PREDICTED ENERGY ASSESSMENT

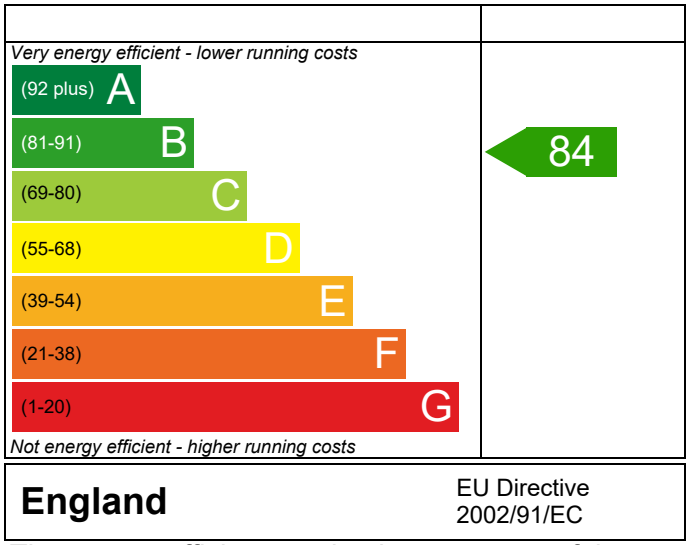
106 - PRJ011597

Dwelling type:	House, End-Terrace
Date of assessment:	17/03/2021
Produced by:	Michael Juckes
Total floor area:	95.39 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

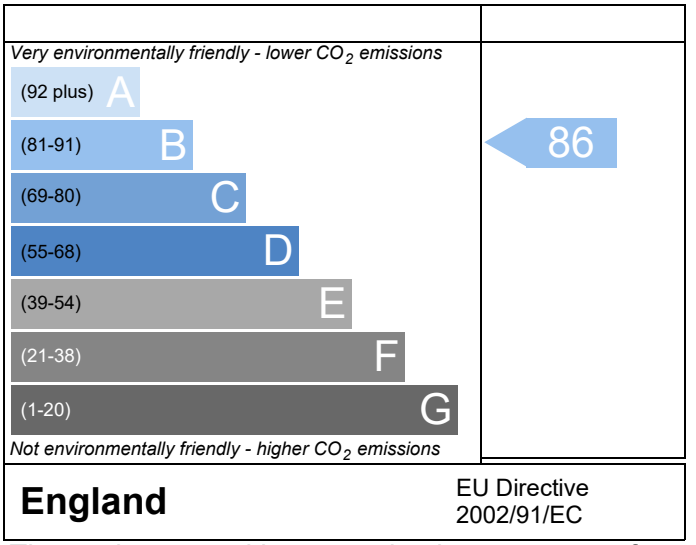
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

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BUILDING REGULATION COMPLIANCE
Calculation Type: New Build (As Designed)

Briary Energy

Property Reference	106 - PRJ011597	**Issued on Date**	17/03/2021
Assessment Reference	106 E	**Prop Type Ref**	3B.B
Property	106 - PRJ011597		

SAP Rating	84 B	**DER**	16.72	**TER**	17.39
Environmental	86 B	**% DER<TER**	3.86		
CO_2 Emissions (t/year)	1.37	**DFEE**	46.36	**TFEE**	52.43
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.58		

Assessor Details	Mr. Michael Juckes, Michael Juckes, Tel: 02033971373, michael@briaryenergy.co.uk	**Assessor ID**	T850-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.39	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	16.72	$kgCO_2/m^2$	Pass
	-0.67 (-3.9%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.43	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	46.36	$kWh/m^2/yr$	
	-6.0 (-11.5%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.25 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.25 (max. 0.35)	Pass
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.01 (design value)	$m^3/(h.m^2)$ @ 50 Pa	
Maximum	10.0	$m^3/(h.m^2)$ @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Ideal LOGIC COMBI ESP1 30 Combi boiler Efficiency: 89.6% SEDBUK2009 Minimum: 88.0%		Pass
Secondary heating system	None		

5 Cylinder insulation

Hot water storage	No cylinder		

6 Controls

Space heating controls	Programmer, room thermostat and TRVs		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (East Anglia)	Slight		Pass

Based on:

Overshading	Average		
Windows facing North	0.81 m², No overhang		
Windows facing North East	5.93 m², No overhang		
Windows facing East	0.81 m², No overhang		
Windows facing South East	7.61 m², No overhang		
Windows facing South West	5.70 m², No overhang		
Air change rate	4.21 ach		
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.01 (design value)	m³/(h.m²) @ 50 Pa	
Maximum	10.0	m³/(h.m²) @ 50 Pa	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Roof U-value	0.10	W/m²K

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FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Property Reference	106 - PRJ011597	**Issued on Date**	17/03/2021
Assessment Reference	106 E	**Prop Type Ref**	3B.B
Property	106 - PRJ011597		

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Environmental	86 B	**% DER<TER**	3.86		
CO_2 Emissions (t/year)	1.37	**DFEE**	46.36	**TFEE**	52.43
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.58		

Assessor Details	Mr. Michael Juckes, Michael Juckes, Tel: 02033971373, michael@briaryenergy.co.uk	**Assessor ID**	T850-0001
Client			

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF HEAT DEMAND 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	48.1700	(1b)	x 2.3800	(2b) =	114.6446	(1b) - (3b)
First floor	47.2200	(1c)	x 2.6900	(2c) =	127.0218	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.3900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		241.6664	(5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =		0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =		0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =		30.0000 / (5) =	0.1241	(8)
Pressure test			Yes	
Measured/design AP50			5.0100	
Infiltration rate			0.3746	(18)
Number of sides sheltered			1	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3465	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.9000	4.8000	4.7000	4.2000	4.2000	3.7000	3.8000	3.8000	4.0000	4.2000	4.3000	4.5000	(22)
Wind factor	1.2250	1.2000	1.1750	1.0500	1.0500	0.9250	0.9500	0.9500	1.0000	1.0500	1.0750	1.1250	(22a)
Adj infilt rate	0.4245	0.4158	0.4072	0.3639	0.3639	0.3205	0.3292	0.3292	0.3465	0.3639	0.3725	0.3899	(22b)
Effective ac	0.5901	0.5865	0.5829	0.5662	0.5662	0.5514	0.5542	0.5542	0.5600	0.5662	0.5694	0.5760	(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	
Windows (Uw = 1.40)			20.8600	1.3258	27.6553			(27)
Solid Door			2.0900	1.2000	2.5080			(26)
Flr - Ground			48.1720	0.1500	7.2258	75.6000	3641.8032	(28a)
Wl - Brick	102.8990	22.9430	79.9560	0.2500	19.9890	51.1800	4092.1481	(29a)
Rf - Ins Joist	47.2220		47.2220	0.1000	4.7222	5.8200	274.8320	(30)
Rf - Flat over Bay	0.9500		0.9500	0.2500	0.2375	9.0000	8.5500	(30)
Total net area of external elements Aum(A, m2)			199.2500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.3378			(33)
Party Wall			41.0660	0.0000	0.0000	54.0300	2218.7960	(32)
Ground Floor Block			56.8154			54.0300	3069.7339	(32c)
Ground Floor Stud			31.1161			5.8200	181.0958	(32c)
1st Floor Stud			107.0993			5.8200	623.3178	(32c)
Internal Floor			47.2200			18.0000	849.9600	(32d)
Internal Ceiling			47.2200			5.8200	274.8204	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15235.0572	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	159.7134	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.8322	(36)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Total fabric heat loss (33) + (36) = 75.1700 (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	47.0608	46.7705	46.4862	45.1544	45.1544	43.9722	44.1967	44.1967	44.6635	45.1544	45.4088	45.9355	(38)

Heat transfer coeff

	122.2308	121.9405	121.6562	120.3244	120.3244	119.1422	119.3667	119.3667	119.8335	120.3244	120.5788	121.1055	(39)

Average = Sum(39)m / 12 = 120.5162 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2814	1.2783	1.2754	1.2614	1.2614	1.2490	1.2514	1.2514	1.2562	1.2614	1.2641	1.2696	(40)
HLP (average)												1.2634	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6926 (42)

Average daily hot water use (litres/day) 98.1482 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	107.9630	104.0371	100.1112	96.1852	92.2593	88.3334	88.3334	92.2593	96.1852	100.1112	104.0371	107.9630	(44)
Energy conte	160.1060	140.0298	144.4982	125.9770	120.8779	104.3085	96.6571	110.9155	112.2402	130.8051	142.7840	155.0542	(45)
Energy content (annual)										Total = Sum(45)m =		1544.2534	(45)
Distribution loss (46)m = 0.15 x (45)m													
	24.0159	21.0045	21.6747	18.8966	18.1317	15.6463	14.4986	16.6373	16.8360	19.6208	21.4176	23.2581	(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)
Combi loss	14.6972	13.2612	14.6504	14.1218	14.5515	14.0347	14.4731	14.5239	14.0822	14.6093	14.1867	14.6821	(61)
Total heat required for water heating calculated for each month													
	174.8033	153.2909	159.1486	140.0988	135.4294	118.3432	111.1302	125.4394	126.3223	145.4144	156.9706	169.7362	(62)
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	(63)
									Solar input (sum of months) = Sum(63)m =			0.0000	(63)
Output from w/h													
	174.8033	153.2909	159.1486	140.0988	135.4294	118.3432	111.1302	125.4394	126.3223	145.4144	156.9706	169.7362	(64)
									Total per year (kWh/year) = Sum(64)m =			1716.1273	(64)
RHI water heating demand												1716	(64)
Heat gains from water heating, kWh/month													
	56.9096	49.8752	51.7082	45.4178	43.8298	38.1912	35.7568	40.5104	40.8404	47.1450	51.0223	55.2260	(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	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	55.4497	49.2500	40.0528	30.3225	22.6664	19.1360	20.6771	26.8769	36.0741	45.8043	53.4604	56.9909	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	371.1231	374.9742	365.2695	344.6095	318.5299	294.0188	277.6439	273.7928	283.4974	304.1574	330.2370	354.7481	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	(71)
Water heating gains (Table 5)													
	76.4914	74.2190	69.5003	63.0803	58.9110	53.0434	48.0602	54.4494	56.7228	63.3670	70.8644	74.2285	(72)
Total internal gains													
	613.7632	609.1422	585.5216	548.7113	510.8064	476.8972	457.0801	465.8181	486.9933	524.0277	565.2608	596.6665	(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	
North	0.8100	12.0539	0.5000	0.0000	0.7700	3.7590	(74)
Northeast	5.9300	12.9465	0.5000	0.0000	0.7700	29.5576	(75)
East	0.8100	22.4175	0.5000	0.0000	0.7700	6.9909	(76)
Southeast	7.6100	40.9830	0.5000	0.0000	0.7700	120.0741	(77)
Southwest	5.6970	40.9830	0.5000	0.0000	0.7700	89.8899	(79)

Solar gains	250.2715	408.8773	579.8540	807.2882	918.0499	970.4286	917.9090	814.2003	683.3530	480.8463	309.4284	210.6549	(83)
Total gains	864.0347	1018.0194	1165.3757	1355.9996	1428.8562	1447.3258	1374.9891	1280.0184	1170.3463	1004.8741	874.6891	807.3214	(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, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.6227	34.7051	34.7862	35.1713	35.1713	35.5202	35.4535	35.4535	35.3153	35.1713	35.0971	34.9444	
alpha	3.3082	3.3137	3.3191	3.3448	3.3448	3.3680	3.3636	3.3636	3.3544	3.3448	3.3398	3.3296	
util living area													
	0.9633	0.9392	0.8888	0.7776	0.6290	0.4420	0.2917	0.3125	0.5618	0.8203	0.9353	0.9693	(86)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	19.4533	19.7050	20.1088	20.5587	20.8338	20.9631	20.9936	20.9921	20.9175	20.5567	19.9481	19.4067	(87)
Th 2	19.8554	19.8578	19.8602	19.8712	19.8712	19.8810	19.8791	19.8791	19.8753	19.8712	19.8691	19.8647	(88)
util rest of house													
	0.9555	0.9269	0.8666	0.7369	0.5661	0.3607	0.1972	0.2116	0.4736	0.7753	0.9197	0.9626	(89)
MIT 2	18.4864	18.7320	19.1197	19.5380	19.7666	19.8650	19.8779	19.8776	19.8351	19.5493	18.9815	18.4481	(90)
Living area fraction									fLA = Living area / (4) =			0.1981	(91)
MIT	18.6779	18.9248	19.3157	19.7402	19.9780	20.0826	20.0989	20.0984	20.0496	19.7489	19.1730	18.6381	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5279	18.7748	19.1657	19.5902	19.8280	19.9326	19.9489	19.9484	19.8996	19.5989	19.0230	18.4881	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9438	0.9123	0.8506	0.7256	0.5635	0.3646	0.2031	0.2180	0.4757	0.7627	0.9050	0.9520	(94)
Useful gains	815.4558	928.7851	991.3060	983.9225	805.1622	527.6245	279.3228	278.9946	556.6954	766.4127	791.6172	768.5669	(95)
Ext temp.	4.7000	5.2000	7.0000	9.5000	12.5000	15.4000	17.6000	17.6000	15.0000	11.4000	7.7000	4.7000	(96)
Heat loss rate W													
	1690.2004	1655.3129	1480.0305	1214.0995	881.7402	540.0260	280.3856	280.3201	587.1368	986.5303	1365.3172	1669.8107	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	650.8100	488.2266	363.6110	165.7275	56.9740	0.0000	0.0000	0.0000	0.0000	163.7675	413.0640	670.5253	(98)
Space heating												2972.7060	(98)
RHI space heating demand												2973	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	48.1700	(1b)	x 2.3800	(2b) =	114.6446	(1b) - (3b)
First floor	47.2200	(1c)	x 2.6900	(2c) =	127.0218	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.3900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	241.6664	(5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40	=	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20	=	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	30.0000	/ (5) =	0.1241	(8)
Pressure test			Yes	
Measured/design AP50			5.0100	
Infiltration rate			0.3746	(18)
Number of sides sheltered			1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3465	(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	0.4418	0.4332	0.4245	0.3812	0.3725	0.3292	0.3292	0.3205	0.3465	0.3725	0.3899	0.4072	(22b)
Effective ac	0.5976	0.5938	0.5901	0.5727	0.5694	0.5542	0.5542	0.5514	0.5600	0.5694	0.5760	0.5829	(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	
Windows (Uw = 1.40)			20.8600	1.3258	27.6553			(27)
Solid Door			2.0900	1.2000	2.5080			(26)
Flr - Ground			48.1720	0.1500	7.2258	75.6000	3641.8032	(28a)
Wl - Brick	102.8990	22.9430	79.9560	0.2500	19.9890	51.1800	4092.1481	(29a)
Rf - Ins Joist	47.2220		47.2220	0.1000	4.7222	5.8200	274.8320	(30)
Rf - Flat over Bay	0.9500		0.9500	0.2500	0.2375	9.0000	8.5500	(30)
Total net area of external elements Aum(A, m2)			199.2500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.3378			(33)
Party Wall			41.0660	0.0000	0.0000	54.0300	2218.7960	(32)
Ground Floor Block			56.8154			54.0300	3069.7339	(32c)
Ground Floor Stud			31.1161			5.8200	181.0958	(32c)
1st Floor Stud			107.0993			5.8200	623.3178	(32c)
Internal Floor			47.2200			18.0000	849.9600	(32d)
Internal Ceiling			47.2200			5.8200	274.8204	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15235.0572	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	159.7134	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.8322	(36)
Total fabric heat loss	(33) + (36) = 75.1700	(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	47.6594	47.3571	47.0608	45.6691	45.4088	44.1967	44.1967	43.9722	44.6635	45.4088	45.9355	46.4862	(38)
Heat transfer coeff	122.8294	122.5271	122.2308	120.8392	120.5788	119.3667	119.3667	119.1422	119.8335	120.5788	121.1055	121.6562	(39)
Average = Sum(39)m / 12 =												120.8379	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2877	1.2845	1.2814	1.2668	1.2641	1.2514	1.2514	1.2490	1.2562	1.2641	1.2696	1.2754	(40)
HLP (average)												1.2668	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6926 (42)
Average daily hot water use (litres/day)	98.1482 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.9630	104.0371	100.1112	96.1852	92.2593	88.3334	88.3334	92.2593	96.1852	100.1112	104.0371	107.9630	(44)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy conte	160.1060	140.0298	144.4982	125.9770	120.8779	104.3085	96.6571	110.9155	112.2402	130.8051	142.7840	155.0542	(45)
Energy content (annual)										Total = Sum(45)m =		1544.2534	(45)
Distribution loss (46)m = 0.15 x (45)m													
	24.0159	21.0045	21.6747	18.8966	18.1317	15.6463	14.4986	16.6373	16.8360	19.6208	21.4176	23.2581	(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)
Combi loss	14.6972	13.2612	14.6504	14.1218	14.5515	14.0347	14.4731	14.5239	14.0822	14.6093	14.1867	14.6821	(61)
Total heat required for water heating calculated for each month													
	174.8033	153.2909	159.1486	140.0988	135.4294	118.3432	111.1302	125.4394	126.3223	145.4144	156.9706	169.7362	(62)
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	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	174.8033	153.2909	159.1486	140.0988	135.4294	118.3432	111.1302	125.4394	126.3223	145.4144	156.9706	169.7362	(64)
									Total per year (kWh/year) = Sum(64)m =			1716.1273	(64)
Heat gains from water heating, kWh/month													
	56.9096	49.8752	51.7082	45.4178	43.8298	38.1912	35.7568	40.5104	40.8404	47.1450	51.0223	55.2260	(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	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	55.4497	49.2500	40.0528	30.3225	22.6664	19.1360	20.6771	26.8769	36.0741	45.8043	53.4604	56.9909	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	371.1231	374.9742	365.2695	344.6095	318.5299	294.0188	277.6439	273.7928	283.4974	304.1574	330.2370	354.7481	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	(71)
Water heating gains (Table 5)													
	76.4914	74.2190	69.5003	63.0803	58.9110	53.0434	48.0602	54.4494	56.7228	63.3670	70.8644	74.2285	(72)
Total internal gains													
	613.7632	609.1422	585.5216	548.7113	510.8064	476.8972	457.0801	465.8181	486.9933	524.0277	565.2608	596.6665	(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	
North	0.8100	10.6334	0.5000	0.0000	0.7700	3.3160	(74)
Northeast	5.9300	11.2829	0.5000	0.0000	0.7700	25.7595	(75)
East	0.8100	19.6403	0.5000	0.0000	0.7700	6.1248	(76)
Southeast	7.6100	36.7938	0.5000	0.0000	0.7700	107.8004	(77)
Southwest	5.6970	36.7938	0.5000	0.0000	0.7700	80.7016	(79)

Solar gains	223.7023	391.8414	564.2973	745.5687	876.8307	888.6861	849.2276	748.6243	626.7074	440.7106	269.9217	190.1561	(83)
Total gains	837.4655	1000.9836	1149.8189	1294.2801	1387.6370	1365.5833	1306.3078	1214.4424	1113.7007	964.7383	835.1825	786.8226	(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, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.4540	34.5390	34.6227	35.0214	35.0971	35.4535	35.4535	35.5202	35.3153	35.0971	34.9444	34.7862	
alpha	3.2969	3.3026	3.3082	3.3348	3.3398	3.3636	3.3636	3.3680	3.3544	3.3398	3.3296	3.3191	
util living area													
	0.9685	0.9446	0.9007	0.8138	0.6820	0.5215	0.3906	0.4338	0.6455	0.8586	0.9487	0.9737	(86)
MIT	19.3490	19.6315	20.0177	20.4529	20.7656	20.9304	20.9799	20.9714	20.8552	20.4300	19.8085	19.2939	(87)
Th 2	19.8505	19.8530	19.8554	19.8669	19.8691	19.8791	19.8791	19.8810	19.8753	19.8691	19.8647	19.8602	(88)
util rest of house													
	0.9618	0.9334	0.8810	0.7783	0.6251	0.4424	0.2960	0.3354	0.5668	0.8226	0.9364	0.9681	(89)
MIT 2	18.3801	18.6569	19.0295	19.4416	19.7117	19.8441	19.8727	19.8711	19.7937	19.4352	18.8434	18.3334	(90)
Living area fraction									fLA = Living area / (4) =			0.1981	(91)
MIT	18.5721	18.8500	19.2253	19.6420	19.9205	20.0594	20.0921	20.0891	20.0040	19.6323	19.0346	18.5237	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4221	18.7000	19.0753	19.4920	19.7705	19.9094	19.9421	19.9391	19.8540	19.4823	18.8846	18.3737	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9510	0.9193	0.8649	0.7650	0.6198	0.4446	0.3014	0.3407	0.5652	0.8080	0.9227	0.9584	(94)
Useful gains	796.4014	920.2182	994.4412	990.1213	860.0092	607.1439	393.7774	413.7704	629.4958	779.5438	770.6527	754.0739	(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													
	1734.6053	1690.8761	1537.0868	1279.9232	973.1298	633.7595	398.9342	421.6534	689.5271	1071.0189	1427.1793	1724.3191	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	698.0237	517.8821	403.7283	208.6574	84.1617	0.0000	0.0000	0.0000	0.0000	216.8575	472.6992	721.8624	(98)
Space heating												3323.8723	(98)
Space heating per m2											(98) / (4) =	34.8451	(99)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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 %)	90.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3672.7871	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	698.0237	517.8821	403.7283	208.6574	84.1617	0.0000	0.0000	0.0000	0.0000	216.8575	472.6992	721.8624	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	771.2969	572.2454	446.1086	230.5606	92.9964	0.0000	0.0000	0.0000	0.0000	239.6216	522.3195	797.6380	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	174.8033	153.2909	159.1486	140.0988	135.4294	118.3432	111.1302	125.4394	126.3223	145.4144	156.9706	169.7362	(64)
Efficiency of water heater												87.3000	(216)
(217)m	89.8405	89.7486	89.5717	89.1867	88.4993	87.3000	87.3000	87.3000	87.3000	89.1878	89.6805	89.8729	(217)
Fuel for water heating, kWh/month	194.5707	170.8003	177.6773	157.0848	153.0287	135.5592	127.2969	143.6877	144.6991	163.0430	175.0331	188.8626	(219)
Water heating fuel used												1931.3436	(219)
Annual totals kWh/year													
Space heating fuel - main system												3672.7871	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												391.7039	(232)
Total delivered energy for all uses												6070.8346	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3672.7871	3.4800	127.8130	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1931.3436	3.4800	67.2108	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	391.7039	13.1900	51.6657	(250)
Additional standing charges			120.0000	(251)
Total energy cost			376.5820	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.1266	(257)
SAP value		84.2838	
SAP rating (Section 12)		84	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3672.7871	0.2160	793.3220	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1931.3436	0.2160	417.1702	(264)
Space and water heating			1210.4922	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	391.7039	0.5190	203.2943	(268)
Total kg/year			1452.7116	(272)
CO2 emissions per m2			15.2300	(273)
EI value			86.1341	
EI rating			86	(274)
EI band			B	

Calculation of stars for heating and DHW

Main heating energy efficiency	3.48 × (1 + 0.29 × 0.00) / 0.9050 = 3.845, stars = 4
Main heating environmental impact	0.216 × (1 + 0.29 × 0.00) / 0.9050 = 0.2387, stars = 4
Water heating energy efficiency	3.48 / 0.8873 = 3.922, stars = 4
Water heating environmental impact	0.216 / 0.8873 = 0.2434, stars = 4

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	48.1700 (1b)	x	2.3800 (2b)	=	114.6446	(1b) - (3b)
First floor	47.2200 (1c)	x	2.6900 (2c)	=	127.0218	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.3900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	241.6664	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1241	(8)
Pressure test		Yes	
Measured/design AP50		5.0100	
Infiltration rate		0.3746	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3465	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.9000	4.8000	4.7000	4.2000	4.2000	3.7000	3.8000	3.8000	4.0000	4.2000	4.3000	4.5000	(22)
Wind factor	1.2250	1.2000	1.1750	1.0500	1.0500	0.9250	0.9500	0.9500	1.0000	1.0500	1.0750	1.1250	(22a)
Adj infilt rate	0.4245	0.4158	0.4072	0.3639	0.3639	0.3205	0.3292	0.3292	0.3465	0.3639	0.3725	0.3899	(22b)
Effective ac	0.5901	0.5865	0.5829	0.5662	0.5662	0.5514	0.5542	0.5542	0.5600	0.5662	0.5694	0.5760	(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	
Windows (Uw = 1.40)			20.8600	1.3258	27.6553			(27)
Solid Door			2.0900	1.2000	2.5080			(26)
Flr - Ground			48.1720	0.1500	7.2258	75.6000	3641.8032	(28a)
Wl - Brick	102.8990	22.9430	79.9560	0.2500	19.9890	51.1800	4092.1481	(29a)
Rf - Ins Joist	47.2220		47.2220	0.1000	4.7222	5.8200	274.8320	(30)
Rf - Flat over Bay	0.9500		0.9500	0.2500	0.2375	9.0000	8.5500	(30)
Total net area of external elements Aum(A, m2)			199.2500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.3378			(33)
Party Wall			41.0660	0.0000	0.0000	54.0300	2218.7960	(32)
Ground Floor Block			56.8154			54.0300	3069.7339	(32c)
Ground Floor Stud			31.1161			5.8200	181.0958	(32c)
1st Floor Stud			107.0993			5.8200	623.3178	(32c)
Internal Floor			47.2200			18.0000	849.9600	(32d)
Internal Ceiling			47.2200			5.8200	274.8204	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15235.0572 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		159.7134 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.8322 (36)
Total fabric heat loss	(33) + (36) =	75.1700 (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	47.0608	46.7705	46.4862	45.1544	45.1544	43.9722	44.1967	44.1967	44.6635	45.1544	45.4088	45.9355	(38)
Heat transfer coeff	122.2308	121.9405	121.6562	120.3244	120.3244	119.1422	119.3667	119.3667	119.8335	120.3244	120.5788	121.1055	(39)
Average = Sum(39)m / 12 =												120.5162	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2814	1.2783	1.2754	1.2614	1.2614	1.2490	1.2514	1.2514	1.2562	1.2614	1.2641	1.2696	(40)
HLP (average)												1.2634	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6926 (42)
Average daily hot water use (litres/day)	98.1482 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.9630	104.0371	100.1112	96.1852	92.2593	88.3334	88.3334	92.2593	96.1852	100.1112	104.0371	107.9630	(44)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy conte	160.1060	140.0298	144.4982	125.9770	120.8779	104.3085	96.6571	110.9155	112.2402	130.8051	142.7840	155.0542	(45)
Energy content (annual)										Total = Sum(45)m =		1544.2534	(45)
Distribution loss (46)m = 0.15 x (45)m													
	24.0159	21.0045	21.6747	18.8966	18.1317	15.6463	14.4986	16.6373	16.8360	19.6208	21.4176	23.2581	(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)
Combi loss	14.6972	13.2612	14.6504	14.1218	14.5515	14.0347	14.4731	14.5239	14.0822	14.6093	14.1867	14.6821	(61)
Total heat required for water heating calculated for each month													
	174.8033	153.2909	159.1486	140.0988	135.4294	118.3432	111.1302	125.4394	126.3223	145.4144	156.9706	169.7362	(62)
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	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	174.8033	153.2909	159.1486	140.0988	135.4294	118.3432	111.1302	125.4394	126.3223	145.4144	156.9706	169.7362	(64)
									Total per year (kWh/year) = Sum(64)m =			1716.1273	(64)
Heat gains from water heating, kWh/month													
	56.9096	49.8752	51.7082	45.4178	43.8298	38.1912	35.7568	40.5104	40.8404	47.1450	51.0223	55.2260	(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	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	55.4497	49.2500	40.0528	30.3225	22.6664	19.1360	20.6771	26.8769	36.0741	45.8043	53.4604	56.9909	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	371.1231	374.9742	365.2695	344.6095	318.5299	294.0188	277.6439	273.7928	283.4974	304.1574	330.2370	354.7481	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	(71)
Water heating gains (Table 5)													
	76.4914	74.2190	69.5003	63.0803	58.9110	53.0434	48.0602	54.4494	56.7228	63.3670	70.8644	74.2285	(72)
Total internal gains													
	613.7632	609.1422	585.5216	548.7113	510.8064	476.8972	457.0801	465.8181	486.9933	524.0277	565.2608	596.6665	(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	
North	0.8100	12.0539	0.5000	0.0000	0.7700	3.7590	(74)
Northeast	5.9300	12.9465	0.5000	0.0000	0.7700	29.5576	(75)
East	0.8100	22.4175	0.5000	0.0000	0.7700	6.9909	(76)
Southeast	7.6100	40.9830	0.5000	0.0000	0.7700	120.0741	(77)
Southwest	5.6970	40.9830	0.5000	0.0000	0.7700	89.8899	(79)

Solar gains	250.2715	408.8773	579.8540	807.2882	918.0499	970.4286	917.9090	814.2003	683.3530	480.8463	309.4284	210.6549	(83)
Total gains	864.0347	1018.0194	1165.3757	1355.9996	1428.8562	1447.3258	1374.9891	1280.0184	1170.3463	1004.8741	874.6891	807.3214	(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, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.6227	34.7051	34.7862	35.1713	35.1713	35.5202	35.4535	35.4535	35.3153	35.1713	35.0971	34.9444	
alpha	3.3082	3.3137	3.3191	3.3448	3.3448	3.3680	3.3636	3.3636	3.3544	3.3448	3.3398	3.3296	
util living area													
	0.9633	0.9392	0.8888	0.7776	0.6290	0.4420	0.2917	0.3125	0.5618	0.8203	0.9353	0.9693	(86)
MIT	19.4533	19.7050	20.1088	20.5587	20.8338	20.9631	20.9936	20.9921	20.9175	20.5567	19.9481	19.4067	(87)
Th 2	19.8554	19.8578	19.8602	19.8712	19.8712	19.8810	19.8791	19.8791	19.8753	19.8712	19.8691	19.8647	(88)
util rest of house													
	0.9555	0.9269	0.8666	0.7369	0.5661	0.3607	0.1972	0.2116	0.4736	0.7753	0.9197	0.9626	(89)
MIT 2	18.4864	18.7320	19.1197	19.5380	19.7666	19.8650	19.8779	19.8776	19.8351	19.5493	18.9815	18.4481	(90)
Living area fraction									fLA = Living area / (4) =			0.1981	(91)
MIT	18.6779	18.9248	19.3157	19.7402	19.9780	20.0826	20.0989	20.0984	20.0496	19.7489	19.1730	18.6381	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5279	18.7748	19.1657	19.5902	19.8280	19.9326	19.9489	19.9484	19.8996	19.5989	19.0230	18.4881	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9438	0.9123	0.8506	0.7256	0.5635	0.3646	0.2031	0.2180	0.4757	0.7627	0.9050	0.9520	(94)
Useful gains	815.4558	928.7851	991.3060	983.9225	805.1622	527.6245	279.3228	278.9946	556.6954	766.4127	791.6172	768.5669	(95)
Ext temp.	4.7000	5.2000	7.0000	9.5000	12.5000	15.4000	17.6000	17.6000	15.0000	11.4000	7.7000	4.7000	(96)
Heat loss rate W													
	1690.2004	1655.3129	1480.0305	1214.0995	881.7402	540.0260	280.3856	280.3201	587.1368	986.5303	1365.3172	1669.8107	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	650.8100	488.2266	363.6110	165.7275	56.9740	0.0000	0.0000	0.0000	0.0000	163.7675	413.0640	670.5253	(98)
Space heating												2972.7060	(98)
Space heating per m2											(98) / (4) =	31.1637	(99)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

8c. Space cooling requirement

Not applicable

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 %)	90.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3284.7580	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	650.8100	488.2266	363.6110	165.7275	56.9740	0.0000	0.0000	0.0000	0.0000	163.7675	413.0640	670.5253	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	719.1271	539.4770	401.7801	183.1243	62.9547	0.0000	0.0000	0.0000	0.0000	180.9585	456.4243	740.9120	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	174.8033	153.2909	159.1486	140.0988	135.4294	118.3432	111.1302	125.4394	126.3223	145.4144	156.9706	169.7362	(64)
Efficiency of water heater												87.3000	(216)
(217)m	89.8031	89.7142	89.5012	89.0054	88.2237	87.3000	87.3000	87.3000	87.3000	88.9663	89.5956	89.8348	(217)
Fuel for water heating, kWh/month	194.6518	170.8658	177.8172	157.4048	153.5068	135.5592	127.2969	143.6877	144.6991	163.4490	175.1989	188.9426	(219)
Water heating fuel used												1933.0798	(219)
Annual totals kWh/year													
Space heating fuel - main system												3284.7580	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												391.7039	(232)
Total delivered energy for all uses												5684.5417	(238)

10a. Fuel costs - using BEDF prices (473)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3284.7580	3.8700	127.1201	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1933.0798	3.8700	74.8102	(247)
Pumps and fans for heating	75.0000	18.9000	14.1750	(249)
Energy for lighting	391.7039	18.9000	74.0320	(250)
Additional standing charges			93.0000	(251)
Total energy cost			383.1374	(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	3284.7580	0.2160	709.5077	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1933.0798	0.2160	417.5452	(264)
Space and water heating			1127.0530	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	391.7039	0.5190	203.2943	(268)
Total kg/year			1369.2723	(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	3284.7580	1.2200	4007.4047	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1933.0798	1.2200	2358.3573	(264)
Space and water heating			6365.7621	(265)
Pumps and fans	75.0000	3.0700	230.2500	(267)
Energy for lighting	391.7039	3.0700	1202.5311	(268)
Primary energy kWh/year			7798.5431	(272)
Primary energy kWh/m2/year			81.7543	(273)

SAP 2012 EPC IMPROVEMENTS

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Current energy efficiency rating: B 84
Current environmental impact rating: B 86

(For testing purposes):

A		Not considered
B		Not considered
C		Not considered
D		Not considered
E	Low energy lighting	Already installed
F		Not considered
G		Not considered
H		Not considered
I		Not considered
J		Not considered
K		Not considered
M		Not considered
N	Solar water heating	Recommended
O		Not considered
P		Not considered
R		Not considered
S		Not considered
T		Not considered
U	Solar photovoltaic panels	Recommended
A2		Not considered
A3		Not considered
T2		Not considered
W		Not considered
X		Not considered
Y		Not considered
J2		Not considered
Q2		Not considered
Z1		Not considered
Z2		Not considered
Z3		Not considered
Z4		Not considered
Z5		Not considered
V2	Wind turbine	Not applicable
L2		Not considered
Q3		Not considered
O3		Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.1	-£ 29	-190 kg (13.9%)
U Solar photovoltaic panels	+ 9.5	-£ 353	-970 kg (82.3%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£29	1.99 kg/m²	B 85	B 88
Solar photovoltaic panels	£353	10.17 kg/m²	A 95	A 96
Total Savings	£383	12.16 kg/m²		

Potential energy efficiency rating: A 95
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 473 TEST (26 Feb 2021)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, East Anglia):

	Current	Potential	Saving
Electricity	£88	£98	-£9
Mains gas	£295	£256	£39
Space heating	£234	£234	£0
Water heating	£75	£46	£29
Lighting	£74	£74	£0
Generated (PV)	-£0	-£353	£353
Total cost of fuels	£383	£1	£383
Total cost of uses	£383	£1	£382
Delivered energy	60 kWh/m²	30 kWh/m²	30 kWh/m²
Carbon dioxide emissions	1.4 tonnes	0.2 tonnes	1.2 tonnes
CO2 emissions per m²	14 kg/m²	2 kg/m²	12 kg/m²
Primary energy	82 kWh/m²	10 kWh/m²	71 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	48.1700	(1b)	x 2.3800	(2b) =	114.6446	(1b) - (3b)
First floor	47.2200	(1c)	x 2.6900	(2c) =	127.0218	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.3900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		241.6664	(5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40	=	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20	=	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =			30.0000 / (5) =	0.1241	(8)
Pressure test				Yes	
Measured/design AP50				5.0100	
Infiltration rate				0.3746	(18)
Number of sides sheltered				1	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.3465	(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	0.4418	0.4332	0.4245	0.3812	0.3725	0.3292	0.3292	0.3205	0.3465	0.3725	0.3899	0.4072	(22b)
Effective ac	0.5976	0.5938	0.5901	0.5727	0.5694	0.5542	0.5542	0.5514	0.5600	0.5694	0.5760	0.5829	(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	
Windows (Uw = 1.40)			20.8600	1.3258	27.6553			(27)
Solid Door			2.0900	1.2000	2.5080			(26)
Flr - Ground			48.1720	0.1500	7.2258	75.6000	3641.8032	(28a)
Wl - Brick	102.8990	22.9430	79.9560	0.2500	19.9890	51.1800	4092.1481	(29a)
Rf - Ins Joist	47.2220		47.2220	0.1000	4.7222	5.8200	274.8320	(30)
Rf - Flat over Bay	0.9500		0.9500	0.2500	0.2375	9.0000	8.5500	(30)
Total net area of external elements Aum(A, m2)			199.2500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.3378			(33)
Party Wall			41.0660	0.0000	0.0000	54.0300	2218.7960	(32)
Ground Floor Block			56.8154			54.0300	3069.7339	(32c)
Ground Floor Stud			31.1161			5.8200	181.0958	(32c)
1st Floor Stud			107.0993			5.8200	623.3178	(32c)
Internal Floor			47.2200			18.0000	849.9600	(32d)
Internal Ceiling			47.2200			5.8200	274.8204	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15235.0572 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		159.7134 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		12.8322 (36)
Total fabric heat loss	(33) + (36) =	75.1700 (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	47.6594	47.3571	47.0608	45.6691	45.4088	44.1967	44.1967	43.9722	44.6635	45.4088	45.9355	46.4862	(38)
Heat transfer coeff	122.8294	122.5271	122.2308	120.8392	120.5788	119.3667	119.3667	119.1422	119.8335	120.5788	121.1055	121.6562	(39)
Average = Sum(39)m / 12 =												120.8379	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2877	1.2845	1.2814	1.2668	1.2641	1.2514	1.2514	1.2490	1.2562	1.2641	1.2696	1.2754	(40)
HLP (average)												1.2668	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6926 (42)
Average daily hot water use (litres/day)		98.1482 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.9630	104.0371	100.1112	96.1852	92.2593	88.3334	88.3334	92.2593	96.1852	100.1112	104.0371	107.9630	(44)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	160.1060	140.0298	144.4982	125.9770	120.8779	104.3085	96.6571	110.9155	112.2402	130.8051	142.7840	155.0542	(45)
Energy content (annual)										Total = Sum(45)m =		1544.2534	(45)
Distribution loss (46)m = 0.15 x (45)m													
	24.0159	21.0045	21.6747	18.8966	18.1317	15.6463	14.4986	16.6373	16.8360	19.6208	21.4176	23.2581	(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)
Combi loss	14.6972	13.2612	14.6504	14.1218	14.5515	14.0347	14.4731	14.5239	14.0822	14.6093	14.1867	14.6821	(61)
Total heat required for water heating calculated for each month													
	174.8033	153.2909	159.1486	140.0988	135.4294	118.3432	111.1302	125.4394	126.3223	145.4144	156.9706	169.7362	(62)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.7000	(H2)
Collector heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0050	(H3a)
Collector effective heat loss coefficient												1.8063	(H3b)
Collector performance ratio												2.5804	(H4)
Annual solar radiation per m2												1079.5246	(H5)
Overshading factor												0.8000	(H6)
Solar energy available												1813.6014	(H7)
Adjustment factor for showers												1.0000	(H7a)
Solar-to-load ratio												1.1744	(H8)
Utilisation factor												0.5732	(H9)
Collector performance factor												0.8793	(H10)
Dedicated solar storage volume												75.0000	(H11)
Effective solar volume												75.0000	(H13)
Daily hot water demand												98.1482	(H14)
Volume ratio Veff/V												0.7642	(H15)
Solar storage volume factor												0.9462	(H16)
Solar input												-864.9283	(H17)
Solar input	-25.0812	-41.8533	-71.2810	-95.5306	-118.0200	-116.0324	-114.4990	-100.0383	-78.3501	-53.5039	-29.7499	-20.9887	(63)
								Solar input (sum of months) = Sum(63)m =				-864.9283	(63)
Output from w/h													
	149.7221	111.4376	87.8676	44.5683	17.4095	2.3108	0.0000	25.4010	47.9722	91.9105	127.2207	148.7475	(64)
									Total per year (kWh/year) = Sum(64)m =			854.5678	(64)
Heat gains from water heating, kWh/month													
	56.9096	49.8752	51.7082	45.4178	43.8298	38.1912	35.7568	40.5104	40.8404	47.1450	51.0223	55.2260	(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	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	55.4497	49.2500	40.0528	30.3225	22.6664	19.1360	20.6771	26.8769	36.0741	45.8043	53.4604	56.9909	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	371.1231	374.9742	365.2695	344.6095	318.5299	294.0188	277.6439	273.7928	283.4974	304.1574	330.2370	354.7481	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	(71)
Water heating gains (Table 5)													
	76.4914	74.2190	69.5003	63.0803	58.9110	53.0434	48.0602	54.4494	56.7228	63.3670	70.8644	74.2285	(72)
Total internal gains													
	613.7632	609.1422	585.5216	548.7113	510.8064	476.8972	457.0801	465.8181	486.9933	524.0277	565.2608	596.6665	(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	
North	0.8100	10.6334	0.5000	0.0000	0.7700	3.3160	(74)
Northeast	5.9300	11.2829	0.5000	0.0000	0.7700	25.7595	(75)
East	0.8100	19.6403	0.5000	0.0000	0.7700	6.1248	(76)
Southeast	7.6100	36.7938	0.5000	0.0000	0.7700	107.8004	(77)
Southwest	5.6970	36.7938	0.5000	0.0000	0.7700	80.7016	(79)

Solar gains	223.7023	391.8414	564.2973	745.5687	876.8307	888.6861	849.2276	748.6243	626.7074	440.7106	269.9217	190.1561	(83)
Total gains	837.4655	1000.9836	1149.8189	1294.2801	1387.6370	1365.5833	1306.3078	1214.4424	1113.7007	964.7383	835.1825	786.8226	(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, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.4540	34.5390	34.6227	35.0214	35.0971	35.4535	35.4535	35.5202	35.3153	35.0971	34.9444	34.7862	
alpha	3.2969	3.3026	3.3082	3.3348	3.3398	3.3636	3.3636	3.3680	3.3544	3.3398	3.3296	3.3191	
util living area													
	0.9685	0.9446	0.9007	0.8138	0.6820	0.5215	0.3906	0.4338	0.6455	0.8586	0.9487	0.9737	(86)
MIT	19.3490	19.6315	20.0177	20.4529	20.7656	20.9304	20.9799	20.9714	20.8552	20.4300	19.8085	19.2939	(87)
Th 2	19.8505	19.8530	19.8554	19.8669	19.8691	19.8791	19.8791	19.8810	19.8753	19.8691	19.8647	19.8602	(88)
util rest of house													
	0.9618	0.9334	0.8810	0.7783	0.6251	0.4424	0.2960	0.3354	0.5668	0.8226	0.9364	0.9681	(89)
MIT 2	18.3801	18.6569	19.0295	19.4416	19.7117	19.8441	19.8727	19.8711	19.7937	19.4352	18.8434	18.3334	(90)
Living area fraction									fLA = Living area / (4) =			0.1981	(91)
MIT	18.5721	18.8500	19.2253	19.6420	19.9205	20.0594	20.0921	20.0891	20.0040	19.6323	19.0346	18.5237	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4221	18.7000	19.0753	19.4920	19.7705	19.9094	19.9421	19.9391	19.8540	19.4823	18.8846	18.3737	(93)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9510	0.9193	0.8649	0.7650	0.6198	0.4446	0.3014	0.3407	0.5652	0.8080	0.9227	0.9584	(94)
Useful gains	796.4014	920.2182	994.4412	990.1213	860.0092	607.1439	393.7774	413.7704	629.4958	779.5438	770.6527	754.0739	(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	1734.6053	1690.8761	1537.0868	1279.9232	973.1298	633.7595	398.9342	421.6534	689.5271	1071.0189	1427.1793	1724.3191	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	698.0237	517.8821	403.7283	208.6574	84.1617	0.0000	0.0000	0.0000	0.0000	216.8575	472.6992	721.8624	(98)
Space heating												3323.8723	(98)
Space heating per m2											(98) / (4) =	34.8451	(99)

8c. Space cooling requirement

Not applicable

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 %)												90.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3672.7871	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	698.0237	517.8821	403.7283	208.6574	84.1617	0.0000	0.0000	0.0000	0.0000	216.8575	472.6992	721.8624	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	771.2969	572.2454	446.1086	230.5606	92.9964	0.0000	0.0000	0.0000	0.0000	239.6216	522.3195	797.6380	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	149.7221	111.4376	87.8676	44.5683	17.4095	2.3108	0.0000	25.4010	47.9722	91.9105	127.2207	148.7475	(64)
Efficiency of water heater												87.3000	(216)
(217)m	89.9179	89.9164	89.9109	89.9199	89.9350	87.3000	87.3000	87.3000	87.3000	89.5232	89.8020	89.9368	(217)
Fuel for water heating, kWh/month	166.5098	123.9347	97.7274	49.5644	19.3578	2.6469	0.0000	29.0962	54.9510	102.6667	141.6681	165.3913	(219)
Water heating fuel used												953.5144	(219)
Annual totals kWh/year													
Space heating fuel - main system												3672.7871	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
pump for solar water heating												50.0000	(230g)
Total electricity for the above, kWh/year												125.0000	(231)
Electricity for lighting (calculated in Appendix L)												391.7039	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1080 * 0.80) =										-1727.2394		-1727.2394	(233)
Total delivered energy for all uses												3415.7661	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3672.7871	3.4800	127.8130	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	953.5144	3.4800	33.1823	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	391.7039	13.1900	51.6657	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-1727.2394	13.1900	-227.8229	(252)
Total energy cost			121.3257	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3630	(257)
SAP value		94.9366	
SAP rating (Section 12)		95	(258)
SAP band		A	

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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	3672.7871	0.2160	793.3220	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	953.5144	0.2160	205.9591	(264)
Space and water heating			999.2811	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	391.7039	0.5190	203.2943	(268)
Energy saving/generation technologies				
PV Unit	-1727.2394	0.5190	-896.4372	(269)
Total kg/year			371.0132	(272)
CO2 emissions per m2			3.8900	(273)
EI value			96.4587	
EI rating			96	(274)
EI band			A	

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	48.1700 (1b)	x	2.3800 (2b)	=	114.6446	(1b) - (3b)
First floor	47.2200 (1c)	x	2.6900 (2c)	=	127.0218	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.3900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	241.6664	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1241	(8)
Pressure test		Yes	
Measured/design AP50		5.0100	
Infiltration rate		0.3746	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3465	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.9000	4.8000	4.7000	4.2000	4.2000	3.7000	3.8000	3.8000	4.0000	4.2000	4.3000	4.5000	(22)
Wind factor	1.2250	1.2000	1.1750	1.0500	1.0500	0.9250	0.9500	0.9500	1.0000	1.0500	1.0750	1.1250	(22a)
Adj infilt rate	0.4245	0.4158	0.4072	0.3639	0.3639	0.3205	0.3292	0.3292	0.3465	0.3639	0.3725	0.3899	(22b)
Effective ac	0.5901	0.5865	0.5829	0.5662	0.5662	0.5514	0.5542	0.5542	0.5600	0.5662	0.5694	0.5760	(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	
Windows (Uw = 1.40)			20.8600	1.3258	27.6553			(27)
Solid Door			2.0900	1.2000	2.5080			(26)
Flr - Ground			48.1720	0.1500	7.2258	75.6000	3641.8032	(28a)
Wl - Brick	102.8990	22.9430	79.9560	0.2500	19.9890	51.1800	4092.1481	(29a)
Rf - Ins Joist	47.2220		47.2220	0.1000	4.7222	5.8200	274.8320	(30)
Rf - Flat over Bay	0.9500		0.9500	0.2500	0.2375	9.0000	8.5500	(30)
Total net area of external elements Aum(A, m2)			199.2500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.3378			(33)
Party Wall			41.0660	0.0000	0.0000	54.0300	2218.7960	(32)
Ground Floor Block			56.8154			54.0300	3069.7339	(32c)
Ground Floor Stud			31.1161			5.8200	181.0958	(32c)
1st Floor Stud			107.0993			5.8200	623.3178	(32c)
Internal Floor			47.2200			18.0000	849.9600	(32d)
Internal Ceiling			47.2200			5.8200	274.8204	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15235.0572	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	159.7134	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	12.8322	(36)
Total fabric heat loss	(33) + (36) = 75.1700	(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	47.0608	46.7705	46.4862	45.1544	45.1544	43.9722	44.1967	44.1967	44.6635	45.1544	45.4088	45.9355	(38)
Heat transfer coeff	122.2308	121.9405	121.6562	120.3244	120.3244	119.1422	119.3667	119.3667	119.8335	120.3244	120.5788	121.1055	(39)
Average = Sum(39)m / 12 =												120.5162	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2814	1.2783	1.2754	1.2614	1.2614	1.2490	1.2514	1.2514	1.2562	1.2614	1.2641	1.2696	(40)
HLP (average)												1.2634	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6926 (42)
Average daily hot water use (litres/day)	98.1482 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.9630	104.0371	100.1112	96.1852	92.2593	88.3334	88.3334	92.2593	96.1852	100.1112	104.0371	107.9630	(44)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

Energy conte	160.1060	140.0298	144.4982	125.9770	120.8779	104.3085	96.6571	110.9155	112.2402	130.8051	142.7840	155.0542	(45)
Energy content (annual)										Total = Sum(45)m =		1544.2534	(45)
Distribution loss (46)m = 0.15 x (45)m													
	24.0159	21.0045	21.6747	18.8966	18.1317	15.6463	14.4986	16.6373	16.8360	19.6208	21.4176	23.2581	(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)
Combi loss	14.6972	13.2612	14.6504	14.1218	14.5515	14.0347	14.4731	14.5239	14.0822	14.6093	14.1867	14.6821	(61)
Total heat required for water heating calculated for each month													
	174.8033	153.2909	159.1486	140.0988	135.4294	118.3432	111.1302	125.4394	126.3223	145.4144	156.9706	169.7362	(62)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.7000	(H2)
Collector heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0050	(H3a)
Collector effective heat loss coefficient												1.8063	(H3b)
Collector performance ratio												2.5804	(H4)
Annual solar radiation per m2												1168.2835	(H5)
Overshading factor												0.8000	(H6)
Solar energy available												1962.7164	(H7)
Adjustment factor for showers												1.0000	(H7a)
Solar-to-load ratio												1.2710	(H8)
Utilisation factor												0.5447	(H9)
Collector performance factor												0.8793	(H10)
Dedicated solar storage volume												75.0000	(H11)
Effective solar volume												75.0000	(H13)
Daily hot water demand												98.1482	(H14)
Volume ratio Veff/V												0.7642	(H15)
Solar storage volume factor												0.9462	(H16)
Solar input												-889.4690	(H17)
Solar input	-26.9198	-41.8808	-70.0995	-98.6563	-117.5503	-120.4203	-117.6662	-103.6473	-81.6557	-55.9500	-32.7170	-22.3059	(63)
								Solar input (sum of months) = Sum(63)m =				-889.4690	(63)
Output from w/h													
	147.8835	111.4102	89.0491	41.4426	17.8791	0.0000	0.0000	21.7920	44.6666	89.4644	124.2536	147.4304	(64)
									Total per year (kWh/year) = Sum(64)m =			835.2715	(64)
Heat gains from water heating, kWh/month													
	56.9096	49.8752	51.7082	45.4178	43.8298	38.1912	35.7568	40.5104	40.8404	47.1450	51.0223	55.2260	(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	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	161.5533	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	55.4497	49.2500	40.0528	30.3225	22.6664	19.1360	20.6771	26.8769	36.0741	45.8043	53.4604	56.9909	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	371.1231	374.9742	365.2695	344.6095	318.5299	294.0188	277.6439	273.7928	283.4974	304.1574	330.2370	354.7481	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	53.8479	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	-107.7022	(71)
Water heating gains (Table 5)													
	76.4914	74.2190	69.5003	63.0803	58.9110	53.0434	48.0602	54.4494	56.7228	63.3670	70.8644	74.2285	(72)
Total internal gains													
	613.7632	609.1422	585.5216	548.7113	510.8064	476.8972	457.0801	465.8181	486.9933	524.0277	565.2608	596.6665	(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	
North	0.8100	12.0539	0.5000	0.0000	0.7700	3.7590	(74)
Northeast	5.9300	12.9465	0.5000	0.0000	0.7700	29.5576	(75)
East	0.8100	22.4175	0.5000	0.0000	0.7700	6.9909	(76)
Southeast	7.6100	40.9830	0.5000	0.0000	0.7700	120.0741	(77)
Southwest	5.6970	40.9830	0.5000	0.0000	0.7700	89.8899	(79)

Solar gains	250.2715	408.8773	579.8540	807.2882	918.0499	970.4286	917.9090	814.2003	683.3530	480.8463	309.4284	210.6549	(83)
Total gains	864.0347	1018.0194	1165.3757	1355.9996	1428.8562	1447.3258	1374.9891	1280.0184	1170.3463	1004.8741	874.6891	807.3214	(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, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.6227	34.7051	34.7862	35.1713	35.1713	35.5202	35.4535	35.4535	35.3153	35.1713	35.0971	34.9444	
alpha	3.3082	3.3137	3.3191	3.3448	3.3448	3.3680	3.3636	3.3636	3.3544	3.3448	3.3398	3.3296	
util living area													
	0.9633	0.9392	0.8888	0.7776	0.6290	0.4420	0.2917	0.3125	0.5618	0.8203	0.9353	0.9693	(86)
MIT	19.4533	19.7050	20.1088	20.5587	20.8338	20.9631	20.9936	20.9921	20.9175	20.5567	19.9481	19.4067	(87)
Th 2	19.8554	19.8578	19.8602	19.8712	19.8712	19.8810	19.8791	19.8791	19.8753	19.8712	19.8691	19.8647	(88)
util rest of house													
	0.9555	0.9269	0.8666	0.7369	0.5661	0.3607	0.1972	0.2116	0.4736	0.7753	0.9197	0.9626	(89)
MIT 2	18.4864	18.7320	19.1197	19.5380	19.7666	19.8650	19.8779	19.8776	19.8351	19.5493	18.9815	18.4481	(90)
Living area fraction									fLA = Living area / (4) =			0.1981	(91)
MIT	18.6779	18.9248	19.3157	19.7402	19.9780	20.0826	20.0989	20.0984	20.0496	19.7489	19.1730	18.6381	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5279	18.7748	19.1657	19.5902	19.8280	19.9326	19.9489	19.9484	19.8996	19.5989	19.0230	18.4881	(93)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9438	0.9123	0.8506	0.7256	0.5635	0.3646	0.2031	0.2180	0.4757	0.7627	0.9050	0.9520	(94)
Useful gains	815.4558	928.7851	991.3060	983.9225	805.1622	527.6245	279.3228	278.9946	556.6954	766.4127	791.6172	768.5669	(95)
Ext temp.	4.7000	5.2000	7.0000	9.5000	12.5000	15.4000	17.6000	17.6000	15.0000	11.4000	7.7000	4.7000	(96)
Heat loss rate W	1690.2004	1655.3129	1480.0305	1214.0995	881.7402	540.0260	280.3856	280.3201	587.1368	986.5303	1365.3172	1669.8107	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	650.8100	488.2266	363.6110	165.7275	56.9740	0.0000	0.0000	0.0000	0.0000	163.7675	413.0640	670.5253	(98)
Space heating												2972.7060	(98)
Space heating per m2											(98) / (4) =	31.1637	(99)

8c. Space cooling requirement

Not applicable

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 %)	90.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3284.7580	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	650.8100	488.2266	363.6110	165.7275	56.9740	0.0000	0.0000	0.0000	0.0000	163.7675	413.0640	670.5253	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	719.1271	539.4770	401.7801	183.1243	62.9547	0.0000	0.0000	0.0000	0.0000	180.9585	456.4243	740.9120	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	147.8835	111.4102	89.0491	41.4426	17.8791	0.0000	0.0000	21.7920	44.6666	89.4644	124.2536	147.4304	(64)
Efficiency of water heater												87.3000	(216)
(217)m	89.8899	89.8878	89.8521	89.8412	89.7145	87.3000	87.3000	87.3000	87.3000	89.3430	89.7393	89.9060	(217)
Fuel for water heating, kWh/month	164.5162	123.9436	99.1063	46.1287	19.9289	0.0000	0.0000	24.9622	51.1645	100.1359	138.4606	163.9828	(219)
Water heating fuel used												932.3296	(219)
Annual totals kWh/year													
Space heating fuel - main system												3284.7580	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
pump for solar water heating												50.0000	(230g)
Total electricity for the above, kWh/year												125.0000	(231)
Electricity for lighting (calculated in Appendix L)												391.7039	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1168 * 0.80) =										-1869.2537		-1869.2537	(233)
Total delivered energy for all uses												2864.5379	(238)

10a. Fuel costs - using BEDF prices (473)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3284.7580	3.8700	127.1201	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	932.3296	3.8700	36.0812	(247)
Pumps and fans for heating	75.0000	18.9000	14.1750	(249)
Pump for solar water heating	50.0000	18.9000	9.4500	(249)
Energy for lighting	391.7039	18.9000	74.0320	(250)
Additional standing charges			93.0000	(251)
Energy saving/generation technologies				
PV Unit	-1869.2537	18.9000	-353.2889	(252)
Total energy cost			0.5694	(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	3284.7580	0.2160	709.5077	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	932.3296	0.2160	201.3832	(264)
Space and water heating			910.8909	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	391.7039	0.5190	203.2943	(268)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

Energy saving/generation technologies			
PV Unit	-1869.2537	0.5190	-970.1427 (269)
Total kg/year			208.9176 (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	3284.7580	1.2200	4007.4047	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	932.3296	1.2200	1137.4422	(264)
Space and water heating			5144.8469	(265)
Pumps and fans	125.0000	3.0700	383.7500	(267)
Energy for lighting	391.7039	3.0700	1202.5311	(268)
Energy saving/generation technologies				
PV Unit	-1869.2537	3.0700	-5738.6088	(269)
Primary energy kWh/year			992.5192	(272)
Primary energy kWh/m2/year			10.4049	(273)

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Property Reference	106 - PRJ011597	**Issued on Date**	17/03/2021
Assessment Reference	106 E	**Prop Type Ref**	3B.B
Property	106 - PRJ011597		

SAP Rating	84 B	**DER**	16.72	**TER**	17.39
Environmental	86 B	**% DER<TER**	3.86		
CO_2 Emissions (t/year)	1.37	**DFEE**	46.36	**TFEE**	52.43
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.58		

Assessor Details	Mr. Michael Juckes, Michael Juckes, Tel: 02033971373, michael@briaryenergy.co.uk	**Assessor ID**	T850-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.39	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	16.72	$kgCO_2/m^2$	Pass
	-0.67 (-3.9%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.43	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	46.36	$kWh/m^2/yr$	
	-6.0 (-11.5%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.25 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.25 (max. 0.35)	Pass
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.01 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Ideal LOGIC COMBI ESP1 30 Combi boiler Efficiency: 89.6% SEDBUK2009 Minimum: 88.0%		Pass
Secondary heating system	None		

5 Cylinder insulation

Hot water storage	No cylinder		

6 Controls

Space heating controls	Programmer, room thermostat and TRVs		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (East Anglia)	Slight		Pass

Based on:

Overshading	Average		
Windows facing North	0.81 m², No overhang		
Windows facing North East	5.93 m², No overhang		
Windows facing East	0.81 m², No overhang		
Windows facing South East	7.61 m², No overhang		
Windows facing South West	5.70 m², No overhang		
Air change rate	4.21 ach		
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.01 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K	
Roof U-value	0.10	W/m²K	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.