803	0.8814	0.8837	(40)
HLP (average)												0.8780	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2206 (42)
Hot water usage for mixer showers

108.5082	106.8775	104.5013	99.9549	96.5997	92.8581	90.7313	93.0895	95.6746	99.6920	104.3361	108.0924	(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	(42b)

Hot water usage for other uses

39.3382	37.9077	36.4772	35.0468	33.6163	32.1858	32.1858	33.6163	35.0468	36.4772	37.9077	39.3382	(42c)

Average daily hot water use (litres/day) 135.8029 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.8464	144.7852	140.9785	135.0016	130.2160	125.0439	122.9171	126.7058	130.7214	136.1692	142.2438	147.4306	(44)
Energy conte	234.1525	206.1722	216.6788	184.8105	175.2958	153.7560	148.6576	156.8883	161.1925	184.7803	202.6523	230.8407	(45)
Energy content (annual)										Total = Sum(45)m =		2255.8776	
Distribution loss (46)m = 0.15 x (45)m	35.1229	30.9258	32.5018	27.7216	26.2944	23.0634	22.2986	23.5332	24.1789	27.7171	30.3979	34.6261	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1500 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6210 (55)
Total storage loss

19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(56)

If cylinder contains dedicated solar storage

19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(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

276.6659	244.5714	259.1922	225.9525	217.8092	194.8980	191.1710	199.4017	202.3345	227.2937	243.7943	273.3541	(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													

276.6659	244.5714	259.1922	225.9525	217.8092	194.8980	191.1710	199.4017	202.3345	227.2937	243.7943	273.3541	(64)

											Total per year (kWh/year) = Sum(64)m =	2756.4386	(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													
111.8664	99.2716	106.0564	94.3631	92.2966	84.0375	83.4394	86.1761	86.5101	95.4502	100.2955	110.7653		(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
23.0898	20.5081	16.6783	12.6266	9.4385	7.9684	8.6101	11.1918	15.0216	19.0733	22.2614	23.7315		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
290.8324	293.8503	286.2452	270.0549	249.6175	230.4092	217.5770	214.5590	222.1641	238.3544	258.7918	278.0001		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443		(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)													
-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245		(71)
Water heating gains (Table 5)													
150.3581	147.7256	142.5489	131.0598	124.0545	116.7187	112.1497	115.8281	120.1529	128.2933	139.2993	148.8780		(72)
Total internal gains													
559.2368	557.0406	540.4290	508.6978	478.0671	450.0529	433.2933	436.5354	452.2951	480.6776	515.3091	545.5662		(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	
East	5.0900	26.5524	0.6300	0.7000	0.7700	41.3041	(76)
South	2.6200	59.0235	0.6300	0.7000	0.7700	47.2605	(78)
West	1.1300	26.5524	0.6300	0.7000	0.7700	9.1697	(80)
South	3.2000	59.0235	0.6300	0.7000	0.7700	57.7228	(78)

Solar gains	155.4570	231.4865	322.3729	415.6766	447.1579	479.7810	418.0538	409.6638	366.9048	268.1522	180.3444	131.9644	(83)
Total gains	714.6938	788.5271	862.8019	924.3744	925.2250	929.8339	851.3472	846.1992	819.1999	748.8298	695.6534	677.5305	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	98.2753	98.5292	98.7204	99.1696	99.1696	99.4930	99.4930	99.4930	99.2341	98.6566	98.5292	98.2753	
alpha	7.5517	7.5686	7.5814	7.6113	7.6113	7.6329	7.6329	7.6329	7.6156	7.5771	7.5686	7.5517	
util living area													
0.9472	0.9114	0.8278	0.7067	0.5645	0.4011	0.3252	0.3130	0.4342	0.6758	0.8735	0.9515		(86)
Living	20.7739	20.8308	20.9019	20.9418	20.9560	20.9590	20.9592	20.9592	20.9588	20.9488	20.8847	20.7721	
Non living	19.9404	20.0058	20.0818	20.1224	20.1338	20.1382	20.1383	20.1383	20.1361	20.1251	20.0661	19.9391	
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	20.8844	20.8308	20.9019	20.9418	20.9560	20.9590	20.9592	20.9592	20.9588	20.9488	20.8847	20.8040	(87)
Th 2	20.1814	20.1833	20.1848	20.1882	20.1882	20.1906	20.1906	20.1906	20.1887	20.1843	20.1833	20.1814	(88)
util rest of house													
0.9302	0.8870	0.7908	0.6611	0.5133	0.3489	0.2680	0.2554	0.3747	0.6163	0.8360	0.9348		(89)
MIT 2	20.0853	20.0058	20.0818	20.1224	20.1338	20.1382	20.1383	20.1383	20.1361	20.1251	20.0661	19.9828	(90)
Living area fraction										fLA = Living area / (4) =		0.5006	(91)
MIT	20.4853	20.4188	20.4923	20.5326	20.5454	20.5491	20.5492	20.5492	20.5479	20.5375	20.4759	20.3938	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4853	20.4188	20.4923	20.5326	20.5454	20.5491	20.5492	20.5492	20.5479	20.5375	20.4759	20.3938	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9370	0.8946	0.8053	0.6808	0.5359	0.3720	0.2933	0.2809	0.4011	0.6425	0.8503	0.9396	(94)
Useful gains	669.7004	705.3972	694.8522	629.2987	495.8672	345.9432	249.7411	237.7074	328.5965	481.1145	591.5442	636.6077	(95)
Ext temp.	6.9000	7.1000	8.3000	9.9000	12.3000	14.8000	16.4000	16.6000	15.1000	12.5000	9.8000	7.4000	(96)
Heat loss rate W													
827.8793	809.5494	739.6413	642.0993	497.9361	346.0581	249.7563	237.7180	328.7848	487.9053	648.9055	791.8367		(97)
Space heating kWh													
117.6851	69.9903	33.3231	9.2164	1.5393	0.0000	0.0000	0.0000	0.0000	5.0524	41.3001	115.4904		(98a)
Space heating requirement - total per year (kWh/year)												393.5971	
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													
117.6851	69.9903	33.3231	9.2164	1.5393	0.0000	0.0000	0.0000	0.0000	5.0524	41.3001	115.4904		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												393.5971	
Space heating per m2										(98c) / (4) =		5.7076	(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 %)	258.2405	(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												

	117.6851	69.9903	33.3231	9.2164	1.5393	0.0000	0.0000	0.0000	0.0000	5.0524	41.3001	115.4904 (98)
Space heating efficiency (main heating system 1)												
	258.2405	258.2405	258.2405	258.2405	258.2405	0.0000	0.0000	0.0000	0.0000	258.2405	258.2405	258.2405 (210)
Space heating fuel (main heating system)												
	45.5719	27.1027	12.9039	3.5689	0.5961	0.0000	0.0000	0.0000	0.0000	1.9565	15.9929	44.7220 (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												
	276.6659	244.5714	259.1922	225.9525	217.8092	194.8980	191.1710	199.4017	202.3345	227.2937	243.7943	273.3541 (64)
Efficiency of water heater												280.5134 (216)
(217)m	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134 (217)
Fuel for water heating, kWh/month												
	98.6284	87.1871	92.3992	80.5496	77.6466	69.4790	68.1504	71.0845	72.1301	81.0278	86.9100	97.4478 (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	21.9810	19.8538	21.9810	21.2719	21.9810	21.2719	21.9810	21.9810	21.2719	21.9810	21.2719	21.9810 (231)
Lighting	20.2103	16.2135	14.5984	10.6954	8.2615	6.7497	7.5364	9.7961	12.7241	16.6948	18.8567	20.7720 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-54.8141	-72.9746	-109.6901	-125.8604	-132.6456	-126.4107	-120.8227	-117.6185	-104.9251	-85.6031	-58.7374	-46.3670 (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	-31.9183	-62.8812	-146.8864	-257.8301	-341.4289	-385.3348	-332.5243	-293.1072	-200.7944	-102.7308	-43.0534	-24.0790 (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	152.4149 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	280.5134
Water heating fuel used	982.6406 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.3375)	
mechanical ventilation fans (SFP = 1.3375)	258.8086 (230a)
Total electricity for the above, kWh/year	258.8086 (231)
Electricity for lighting (calculated in Appendix L)	163.1089 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3379.0381 (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	-1822.0651 (238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	152.4149	25.1600	38.3476	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	982.6406	25.1600	247.2324	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	258.8086	25.1600	65.1162	(249)
Energy for lighting	163.1089	25.1600	41.0382	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1156.4694	25.1600	-290.9677	
PV Unit electricity exported	-2222.5688	5.8100	-129.1312	
Total			-420.0989	(252)
Total energy cost			-28.3645	(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	152.4149	0.1594	24.2987	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	982.6406	0.1411	138.6221	(264)
Space and water heating			162.9208	(265)
Pumps, fans and electric keep-hot	258.8086	0.1387	35.8999	(267)
Energy for lighting	163.1089	0.1443	23.5417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1156.4694	0.1345	-155.5244	
PV Unit electricity exported	-2222.5688	0.1235	-274.3814	
Total			-429.9058	(269)
Total CO2, kg/year			-207.5434	(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	152.4149	1.5901	242.3546	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	982.6406	1.5216	1495.2232	(278)
Space and water heating			1737.5778	(279)
Pumps, fans and electric keep-hot	258.8086	1.5128	391.5257	(281)
Energy for lighting	163.1089	1.5338	250.1819	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1156.4694	1.4970	-1731.2472	
PV Unit electricity exported	-2222.5688	0.4531	-1007.0301	
Total			-2738.2772	(283)
Total Primary energy kWh/year			-358.9919	(286)

SAP 10 EPC IMPROVEMENTS

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

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.1	-£ 43	-26 kg (12.7%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£43	0.38 kg/m²	A 101	A 102
Total Savings	£43	0.38 kg/m²		

Potential energy efficiency rating: A 101
Potential environmental impact rating: A 102

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 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	£392	£338	£54
Space heating	£103	£124	-£20
Water heating	£247	£173	£74
Lighting	£41	£41	£0
Generated (PV)	-£420	-£409	-£11
Total cost of fuels	-£28	-£71	£43
Total cost of uses	-£29	-£71	£43
Delivered energy	-26 kWh/m²	-30 kWh/m²	3 kWh/m²
Carbon dioxide emissions	-0.2 tonnes	-0.2 tonnes	0.0 tonnes
CO2 emissions per m²	-3 kg/m²	-3 kg/m²	0 kg/m²
Primary energy	-5 kWh/m²	-9 kWh/m²	4 kWh/m²

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	68.9600	(1b)	x 2.3000	(2b) =	158.6080	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	158.6080	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

Measured/design AP50												0.6000	(17)
Infiltration rate												0.0300	(18)
Number of sides sheltered												0	(19)
Shelter factor									(20) = 1 - [0.075 x (19)] =			1.0000	(20)
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			0.0300	(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	0.0382	0.0375	0.0367	0.0330	0.0323	0.0285	0.0285	0.0278	0.0300	0.0323	0.0338	0.0352	(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) =	79.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1422	0.1415	0.1407	0.1370	0.1362	0.1325	0.1325	0.1317	0.1340	0.1362	0.1377	0.1392	(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)			8.8400	1.1450	10.1221			(27)
Front Door			2.0500	1.2000	2.4600			(26)
French Doors (Uw = 1.20)			3.2000	1.1450	3.6641			(27)
Heatloss Floor 1			68.9600	0.1100	7.5856	110.0000	7585.6000	(28a)
External Wall 1	81.4000	14.0900	67.3100	0.1600	10.7696	190.0000	12788.9000	(29a)
Cold Roof	68.9600		68.9600	0.1100	7.5856	9.0000	620.6400	(30)
Total net area of external elements Aum(A, m2)			219.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.1871			(33)
Internal Wall 1			62.7400			9.0000	564.6600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21559.8000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	312.6421	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.4000	0.0280	0.2632
E3 Sill	5.6000	0.0270	0.1512
E4 Jamb	18.9800	0.0210	0.3986
E5 Ground floor (normal)	35.3900	0.1620	5.7332
E10 Eaves (insulation at ceiling level)	23.8000	0.0720	1.7136
E12 Gable (insulation at ceiling level)	11.5900	0.1740	2.0167
E16 Corner (normal)	9.2000	0.0480	0.4416

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.7180	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	52.9051	(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	7.4455	7.4062	7.3669	7.1707	7.1314	6.9351	6.9351	6.8959	7.0136	7.1314	7.2099	7.2884	(38)
Heat transfer coeff	60.3505	60.3113	60.2720	60.0757	60.0365	59.8402	59.8402	59.8010	59.9187	60.0365	60.1150	60.1935	(39)
Average = Sum(39)m / 12 =												60.0659	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8752	0.8746	0.8740	0.8712	0.8706	0.8678	0.8678	0.8672	0.8689	0.8706	0.8717	0.8729	(40)
HLP (average)												0.8710	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2206	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
108.5082	106.8775	104.5013	99.9549	96.5997	92.8581	90.7313	93.0895	95.6746	99.6920	104.3361	108.0924	(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	(42b)

Hot water usage for other uses

39.3382	37.9077	36.4772	35.0468	33.6163	32.1858	32.1858	33.6163	35.0468	36.4772	37.9077	39.3382	(42c)

Average daily hot water use (litres/day)	135.8029 (43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
147.8464	144.7852	140.9785	135.0016	130.2160	125.0439	122.9171	126.7058	130.7214	136.1692	142.2438	147.4306	(44)
Energy conte 234.1525	206.1722	216.6788	184.8105	175.2958	153.7560	148.6576	156.8883	161.1925	184.7803	202.6523	230.8407	(45)

Energy content (annual) Total = Sum(45)m =	2255.8776

Distribution loss (46)m = 0.15 x (45)m

35.1229	30.9258	32.5018	27.7216	26.2944	23.0634	22.2986	23.5332	24.1789	27.7171	30.3979	34.6261	(46)

Water storage loss:		
Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.1500	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.6210	(55)

Total storage loss

19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(56)

If cylinder contains dedicated solar storage

19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(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

276.6659	244.5714	257.7964	219.1989	205.0148	182.2913	178.1441	187.3052	196.9316	225.8980	243.7943	273.3541	(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												622.5149	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												622.5149	
Solar input	-0.0000	-16.2042	-58.4794	-80.3918	-104.9289	-96.5477	-95.6904	-83.7602	-57.8279	-28.6843	-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													
	276.6659	228.3672	199.3171	138.8071	100.0859	85.7436	82.4537	103.5450	139.1037	197.2137	243.7943	273.3541	(64)
									Total per year (kWh/year) = Sum(64)m =			2068.4513	(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													
	111.8664	99.2716	104.9398	88.9602	82.0611	73.9521	73.0178	76.4989	82.1878	94.3336	100.2955	110.7653	(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	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	23.0898	20.5081	16.6783	12.6266	9.4385	7.9684	8.6101	11.1918	15.0216	19.0733	22.2614	23.7315	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	290.8324	293.8503	286.2452	270.0549	249.6175	230.4092	217.5770	214.5590	222.1641	238.3544	258.7918	278.0001	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	(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)													
	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	(71)
Water heating gains (Table 5)													
	150.3581	147.7256	141.0481	123.5558	110.2972	102.7113	98.1422	102.8211	114.1497	126.7925	139.2993	148.8780	(72)
Total internal gains													
	559.2368	557.0406	538.9282	501.1938	464.3097	436.0454	419.2859	423.5285	446.2919	479.1768	515.3091	545.5662	(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	
East	5.0900	19.6403	0.6300	0.7000	0.7700	30.5518	(76)
South	2.6200	46.7521	0.6300	0.7000	0.7700	37.4347	(78)
West	1.1300	19.6403	0.6300	0.7000	0.7700	6.7826	(80)
South	3.2000	46.7521	0.6300	0.7000	0.7700	45.7217	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	120.4908	209.2228	293.7570	371.4868	419.2969	416.6974	401.6326	366.5430	321.1074	233.5534	145.1203	102.5568	(83)
Total gains	679.7276	766.2634	832.6852	872.6806	883.6066	852.7429	820.9184	790.0715	767.3994	712.7302	660.4294	648.1230	(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	99.2341	99.2987	99.3634	99.6880	99.7532	100.0804	100.0804	100.1461	99.9493	99.7532	99.6229	99.4930	
alpha	7.6156	7.6199	7.6242	7.6459	7.6502	7.6720	7.6720	7.6764	7.6633	7.6502	7.6415	7.6329	
util living area													
	0.9832	0.9601	0.9043	0.7896	0.6248	0.4486	0.3207	0.3481	0.5366	0.8182	0.9600	0.9877	(86)
Living	20.6143	20.7202	20.8363	20.9209	20.9530	20.9590	20.9594	20.9594	20.9577	20.9174	20.7545	20.5822	
Non living	19.7527	19.8820	20.0169	20.1075	20.1361	20.1427	20.1429	20.1435	20.1411	20.1068	19.9278	19.7145	
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	20.8027	20.7202	20.8363	20.9209	20.9530	20.9590	20.9594	20.9594	20.9577	20.9174	20.7545	20.6407	(87)
Th 2	20.1887	20.1892	20.1896	20.1921	20.1926	20.1950	20.1950	20.1955	20.1940	20.1926	20.1916	20.1906	(88)
util rest of house													
	0.9777	0.9483	0.8800	0.7489	0.5734	0.3924	0.2620	0.2873	0.4750	0.7719	0.9460	0.9835	(89)
MIT 2	20.0149	19.8820	20.0169	20.1075	20.1361	20.1427	20.1429	20.1435	20.1411	20.1068	19.9278	19.8003	(90)
Living area fraction										fLA = Living area / (4) =		0.5006	(91)
MIT	20.4092	20.3016	20.4271	20.5146	20.5450	20.5513	20.5516	20.5519	20.5499	20.5126	20.3416	20.2210	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4092	20.3016	20.4271	20.5146	20.5450	20.5513	20.5516	20.5519	20.5499	20.5126	20.3416	20.2210	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9793	0.9501	0.8876	0.7657	0.5960	0.4173	0.2880	0.3142	0.5023	0.7911	0.9489	0.9837	(94)
Useful gains	665.6864	728.0358	739.0686	668.1985	526.6629	355.8735	236.4556	248.2642	385.4646	563.8280	626.7105	637.5443	(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													
	972.2011	928.8890	839.4125	697.7588	531.0246	356.1292	236.4676	248.2877	386.4671	595.1171	796.0206	964.3584	(97)
Space heating kWh													
	228.0469	134.9734	74.6559	21.2834	3.2451	0.0000	0.0000	0.0000	0.0000	23.2791	121.9032	243.1497	(98a)
Space heating requirement - total per year (kWh/year)												850.5367	
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													
	228.0469	134.9734	74.6559	21.2834	3.2451	0.0000	0.0000	0.0000	0.0000	23.2791	121.9032	243.1497	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												850.5367	
Space heating per m2											(98c) / (4) =	12.3338	(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 %)												258.1154	(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													
	228.0469	134.9734	74.6559	21.2834	3.2451	0.0000	0.0000	0.0000	0.0000	23.2791	121.9032	243.1497	(98)
Space heating efficiency (main heating system 1)													
	258.1154	258.1154	258.1154	258.1154	258.1154	0.0000	0.0000	0.0000	0.0000	258.1154	258.1154	258.1154	(210)
Space heating fuel (main heating system)													
	88.3508	52.2919	28.9234	8.2457	1.2572	0.0000	0.0000	0.0000	0.0000	9.0189	47.2282	94.2019	(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													
	276.6659	228.3672	199.3171	138.8071	100.0859	85.7436	82.4537	103.5450	139.1037	197.2137	243.7943	273.3541	(64)
Efficiency of water heater												280.5803	(216)
(217)m	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	280.5803	(217)
Fuel for water heating, kWh/month													
	98.6049	81.3910	71.0374	49.4714	35.6710	30.5594	29.3869	36.9039	49.5771	70.2878	86.8893	97.4246	(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	28.7755	25.9908	28.7755	27.8473	28.7755	27.8473	28.7755	28.7755	27.8473	28.7755	27.8473	28.7755	(231)
Lighting	20.2103	16.2135	14.5984	10.6954	8.2615	6.7497	7.5364	9.7961	12.7241	16.6948	18.8567	20.7720	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.7927	-66.5437	-100.8003	-113.4123	-118.7732	-110.3198	-108.6595	-104.2619	-93.2780	-76.0899	-49.0688	-36.9598	(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	-19.5538	-49.1309	-120.4860	-214.7711	-311.4704	-322.1937	-314.1648	-249.1231	-160.9364	-78.5962	-28.0882	-14.6591	(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	329.5180	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	280.5803	
Water heating fuel used	737.2048	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.3375)		
mechanical ventilation fans (SFP = 1.3375)	258.8086	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	338.8086	(231)
Electricity for lighting (calculated in Appendix L)	163.1089	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2905.1336	(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	-1336.4932	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	329.5180	16.4900	54.3375	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	737.2048	16.4900	121.5651	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	258.8086	16.4900	42.6775	(249)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	163.1089	16.4900	26.8967	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1021.9600	16.4900	-168.5212	
PV Unit electricity exported	-1883.1736	5.5900	-105.2694	
Total			-273.7906	(252)
Total energy cost			-15.1218	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	-0.0478	(257)
SAP value		100.7743	
SAP rating (Section 12)		101	(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	329.5180	0.1586	52.2512	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	737.2048	0.1457	107.4172	(264)
Space and water heating			159.6684	(265)
Pumps, fans and electric keep-hot	338.8086	0.1387	46.9969	(267)
Energy for lighting	163.1089	0.1443	23.5417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1021.9600	0.1343	-137.2426	
PV Unit electricity exported	-1883.1736	0.1220	-229.7003	
Total			-366.9428	(269)
Total CO2, kg/year			-136.7358	(272)
CO2 emissions per m2			-1.9800	(273)
EI value			101.6078	
EI rating			102	(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	68.9600 (1b)	x	2.3000 (2b)	=	158.6080	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.9600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	158.6080	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		0.6000	(17)
Infiltration rate		0.0300	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.0300	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	6.6000	6.2000	5.9000	5.2000	5.2000	4.7000	4.7000	4.7000	5.1000	6.0000	6.2000	6.6000	(22)
Wind factor	1.6500	1.5500	1.4750	1.3000	1.3000	1.1750	1.1750	1.1750	1.2750	1.5000	1.5500	1.6500	(22a)
Adj infilt rate	0.0495	0.0465	0.0442	0.0390	0.0390	0.0352	0.0352	0.0352	0.0382	0.0450	0.0465	0.0495	(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) =	79.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1535	0.1505	0.1482	0.1430	0.1430	0.1392	0.1392	0.1392	0.1422	0.1490	0.1505	0.1535	(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)			8.8400	1.1450	10.1221			(27)
Front Door			2.0500	1.2000	2.4600			(26)
French Doors (Uw = 1.20)			3.2000	1.1450	3.6641			(27)
Heatloss Floor 1			68.9600	0.1100	7.5856	110.0000	7585.6000	(28a)
External Wall 1	81.4000	14.0900	67.3100	0.1600	10.7696	190.0000	12788.9000	(29a)
Cold Roof	68.9600		68.9600	0.1100	7.5856	9.0000	620.6400	(30)
Total net area of external elements Aum(A, m2)			219.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.1871			(33)
Internal Wall 1			62.7400			9.0000	564.6600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21559.8000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	312.6421	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.4000	0.0280	0.2632
E3 Sill	5.6000	0.0270	0.1512
E4 Jamb	18.9800	0.0210	0.3986

E5 Ground floor (normal)	35.3900	0.1620	5.7332	
E10 Eaves (insulation at ceiling level)	23.8000	0.0720	1.7136	
E12 Gable (insulation at ceiling level)	11.5900	0.1740	2.0167	
E16 Corner (normal)	9.2000	0.0480	0.4416	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7180 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.9051 (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	8.0343	7.8773	7.7595	7.4847	7.4847	7.2884	7.2884	7.2884	7.4455	7.7988	7.8773	8.0343	(38)
Heat transfer coeff	60.9394	60.7823	60.6646	60.3898	60.3898	60.1935	60.1935	60.1935	60.3505	60.7038	60.7823	60.9394	(39)
Average = Sum(39)m / 12 =												60.5435	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8837	0.8814	0.8797	0.8757	0.8757	0.8729	0.8729	0.8729	0.8752	0.8803	0.8814	0.8837	(40)
HLP (average)												0.8780	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2206 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	108.5082	106.8775	104.5013	99.9549	96.5997	92.8581	90.7313	93.0895	95.6746	99.6920	104.3361	108.0924	(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	(42b)
Hot water usage for other uses	39.3382	37.9077	36.4772	35.0468	33.6163	32.1858	32.1858	33.6163	35.0468	36.4772	37.9077	39.3382	(42c)
Average daily hot water use (litres/day)												135.8029	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	147.8464	144.7852	140.9785	135.0016	130.2160	125.0439	122.9171	126.7058	130.7214	136.1692	142.2438	147.4306	(44)
Energy conte	234.1525	206.1722	216.6788	184.8105	175.2958	153.7560	148.6576	156.8883	161.1925	184.7803	202.6523	230.8407	(45)
Energy content (annual)										Total = Sum(45)m =		2255.8776	
Distribution loss (46)m = 0.15 x (45)m	35.1229	30.9258	32.5018	27.7216	26.2944	23.0634	22.2986	23.5332	24.1789	27.7171	30.3979	34.6261	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1500	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6210	(55)
Total storage loss	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(56)
If cylinder contains dedicated solar storage	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(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	276.6659	244.5714	257.7964	219.1989	205.0148	182.2913	178.1441	187.3052	196.9316	225.8980	243.7943	273.3541	(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												762.7267	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												762.7267	
Solar input	-8.1167	-26.2560	-72.5307	-96.6321	-115.4620	-114.1862	-101.4896	-98.1882	-74.1388	-43.8561	-11.8703	-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	268.5492	218.3155	185.2657	122.5668	89.5529	68.1051	76.6545	89.1171	122.7928	182.0419	231.9241	273.3541	(64)
									Total per year (kWh/year) = Sum(64)m =			1928.2395	(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	111.8664	99.2716	104.9398	88.9602	82.0611	73.9521	73.0178	76.4989	82.1878	94.3336	100.2955	110.7653	(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	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	133.2368	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.0898	20.5081	16.6783	12.6266	9.4385	7.9684	8.6101	11.1918	15.0216	19.0733	22.2614	23.7315	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	290.8324	293.8503	286.2452	270.0549	249.6175	230.4092	217.5770	214.5590	222.1641	238.3544	258.7918	278.0001	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	50.5443	(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)	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	-88.8245	(71)
Water heating gains (Table 5)	150.3581	147.7256	141.0481	123.5558	110.2972	102.7113	98.1422	102.8211	114.1497	126.7925	139.2993	148.8780	(72)
Total internal gains	559.2368	557.0406	538.9282	501.1938	464.3097	436.0454	419.2859	423.5285	446.2919	479.1768	515.3091	545.5662	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.0900	26.5524	0.6300	0.7000	0.7700	41.3041	(76)
South	2.6200	59.0235	0.6300	0.7000	0.7700	47.2605	(78)
West	1.1300	26.5524	0.6300	0.7000	0.7700	9.1697	(80)
South	3.2000	59.0235	0.6300	0.7000	0.7700	57.7228	(78)

Solar gains	155.4570	231.4865	322.3729	415.6766	447.1579	479.7810	418.0538	409.6638	366.9048	268.1522	180.3444	131.9644 (83)
Total gains	714.6938	788.5271	861.3011	916.8704	911.4676	915.8264	837.3397	833.1922	813.1967	747.3290	695.6534	677.5305 (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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	98.2753	98.5292	98.7204	99.1696	99.1696	99.4930	99.4930	99.4930	99.2341	98.6566	98.5292	98.2753	
alpha	7.5517	7.5686	7.5814	7.6113	7.6113	7.6329	7.6329	7.6329	7.6156	7.5771	7.5686	7.5517	
util living area	0.9472	0.9114	0.8287	0.7117	0.5727	0.4072	0.3306	0.3178	0.4374	0.6770	0.8735	0.9515	(86)
Living	20.7739	20.8308	20.9014	20.9410	20.9557	20.9590	20.9592	20.9592	20.9588	20.9487	20.8847	20.7721	
Non living	19.9404	20.0058	20.0814	20.1217	20.1336	20.1382	20.1383	20.1383	20.1361	20.1251	20.0661	19.9391	
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	20.8844	20.8308	20.9014	20.9410	20.9557	20.9590	20.9592	20.9592	20.9588	20.9487	20.8847	20.8040	(87)
Th 2	20.1814	20.1833	20.1848	20.1882	20.1882	20.1906	20.1906	20.1906	20.1887	20.1843	20.1833	20.1814	(88)
util rest of house	0.9302	0.8870	0.7918	0.6659	0.5208	0.3542	0.2725	0.2594	0.3775	0.6175	0.8360	0.9348	(89)
MIT 2	20.0853	20.0058	20.0814	20.1217	20.1336	20.1382	20.1383	20.1383	20.1361	20.1251	20.0661	19.9828	(90)
Living area fraction										fLA = Living area / (4) =		0.5006	(91)
MIT	20.4853	20.4188	20.4919	20.5319	20.5451	20.5491	20.5492	20.5492	20.5479	20.5374	20.4759	20.3938	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4853	20.4188	20.4919	20.5319	20.5451	20.5491	20.5492	20.5492	20.5479	20.5374	20.4759	20.3938	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9370	0.8946	0.8063	0.6856	0.5438	0.3777	0.2983	0.2853	0.4041	0.6437	0.8503	0.9396	(94)
Useful gains	669.7004	705.3972	694.4676	628.6512	495.6417	345.9292	249.7390	237.7060	328.5858	481.0279	591.5442	636.6077	(95)
Ext temp.	6.9000	7.1000	8.3000	9.9000	12.3000	14.8000	16.4000	16.6000	15.1000	12.5000	9.8000	7.4000	(96)
Heat loss rate W	827.8793	809.5494	739.6149	642.0556	497.9207	346.0571	249.7561	237.7178	328.7840	487.8994	648.9055	791.8367	(97)
Space heating kWh	117.6851	69.9903	33.5896	9.6512	1.6956	0.0000	0.0000	0.0000	0.0000	5.1124	41.3001	115.4904	(98a)
Space heating requirement - total per year (kWh/year)												394.5147	
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	117.6851	69.9903	33.5896	9.6512	1.6956	0.0000	0.0000	0.0000	0.0000	5.1124	41.3001	115.4904	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												394.5147	
Space heating per m2											(98c) / (4) =	5.7209	(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 %)	258.2405	(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	117.6851	69.9903	33.5896	9.6512	1.6956	0.0000	0.0000	0.0000	0.0000	5.1124	41.3001	115.4904	(98)
Space heating efficiency (main heating system 1)	258.2405	258.2405	258.2405	258.2405	258.2405	0.0000	0.0000	0.0000	0.0000	258.2405	258.2405	258.2405	(210)
Space heating fuel (main heating system)	45.5719	27.1027	13.0071	3.7373	0.6566	0.0000	0.0000	0.0000	0.0000	1.9797	15.9929	44.7220	(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	268.5492	218.3155	185.2657	122.5668	89.5529	68.1051	76.6545	89.1171	122.7928	182.0419	231.9241	273.3541	(64)
Efficiency of water heater												280.5134	(216)
(217)m	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134	280.5134	(217)
Fuel for water heating, kWh/month	95.7349	77.8271	66.0452	43.6937	31.9246	24.2787	27.3265	31.7693	43.7743	64.8960	82.6784	97.4478	(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	28.7755	25.9908	28.7755	27.8473	28.7755	27.8473	28.7755	28.7755	27.8473	28.7755	27.8473	28.7755	(231)
Lighting	20.2103	16.2135	14.5984	10.6954	8.2615	6.7497	7.5364	9.7961	12.7241	16.6948	18.8567	20.7720	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-54.9328	-72.7679	-107.1254	-118.9571	-121.2462	-113.2141	-110.2283	-108.4025	-100.3331	-84.5696	-58.8488	-46.5300	(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	-31.7995	-63.0880	-149.4511	-264.7335	-352.8283	-398.5315	-343.1186	-302.3233	-205.3863	-103.7644	-42.9420	-23.9160	(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	152.7702	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	280.5134	
Water heating fuel used	687.3965	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.3375)		
mechanical ventilation fans (SFP = 1.3375)	258.8086	(230a)
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	338.8086	(231)
Electricity for lighting (calculated in Appendix L)	163.1089	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3379.0381	(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	-2036.9539	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	152.7702	25.1600	38.4370	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	687.3965	25.1600	172.9490	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	258.8086	25.1600	65.1162	(249)
Pump for solar water heating	80.0000	25.1600	20.1280	(249)
Energy for lighting	163.1089	25.1600	41.0382	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1097.1557	25.1600	-276.0444	
PV Unit electricity exported	-2281.8824	5.8100	-132.5774	
Total			-408.6217	(252)
Total energy cost			-70.9533	(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	152.7702	0.1594	24.3497	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	687.3965	0.1464	100.6639	(264)
Space and water heating			125.0136	(265)
Pumps, fans and electric keep-hot	338.8086	0.1387	46.9969	(267)
Energy for lighting	163.1089	0.1443	23.5417	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1097.1557	0.1351	-148.1772	
PV Unit electricity exported	-2281.8824	0.1232	-281.2004	
Total			-429.3776	(269)
Total CO2, kg/year			-233.8254	(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	152.7702	1.5900	242.8989	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	687.3965	1.5417	1059.7858	(278)
Space and water heating			1302.6847	(279)
Pumps, fans and electric keep-hot	338.8086	1.5128	512.5497	(281)
Energy for lighting	163.1089	1.5338	250.1819	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1097.1557	1.4992	-1644.8236	
PV Unit electricity exported	-2281.8824	0.4523	-1032.0364	
Total			-2676.8600	(283)
Total Primary energy kWh/year			-611.4437	(286)