PREDICTED ENERGY ASSESSMENT

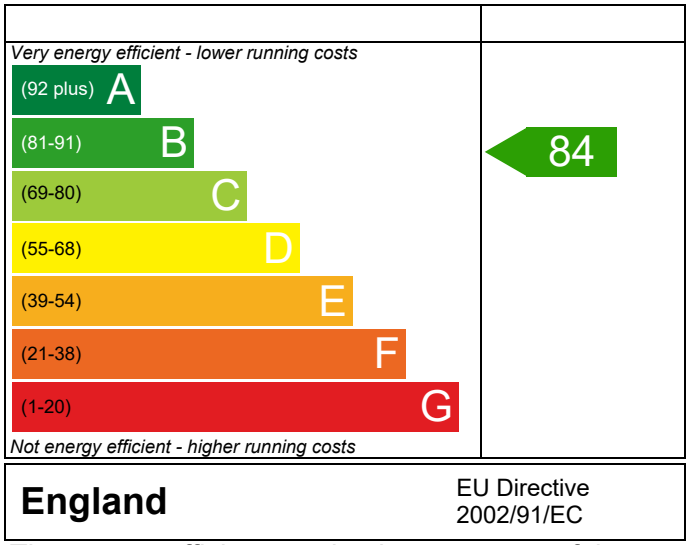
Plot 014 - PRJ011408

Dwelling type:	House, Semi-Detached
Date of assessment:	05/05/2021
Produced by:	Michael Juckes
Total floor area:	80.46 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.

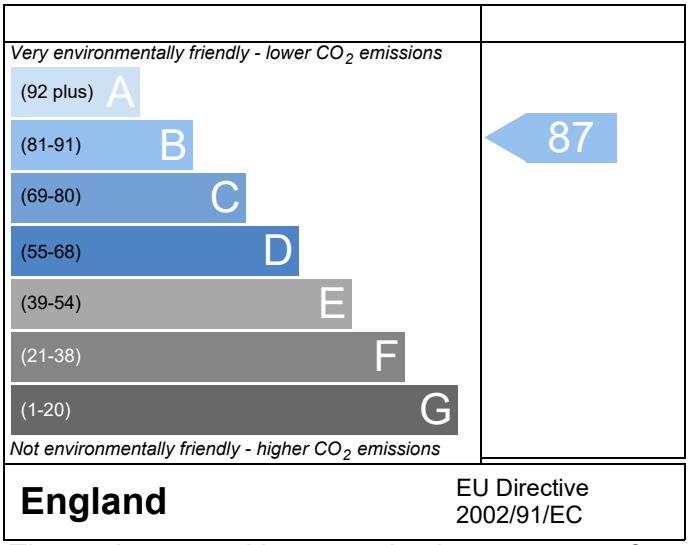
Energy Efficiency Rating



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.

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

Regs Region: England
Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.14r17

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

Property Reference	Plot 014 - PRJ011408	**Issued on Date**	05/05/2021
Assessment Reference	014 - S	**Prop Type Ref**	Elg
Property	Plot 014 - PRJ011408		

SAP Rating	84 B	**DER**	17.32	**TER**	18.52
Environmental	87 B	**% DER<TER**	6.48		
CO_2 Emissions (t/year)	1.15	**DFEE**	45.04	**TFEE**	51.58
General Requirements Compliance	Pass	**% DFEE<TFEE**	12.68		

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)	18.52	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	17.32	$kgCO_2/m^2$	Pass
	-1.20 (-6.5%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.58	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	45.04	$kWh/m^2/yr$	
	-6.6 (-12.8%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.26 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	Pass
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	Pass
Openings	1.28 (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

Continuous extract system (decentralised)			
Specific fan power	0.1900 0.1800		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (South West England)	Not significant	Pass

Based on:

Overshading	Average
Windows facing South East	4.48 m², No overhang
Windows facing South West	2.14 m², No overhang
Windows facing North West	3.18 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

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

10 Key features

Party wall U-value	0.00	W/m²K
Roof U-value	0.12	W/m²K
Door U-value	1.00	W/m²K

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

Property Reference	Plot 014 - PRJ011408	**Issued on Date**	05/05/2021
Assessment Reference	014 - S	**Prop Type Ref**	Elg
Property	Plot 014 - PRJ011408		

SAP Rating	84 B	**DER**	17.32	**TER**	18.52
Environmental	87 B	**% DER<TER**	6.48		
CO_2 Emissions (t/year)	1.15	**DFEE**	45.04	**TFEE**	51.58
General Requirements Compliance	Pass	**% DFEE<TFEE**	12.68		

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	40.2300	(1b)	x 2.3800	(2b) =	95.7474	(1b) - (3b)
First floor	40.2300	(1c)	x 2.6100	(2c) =	105.0003	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.4600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	200.7477	(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							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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		5.0100	
Infiltration rate		0.2505	(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) =	0.2317	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	6.0000	5.6000	5.6000	5.0000	5.0000	4.4000	4.4000	4.3000	4.7000	5.4000	5.5000	5.9000	(22)
Wind factor	1.5000	1.4000	1.4000	1.2500	1.2500	1.1000	1.1000	1.0750	1.1750	1.3500	1.3750	1.4750	(22a)
Adj infilt rate	0.3476	0.3244	0.3244	0.2896	0.2896	0.2549	0.2549	0.2491	0.2723	0.3128	0.3186	0.3418	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation:												0.5000	(23a)
Effective ac	0.5976	0.5744	0.5744	0.5396	0.5396	0.5049	0.5049	0.5000	0.5223	0.5628	0.5686	0.5918	(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)			9.8000	1.3258	12.9924			(27)
Solid Door			4.0600	1.0000	4.0700			(26)
Flr - Ground			40.2300	0.1400	5.6322	75.0000	3017.2500	(28a)
Wl - Brick	89.7890	13.8580	75.9310	0.2600	19.7421	51.1800	3886.1486	(29a)
Rf - Ins Joist	40.2330		40.2330	0.1200	4.8280	9.0000	362.0970	(30)
Total net area of external elements Aum(A, m2)			170.2640					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2646			(33)
Party Wall			41.4370	0.0000	0.0000	54.0300	2238.8411	(32)
Ground Floor Block			17.9976			54.0300	972.4082	(32c)
Ground Floor Stud			62.3608			5.8200	362.9396	(32c)
1st Floor Stud			97.8489			5.8200	569.4806	(32c)
Internal Floor			40.2400			18.0000	724.3200	(32d)
Internal Ceiling			40.2400			5.8200	234.1968	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12367.6819	(34)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 153.7122 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6774 (36)
Total fabric heat loss (33) + (36) = 54.9420 (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	39.5870	38.0520	38.0520	35.7494	35.7494	33.4469	33.4469	33.1234	34.5982	37.2845	37.6682	39.2032	(38)
Heat transfer coeff	94.5290	92.9940	92.9940	90.6915	90.6915	88.3889	88.3889	88.0654	89.5402	92.2265	92.6102	94.1453	(39)

Average = Sum(39)m / 12 = 91.2721 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1749	1.1558	1.1558	1.1272	1.1272	1.0985	1.0985	1.0945	1.1129	1.1462	1.1510	1.1701	(40)

HLP (average) 1.1344 (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 2.4715 (42)
Average daily hot water use (litres/day) 92.8989 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	102.1888	98.4728	94.7568	91.0409	87.3249	83.6090	83.6090	87.3249	91.0409	94.7568	98.4728	102.1888	(44)
Energy conte	151.5430	132.5404	136.7699	119.2393	114.4129	98.7297	91.4875	104.9833	106.2371	123.8091	135.1473	146.7613	(45)

Energy content (annual) Total = Sum(45)m = 1461.6609 (45)

Distribution loss (46)m = 0.15 x (45)m													
	22.7314	19.8811	20.5155	17.8859	17.1619	14.8094	13.7231	15.7475	15.9356	18.5714	20.2721	22.0142	(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	14.6715	13.2326	14.6057	14.0840	14.5166	14.0059	14.4464	14.4919	14.0485	14.5689	14.1576	14.6572	(61)

Total heat required for water heating calculated for each month

	166.2145	145.7731	151.3756	133.3233	128.9296	112.7356	105.9339	119.4752	120.2856	138.3780	149.3049	161.4185	(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													
	166.2145	145.7731	151.3756	133.3233	128.9296	112.7356	105.9339	119.4752	120.2856	138.3780	149.3049	161.4185	(64)

Total per year (kWh/year) = Sum(64)m = 1633.1477 (64)

RHI water heating demand 1633 (64)

Heat gains from water heating, kWh/month													
	54.0559	47.3779	49.1274	43.1681	41.6715	36.3291	34.0312	38.5299	38.8360	44.8088	48.4759	52.4624	(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	148.2919	148.2919	148.2919	148.2919	148.2919	148.2919	148.2919	148.2919	148.2919	148.2919	148.2919	148.2919	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	54.3477	48.2712	39.2567	29.7199	22.2160	18.7556	20.2661	26.3427	35.3571	44.8940	52.3979	55.8582	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	328.9541	332.3676	323.7657	305.4531	282.3369	260.6108	246.0965	242.6830	251.2849	269.5975	292.7137	314.4398	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.3007	52.3007	52.3007	52.3007	52.3007	52.3007	52.3007	52.3007	52.3007	52.3007	52.3007	52.3007	(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)													
	-98.8612	-98.8612	-98.8612	-98.8612	-98.8612	-98.8612	-98.8612	-98.8612	-98.8612	-98.8612	-98.8612	-98.8612	(71)

Water heating gains (Table 5)													
	72.6558	70.5028	66.0315	59.9556	56.0100	50.4571	45.7409	51.7875	53.9388	60.2268	67.3276	70.5140	(72)

Total internal gains													
	560.6890	555.8729	533.7852	499.8600	465.2942	434.5549	416.8349	425.5446	445.3122	479.4496	517.1706	545.5433	(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	
Southeast	4.4760	47.2368	0.5000	0.0000	0.7700	81.4013	(77)
Southwest	2.1390	47.2368	0.5000	0.0000	0.7700	38.9002	(79)
Northwest	3.1820	15.4538	0.5000	0.0000	0.7700	18.9320	(81)

Solar gains	139.2335	205.7540	295.7287	396.8881	444.6436	482.0868	426.0359	400.0718	337.4773	234.8679	161.7866	113.9925	(83)
Total gains	699.9225	761.6268	829.5139	896.7481	909.9378	916.6417	842.8707	825.6164	782.7895	714.3175	678.9572	659.5358	(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	36.3430	36.9429	36.9429	37.8808	37.8808	38.8676	38.8676	39.0104	38.3679	37.2503	37.0960	36.4911	
alpha	3.4229	3.4629	3.4629	3.5254	3.5254	3.5912	3.5912	3.6007	3.5579	3.4834	3.4731	3.4327	

util living area													
	0.9519	0.9358	0.9041	0.8395	0.7395	0.5773	0.4812	0.4796	0.6468	0.8386	0.9210	0.9565	(86)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	19.7624	19.9193	20.1531	20.4795	20.7428	20.9228	20.9682	20.9695	20.8869	20.5809	20.1846	19.7585	(87)
Th 2	19.9402	19.9555	19.9555	19.9787	19.9787	20.0020	20.0020	20.0053	19.9903	19.9632	19.9594	19.9440	(88)
util rest of house													
	0.9417	0.9227	0.8847	0.8080	0.6882	0.5035	0.3898	0.3867	0.5690	0.7969	0.9018	0.9469	(89)
MIT 2	18.8577	19.0208	19.2443	19.5669	19.7991	19.9599	19.9892	19.9933	19.9273	19.6548	19.2838	18.8579	(90)
Living area fraction									fLA = Living area / (4) =			0.1769	(91)
MIT	19.0177	19.1797	19.4050	19.7283	19.9660	20.1302	20.1623	20.1659	20.0970	19.8186	19.4431	19.0172	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8677	19.0297	19.2550	19.5783	19.8160	19.9802	20.0123	20.0159	19.9470	19.6686	19.2931	18.8672	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9285	0.9083	0.8690	0.7939	0.6792	0.5018	0.3907	0.3877	0.5654	0.7830	0.8866	0.9343	(94)
Useful gains	649.8837	691.7712	720.8825	711.8882	618.0598	459.9615	329.3380	320.0869	442.5823	559.3457	601.9552	616.2241	(95)
Ext temp.	6.1000	6.4000	7.5000	9.3000	11.9000	14.5000	16.2000	16.3000	14.6000	11.8000	9.0000	6.4000	(96)
Heat loss rate W													
	1206.9206	1174.4862	1093.1481	932.1539	717.9109	484.3856	336.9674	327.2432	478.7696	725.6915	953.2488	1173.7262	(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													
	414.4355	324.3845	276.9656	158.5913	74.2892	0.0000	0.0000	0.0000	0.0000	123.7613	252.9314	414.7816	(98)
Space heating												2040.1402	(98)
RHI space heating demand												2040	(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	40.2300 (1b)	x	2.3800 (2b)	=	95.7474	(1b) - (3b)
First floor	40.2300 (1c)	x	2.6100 (2c)	=	105.0003	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	200.7477	(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							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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		5.0100	
Infiltration rate		0.2505	(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) =	0.2317	(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	0.2954	0.2896	0.2838	0.2549	0.2491	0.2201	0.2201	0.2143	0.2317	0.2491	0.2607	0.2723	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation:												0.5000	(23a)
Effective ac	0.5454	0.5396	0.5338	0.5049	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5107	0.5223	(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)			9.8000	1.3258	12.9924			(27)
Solid Door			4.0600	1.0000	4.0700			(26)
Flr - Ground			40.2300	0.1400	5.6322	75.0000	3017.2500	(28a)
Wl - Brick	89.7890	13.8580	75.9310	0.2600	19.7421	51.1800	3886.1486	(29a)
Rf - Ins Joist	40.2330		40.2330	0.1200	4.8280	9.0000	362.0970	(30)
Total net area of external elements Aum(A, m2)			170.2640					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.2646			(33)
Party Wall			41.4370	0.0000	0.0000	54.0300	2238.8411	(32)
Ground Floor Block			17.9976			54.0300	972.4082	(32c)
Ground Floor Stud			62.3608			5.8200	362.9396	(32c)
1st Floor Stud			97.8489			5.8200	569.4806	(32c)
Internal Floor			40.2400			18.0000	724.3200	(32d)
Internal Ceiling			40.2400			5.8200	234.1968	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12367.6819 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		153.7122 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.6774 (36)
Total fabric heat loss	(33) + (36) =	54.9420 (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	36.1332	35.7494	35.3657	33.4469	33.1234	33.1234	33.1234	33.1234	33.1234	33.1234	33.8307	34.5982	(38)
Heat transfer coeff	91.0752	90.6915	90.3077	88.3889	88.0654	88.0654	88.0654	88.0654	88.0654	88.0654	88.7727	89.5402	(39)
Average = Sum(39)m / 12 =												88.9307	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1319	1.1272	1.1224	1.0985	1.0945	1.0945	1.0945	1.0945	1.0945	1.0945	1.1033	1.1129	(40)
HLP (average)												1.1053	(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	2.4715 (42)
Average daily hot water use (litres/day)	92.8989 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

CALCULATION OF ENERGY RATINGS 09 Jan 2014

```
Daily hot water use
              102.1888   98.4728   94.7568   91.0409   87.3249   83.6090   83.6090   87.3249   91.0409   94.7568   98.4728  102.1888 (44)
Energy conte  151.5430  132.5404  136.7699  119.2393  114.4129   98.7297   91.4875  104.9833  106.2371  123.8091  135.1473  146.7613 (45)
Energy content (annual)                                                                                 Total = Sum(45)m =  1461.6609 (45)
Distribution loss  (46)m = 0.15 x (45)m
                22.7314   19.8811   20.5155   17.8859   17.1619   14.8094   13.7231   15.7475   15.9356   18.5714   20.2721   22.0142 (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      14.6715   13.2326   14.6057   14.0840   14.5166   14.0059   14.4464   14.4919   14.0485   14.5689   14.1576   14.6572 (61)
Total heat required for water heating calculated for each month
              166.2145  145.7731  151.3756  133.3233  128.9296  112.7356  105.9339  119.4752  120.2856  138.3780  149.3049  161.4185 (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
              166.2145  145.7731  151.3756  133.3233  128.9296  112.7356  105.9339  119.4752  120.2856  138.3780  149.3049  161.4185 (64)
                                                                                    Total per year (kWh/year) = Sum(64)m =  1633.1477 (64)
Heat gains from water heating, kWh/month
                54.0559   47.3779   49.1274   43.1681   41.6715   36.3291   34.0312   38.5299   38.8360   44.8088   48.4759   52.4624 (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         148.2919  148.2919  148.2919  148.2919  148.2919  148.2919  148.2919  148.2919  148.2919  148.2919  148.2919  148.2919 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
                54.3477   48.2712   39.2567   29.7199   22.2160   18.7556   20.2661   26.3427   35.3571   44.8940   52.3979   55.8582 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
               328.9541  332.3676  323.7657  305.4531  282.3369  260.6108  246.0965  242.6830  251.2849  269.5975  292.7137  314.4398 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
                52.3007   52.3007   52.3007   52.3007   52.3007   52.3007   52.3007   52.3007   52.3007   52.3007   52.3007   52.3007 (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)
               -98.8612  -98.8612  -98.8612  -98.8612  -98.8612  -98.8612  -98.8612  -98.8612  -98.8612  -98.8612  -98.8612  -98.8612 (71)
Water heating gains (Table 5)
                72.6558   70.5028   66.0315   59.9556   56.0100   50.4571   45.7409   51.7875   53.9388   60.2268   67.3276   70.5140 (72)
Total internal gains
               560.6890  555.8729  533.7852  499.8600  465.2942  434.5549  416.8349  425.5446  445.3122  479.4496  517.1706  545.5433 (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	
Southeast	4.4760	36.7938	0.5000	0.0000	0.7700	63.4053	(77)
Southwest	2.1390	36.7938	0.5000	0.0000	0.7700	30.3003	(79)
Northwest	3.1820	11.2829	0.5000	0.0000	0.7700	13.8224	(81)

```
Solar gains   107.5280  187.7512  269.0846  353.8498  414.9988  420.2045  401.7067  354.8321  298.2419  210.7932  129.6299   91.4805 (83)
Total gains   668.2170  743.6241  802.8698  853.7098  880.2930  854.7595  818.5416  780.3767  743.5542  690.2428  646.8005  637.0239 (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           37.7212   37.8808   38.0418   38.8676   39.0104   39.0104   39.0104   39.0104   39.0104   39.0104   38.6996   38.3679
alpha          3.5147    3.5254    3.5361    3.5912    3.6007    3.6007    3.6007    3.6007    3.6007    3.6007    3.5800    3.5579
util living area
                0.9681    0.9523    0.9230    0.8607    0.7536    0.6006    0.4560    0.4943    0.6978    0.8777    0.9503    0.9723 (86)

MIT           19.5262   19.7304   20.0392   20.4306   20.7349   20.9144   20.9757   20.9671   20.8488   20.4720   19.9478   19.5004 (87)
Th 2          19.9748   19.9787   19.9826   20.0020   20.0053   20.0053   20.0053   20.0053   20.0053   20.0053   19.9981   19.9903 (88)
util rest of house
                0.9619    0.9431    0.9080    0.8331    0.7052    0.5247    0.3601    0.3972    0.6275    0.8477    0.9392    0.9669 (89)
MIT 2         18.6514   18.8540   19.1566   19.5426   19.8168   19.9585   19.9965   19.9925   19.9143   19.5913   19.0849   18.6381 (90)
Living area fraction                                                                                  fLA = Living area / (4) =     0.1769 (91)
MIT           18.8061   19.0090   19.3127   19.6996   19.9792   20.1276   20.1697   20.1649   20.0795   19.7470   19.2375   18.7906 (92)
Temperature adjustment                                                                                                        -0.1500
adjusted MIT  18.6561   18.8590   19.1627   19.5496   19.8292   19.9776   20.0197   20.0149   19.9295   19.5970   19.0875   18.6406 (93)
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8. Space heating requirement

```
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
Utilisation      0.9515    0.9305    0.8932    0.8187    0.6957    0.5225    0.3615    0.3982    0.6216    0.8331    0.9265    0.9574 (94)
Useful gains   635.7799  691.9526  717.1627  698.9166  612.4037  446.6014  295.9041  310.7563  462.1972  575.0530  599.2682  609.9105 (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
             1307.4866 1265.9612 1143.5414  941.3108  715.9028  473.5765  301.1565  318.3458  513.3807  792.3276 1064.1658 1293.0153 (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
               499.7498  385.7338  317.2257  174.5238   77.0033    0.0000    0.0000    0.0000    0.0000  161.6523  334.7263  508.2300 (98)
Space heating                                                                                                               2458.8450 (98)
Space heating per m2                                                                                                 (98) / (4) =   30.5598 (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												2716.9558	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	499.7498	385.7338	317.2257	174.5238	77.0033	0.0000	0.0000	0.0000	0.0000	161.6523	334.7263	508.2300	(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)													
	552.2097	426.2251	350.5257	192.8440	85.0865	0.0000	0.0000	0.0000	0.0000	178.6214	369.8633	561.5801	(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													
	166.2145	145.7731	151.3756	133.3233	128.9296	112.7356	105.9339	119.4752	120.2856	138.3780	149.3049	161.4185	(64)
Efficiency of water heater												87.3000	(216)
(217)m	89.6796	89.5992	89.4409	89.0858	88.4697	87.3000	87.3000	87.3000	87.3000	88.9955	89.4882	89.7074	(217)
Fuel for water heating, kWh/month													
	185.3427	162.6945	169.2464	149.6572	145.7330	129.1359	121.3447	136.8559	137.7842	155.4888	166.8431	179.9389	(219)
Water heating fuel used												1840.0654	(219)
Annual totals kWh/year													
Space heating fuel - main system												2716.9558	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 6.9550, total flow = 29.0000, SFP = 0.2398)													
mechanical ventilation fans (SFP = 0.2398)												58.7367	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												133.7367	(231)
Electricity for lighting (calculated in Appendix L)												383.9190	(232)
Total delivered energy for all uses												5074.6769	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2716.9558	3.4800	94.5501	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1840.0654	3.4800	64.0343	(247)
Mechanical ventilation fans	58.7367	13.1900	7.7474	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	383.9190	13.1900	50.6389	(250)
Additional standing charges			120.0000	(251)
Total energy cost			346.8631	(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] =	1.1612	(257)
SAP value		83.8014	
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	2716.9558	0.2160	586.8624	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1840.0654	0.2160	397.4541	(264)
Space and water heating			984.3166	(265)
Pumps and fans	133.7367	0.5190	69.4093	(267)
Energy for lighting	383.9190	0.5190	199.2540	(268)
Total kg/year			1252.9799	(272)
CO2 emissions per m2			15.5700	(273)
EI value			86.6173	
EI rating			87	(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

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water heating energy efficiency	3.48 / 0.8864 = 3.926, stars = 4
Water heating environmental impact	0.216 / 0.8864 = 0.2437, 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	40.2300 (1b)	x	2.3800 (2b)	=	95.7474	(1b) - (3b)
First floor	40.2300 (1c)	x	2.6100 (2c)	=	105.0003	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	200.7477	(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							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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		5.0100	
Infiltration rate		0.2505	(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) =	0.2317	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	6.0000	5.6000	5.6000	5.0000	5.0000	4.4000	4.4000	4.3000	4.7000	5.4000	5.5000	5.9000	(22)
Wind factor	1.5000	1.4000	1.4000	1.2500	1.2500	1.1000	1.1000	1.0750	1.1750	1.3500	1.3750	1.4750	(22a)
Adj infilt rate	0.3476	0.3244	0.3244	0.2896	0.2896	0.2549	0.2549	0.2491	0.2723	0.3128	0.3186	0.3418	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation:												0.5000	(23a)
Effective ac	0.5976	0.5744	0.5744	0.5396	0.5396	0.5049	0.5049	0.5000	0.5223	0.5628	0.5686	0.5918	(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)			9.8000	1.3258	12.9924			(27)
Solid Door			4.0600	1.0000	4.0700			(26)
Flr - Ground			40.2300	0.1400	5.6322	75.0000	3017.2500	(28a)
Wl - Brick	89.7890	13.8580	75.9310	0.2600	19.7421	51.1800	3886.1486	(29a)
Rf - Ins Joist	40.2330		40.2330	0.1200	4.8280	9.0000	362.0970	(30)
Total net area of external elements Aum(A, m2)			170.2640					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2646			(33)
Party Wall			41.4370	0.0000	0.0000	54.0300	2238.8411	(32)
Ground Floor Block			17.9976			54.0300	972.4082	(32c)
Ground Floor Stud			62.3608			5.8200	362.9396	(32c)
1st Floor Stud			97.8489			5.8200	569.4806	(32c)
Internal Floor			40.2400			18.0000	724.3200	(32d)
Internal Ceiling			40.2400			5.8200	234.1968	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12367.6819 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		153.7122 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.6774 (36)
Total fabric heat loss	(33) + (36) =	54.9420 (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	39.5870	38.0520	38.0520	35.7494	35.7494	33.4469	33.4469	33.1234	34.5982	37.2845	37.6682	39.2032	(38)
Heat transfer coeff	94.5290	92.9940	92.9940	90.6915	90.6915	88.3889	88.3889	88.0654	89.5402	92.2265	92.6102	94.1453	(39)
Average = Sum(39)m / 12 =												91.2721	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1749	1.1558	1.1558	1.1272	1.1272	1.0985	1.0985	1.0945	1.1129	1.1462	1.1510	1.1701	(40)
HLP (average)												1.1344	(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	2.4715 (42)
Average daily hot water use (litres/day)	92.8989 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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

```
Daily hot water use
               102.1888     98.4728     94.7568     91.0409     87.3249     83.6090     83.6090     87.3249     91.0409     94.7568     98.4728    102.1888 (44)
Energy conte   151.5430    132.5404    136.7699    119.2393    114.4129     98.7297     91.4875    104.9833    106.2371    123.8091    135.1473    146.7613 (45)
Energy content (annual)                                                                                              Total = Sum(45)m =   1461.6609 (45)
Distribution loss  (46)m = 0.15 x (45)m
                22.7314     19.8811     20.5155     17.8859     17.1619     14.8094     13.7231     15.7475     15.9356     18.5714     20.2721     22.0142 (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      14.6715     13.2326     14.6057     14.0840     14.5166     14.0059     14.4464     14.4919     14.0485     14.5689     14.1576     14.6572 (61)
Total heat required for water heating calculated for each month
               166.2145    145.7731    151.3756    133.3233    128.9296    112.7356    105.9339    119.4752    120.2856    138.3780    149.3049    161.4185 (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
               166.2145    145.7731    151.3756    133.3233    128.9296    112.7356    105.9339    119.4752    120.2856    138.3780    149.3049    161.4185 (64)
                                                                                       Total per year (kWh/year) = Sum(64)m =   1633.1477 (64)
Heat gains from water heating, kWh/month
                54.0559     47.3779     49.1274     43.1681     41.6715     36.3291     34.0312     38.5299     38.8360     44.8088     48.4759     52.4624 (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          148.2919    148.2919    148.2919    148.2919    148.2919    148.2919    148.2919    148.2919    148.2919    148.2919    148.2919    148.2919 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
                54.3477     48.2712     39.2567     29.7199     22.2160     18.7556     20.2661     26.3427     35.3571     44.8940     52.3979     55.8582 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
               328.9541    332.3676    323.7657    305.4531    282.3369    260.6108    246.0965    242.6830    251.2849    269.5975    292.7137    314.4398 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
                52.3007     52.3007     52.3007     52.3007     52.3007     52.3007     52.3007     52.3007     52.3007     52.3007     52.3007     52.3007 (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)
               -98.8612    -98.8612    -98.8612    -98.8612    -98.8612    -98.8612    -98.8612    -98.8612    -98.8612    -98.8612    -98.8612    -98.8612 (71)
Water heating gains (Table 5)
                72.6558     70.5028     66.0315     59.9556     56.0100     50.4571     45.7409     51.7875     53.9388     60.2268     67.3276     70.5140 (72)
Total internal gains
               560.6890    555.8729    533.7852    499.8600    465.2942    434.5549    416.8349    425.5446    445.3122    479.4496    517.1706    545.5433 (73)


----------------------------------------------------------------------------------------------------
6. Solar gains
----------------------------------------------------------------------------------------------------
[Jan]                                       Area       Solar flux              g             FF           Access             Gains
                                              m2        Table 6a   Specific data   Specific data        factor                 W
                                                           W/m2      or Table 6b      or Table 6c      Table 6d
----------------------------------------------------------------------------------------------------
Southeast                                 4.4760         47.2368          0.5000          0.0000          0.7700           81.4013 (77)
Southwest                                 2.1390         47.2368          0.5000          0.0000          0.7700           38.9002 (79)
Northwest                                 3.1820         15.4538          0.5000          0.0000          0.7700           18.9320 (81)
----------------------------------------------------------------------------------------------------

Solar gains    139.2335    205.7540    295.7287    396.8881    444.6436    482.0868    426.0359    400.0718    337.4773    234.8679    161.7866    113.9925 (83)
Total gains    699.9225    761.6268    829.5139    896.7481    909.9378    916.6417    842.8707    825.6164    782.7895    714.3175    678.9572    659.5358 (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             36.3430     36.9429     36.9429     37.8808     37.8808     38.8676     38.8676     39.0104     38.3679     37.2503     37.0960     36.4911
alpha            3.4229      3.4629      3.4629      3.5254      3.5254      3.5912      3.5912      3.6007      3.5579      3.4834      3.4731      3.4327
util living area
                 0.9519      0.9358      0.9041      0.8395      0.7395      0.5773      0.4812      0.4796      0.6468      0.8386      0.9210      0.9565 (86)

MIT             19.7624     19.9193     20.1531     20.4795     20.7428     20.9228     20.9682     20.9695     20.8869     20.5809     20.1846     19.7585 (87)
Th 2            19.9402     19.9555     19.9555     19.9787     19.9787     20.0020     20.0020     20.0053     19.9903     19.9632     19.9594     19.9440 (88)
util rest of house
                 0.9417      0.9227      0.8847      0.8080      0.6882      0.5035      0.3898      0.3867      0.5690      0.7969      0.9018      0.9469 (89)
MIT 2           18.8577     19.0208     19.2443     19.5669     19.7991     19.9599     19.9892     19.9933     19.9273     19.6548     19.2838     18.8579 (90)
Living area fraction                                                                                  fLA = Living area / (4) =      0.1769 (91)
MIT             19.0177     19.1797     19.4050     19.7283     19.9660     20.1302     20.1623     20.1659     20.0970     19.8186     19.4431     19.0172 (92)
Temperature adjustment                                                                                                             -0.1500
adjusted MIT    18.8677     19.0297     19.2550     19.5783     19.8160     19.9802     20.0123     20.0159     19.9470     19.6686     19.2931     18.8672 (93)


----------------------------------------------------------------------------------------------------
8. Space heating requirement
----------------------------------------------------------------------------------------------------

                    Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec
Utilisation      0.9285      0.9083      0.8690      0.7939      0.6792      0.5018      0.3907      0.3877      0.5654      0.7830      0.8866      0.9343 (94)
Useful gains   649.8837    691.7712    720.8825    711.8882    618.0598    459.9615    329.3380    320.0869    442.5823    559.3457    601.9552    616.2241 (95)
Ext temp.        6.1000      6.4000      7.5000      9.3000     11.9000     14.5000     16.2000     16.3000     14.6000     11.8000      9.0000      6.4000 (96)
Heat loss rate W
              1206.9206   1174.4862   1093.1481    932.1539    717.9109    484.3856    336.9674    327.2432    478.7696    725.6915    953.2488   1173.7262 (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
               414.4355    324.3845    276.9656    158.5913     74.2892      0.0000      0.0000      0.0000      0.0000    123.7613    252.9314    414.7816 (98)
Space heating                                                                                                                   2040.1402 (98)
Space heating per m2                                                                                          (98) / (4) =      25.3560 (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												2254.2986	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	414.4355	324.3845	276.9656	158.5913	74.2892	0.0000	0.0000	0.0000	0.0000	123.7613	252.9314	414.7816	(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)													
	457.9397	358.4359	306.0393	175.2390	82.0875	0.0000	0.0000	0.0000	0.0000	136.7528	279.4822	458.3222	(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													
	166.2145	145.7731	151.3756	133.3233	128.9296	112.7356	105.9339	119.4752	120.2856	138.3780	149.3049	161.4185	(64)
Efficiency of water heater												87.3000	(216)
(217)m	89.5603	89.4830	89.3427	89.0099	88.4432	87.3000	87.3000	87.3000	87.3000	88.7821	89.2852	89.5801	(217)
Fuel for water heating, kWh/month													
	185.5896	162.9058	169.4326	149.7848	145.7767	129.1359	121.3447	136.8559	137.7842	155.8625	167.2225	180.1945	(219)
Water heating fuel used												1841.8896	(219)
Annual totals kWh/year													
Space heating fuel - main system												2254.2986	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 6.9550, total flow = 29.0000, SFP = 0.2398)													
mechanical ventilation fans (SFP = 0.2398)												58.7367	(230a)
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												133.7367	(231)
Electricity for lighting (calculated in Appendix L)												383.9190	(232)
Total delivered energy for all uses												4613.8439	(238)

10a. Fuel costs - using BEDF prices (476)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2254.2986	3.8700	87.2414	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1841.8896	3.8700	71.2811	(247)
Mechanical ventilation fans	58.7367	18.9000	11.1012	(249)
Pumps and fans for heating	75.0000	18.9000	14.1750	(249)
Energy for lighting	383.9190	18.9000	72.5607	(250)
Additional standing charges			93.0000	(251)
Total energy cost			349.3594	(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	2254.2986	0.2160	486.9285	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1841.8896	0.2160	397.8482	(264)
Space and water heating			884.7767	(265)
Pumps and fans	133.7367	0.5190	69.4093	(267)
Energy for lighting	383.9190	0.5190	199.2540	(268)
Total kg/year			1153.4400	(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	2254.2986	1.2200	2750.2443	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1841.8896	1.2200	2247.1053	(264)
Space and water heating			4997.3496	(265)
Pumps and fans	133.7367	3.0700	410.5717	(267)
Energy for lighting	383.9190	3.0700	1178.6314	(268)
Primary energy kWh/year			6586.5527	(272)
Primary energy kWh/m2/year			81.8612	(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 87

(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	Cancelled by user
O		Not considered
P		Not considered
R		Not considered
S		Not considered
T		Not considered
U	Solar photovoltaic panels	Cancelled by user
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
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 84
Potential environmental impact rating: B 87

Fuel prices for cost data on this page from database revision number 476 TEST (01 Apr 2021)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£98	£98	£0
Mains gas	£252	£252	£0
Space heating	£206	£206	£0
Water heating	£71	£71	£0
Lighting	£73	£73	£0
Total cost of fuels	£350	£350	£0
Total cost of uses	£350	£350	£0
Delivered energy	57 kWh/m²	57 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.2 tonnes	1.2 tonnes	0.0 tonnes
CO2 emissions per m²	14 kg/m²	14 kg/m²	0 kg/m²
Primary energy	82 kWh/m²	82 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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SAP 2012 WORKSHEET FOR New Build (As Designed)   (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable



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

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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
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No improvements selected / applicable
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BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Briary Energy

Property Reference	Plot 014 - PRJ011408	**Issued on Date**	05/05/2021
Assessment Reference	014 - S	**Prop Type Ref**	Elg
Property	Plot 014 - PRJ011408		

SAP Rating	84 B	**DER**	17.32	**TER**	18.52
Environmental	87 B	**% DER<TER**	6.48		
CO_2 Emissions (t/year)	1.15	**DFEE**	45.04	**TFEE**	51.58
General Requirements Compliance	Pass	**% DFEE<TFEE**	12.68		

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)	18.52	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	17.32	$kgCO_2/m^2$	Pass
	-1.20 (-6.5%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.58	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	45.04	$kWh/m^2/yr$	
	-6.6 (-12.8%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.26 (max. 0.30)	0.26 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	Pass
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	Pass
Openings	1.28 (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

Continuous extract system (decentralised)			
Specific fan power	0.1900 0.1800		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (South West England)	Not significant		Pass

Based on:

Overshading	Average		
Windows facing South East Windows facing South West Windows facing North West	4.48 m², No overhang 2.14 m², No overhang 3.18 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	0.12	W/m²K
Door U-value	1.00	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.