PREDICTED ENERGY ASSESSMENT

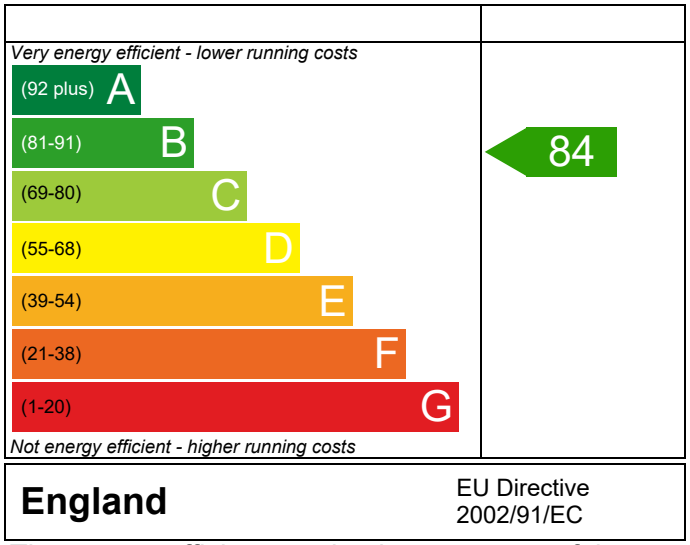
PL 15 - S

Dwelling type:	House, Semi-Detached
Date of assessment:	22/07/2021
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.

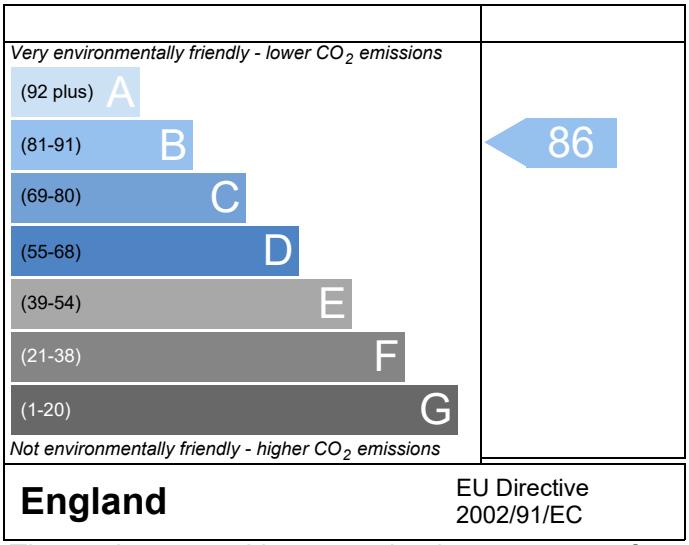
Energy Efficiency Rating



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.

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

Briary Energy

Property Reference	015 - PRJ011408	**Issued on Date**	22/07/2021
Assessment Reference	015 S	**Prop Type Ref**	Elgar
Property	PL 15 - S		

SAP Rating	84 B	**DER**	17.63	**TER**	18.79
Environmental	86 B	**% DER<TER**	6.19		
CO_2 Emissions (t/year)	1.17	**DFEE**	46.27	**TFEE**	52.97
General Requirements Compliance	Pass	**% DFEE<TFEE**	12.64		

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)	18.79	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	17.63	$kgCO_2/m^2$	Pass
	-1.16 (-6.2%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.97	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	46.27	$kWh/m^2/yr$	
	-6.7 (-12.6%)	$kWh/m^2/yr$	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 North East	2.14 m², No overhang
Windows facing South East	4.48 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	015 - PRJ011408	**Issued on Date**	22/07/2021
Assessment Reference	015 S	**Prop Type Ref**	Elgar
Property	PL 15 - S		

SAP Rating	84 B	**DER**	17.63	**TER**	18.79
Environmental	86 B	**% DER<TER**	6.19		
CO_2 Emissions (t/year)	1.17	**DFEE**	46.27	**TFEE**	52.97
General Requirements Compliance	Pass	**% DFEE<TFEE**	12.64		

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	
Northeast	2.1390	15.4538	0.5000	0.0000	0.7700	12.7264	(75)
Southeast	4.4760	47.2368	0.5000	0.0000	0.7700	81.4013	(77)
Northwest	3.1820	15.4538	0.5000	0.0000	0.7700	18.9320	(81)

Solar gains	113.0597	171.8782	259.0588	366.2429	424.7211	466.7224	410.1227	375.0991	302.0546	199.5372	132.3791	91.9093	(83)
Total gains	673.7487	727.7511	792.8440	866.1029	890.0153	901.2773	826.9575	800.6437	747.3668	678.9868	649.5497	637.4526	(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	0.9565	0.9429	0.9139	0.8506	0.7487	0.5849	0.4892	0.4926	0.6677	0.8545	0.9292	0.9603	(86)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	19.7261	19.8748	20.1105	20.4523	20.7317	20.9195	20.9664	20.9668	20.8746	20.5493	20.1481	19.7273	(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													
	0.9472	0.9310	0.8959	0.8203	0.6980	0.5108	0.3967	0.3979	0.5899	0.8152	0.9116	0.9515	(89)
MIT 2	18.8228	18.9785	19.2049	19.5432	19.7906	19.9579	19.9884	19.9921	19.9196	19.6284	19.2500	18.8278	(90)
Living area fraction									fLA = Living area / (4) =			0.1769	(91)
MIT	18.9825	19.1370	19.3651	19.7040	19.9570	20.1279	20.1614	20.1645	20.0885	19.7913	19.4088	18.9869	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8325	18.9870	19.2151	19.5540	19.8070	19.9779	20.0114	20.0145	19.9385	19.6413	19.2588	18.8369	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9346	0.9171	0.8805	0.8059	0.6885	0.5089	0.3976	0.3988	0.5855	0.8008	0.8967	0.9394	(94)
Useful gains	629.6544	667.4203	698.0814	697.9577	612.8099	458.6541	328.8171	319.2820	437.6105	543.7186	582.4537	598.8238	(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													
	1203.5947	1170.5185	1089.4306	929.9474	717.0978	484.1892	336.8856	327.1165	478.0067	723.1737	950.0720	1170.8767	(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													
	427.0116	338.0820	291.1638	167.0326	77.5902	0.0000	0.0000	0.0000	0.0000	133.5146	264.6852	425.6074	(98)
Space heating												2124.6874	(98)
RHI space heating demand												2125	(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	
Northeast	2.1390	11.2829	0.5000	0.0000	0.7700	9.2917	(75)
Southeast	4.4760	36.7938	0.5000	0.0000	0.7700	63.4053	(77)
Northwest	3.1820	11.2829	0.5000	0.0000	0.7700	13.8224	(81)

```
Solar gains     86.5194  155.0521  232.5420  322.3126  392.2165  403.1038  382.9239  328.6744  263.2992  176.8641  105.0285   73.1379 (83)
Total gains    647.2084  710.9250  766.3273  822.1726  857.5107  837.6587  799.7588  754.2190  708.6114  656.3137  622.1990  618.6812 (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
              0.9709    0.9578    0.9316    0.8717    0.7643    0.6098    0.4654    0.5090    0.7190    0.8911    0.9553    0.9746 (86)

MIT          19.4949   19.6844   19.9933   20.3998   20.7214   20.9101   20.9740   20.9639   20.8328   20.4363   19.9134   19.4726 (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
              0.9651    0.9495    0.9179    0.8455    0.7166    0.5336    0.3680    0.4099    0.6495    0.8633    0.9452    0.9696 (89)
MIT 2         18.6209   18.8096   19.1134   19.5153   19.8062   19.9559   19.9959   19.9912   19.9034   19.5597   19.0520   18.6108 (90)
Living area fraction                                                                                 fLA = Living area / (4) =      0.1769 (91)
MIT           18.7755   18.9644   19.2690   19.6717   19.9681   20.1247   20.1689   20.1632   20.0678   19.7147   19.2043   18.7632 (92)
Temperature adjustment                                                                                                        -0.1500
adjusted MIT  18.6255   18.8144   19.1190   19.5217   19.8181   19.9747   20.0189   20.0132   19.9178   19.5647   19.0543   18.6132 (93)
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8. Space heating requirement

```
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
Utilisation   0.9552    0.9376    0.9035    0.8309    0.7067    0.5311    0.3694    0.4108    0.6427    0.8485    0.9330    0.9606 (94)
Useful gains  618.2327  666.5620  692.4086  683.1194  605.9681  444.9056  295.4506  309.8131  455.3928  556.8953  580.5229  594.2804 (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
            1304.6958 1261.9130 1139.5907  938.8445  714.9237  473.3212  301.0838  318.1967  512.3443  789.4833 1061.2179 1290.5650 (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
             510.7286  400.0759  332.7035  184.1220   81.0629    0.0000    0.0000    0.0000    0.0000  173.0455  346.1004  518.0357 (98)
Space heating                                                                                                 2545.8746 (98)
Space heating per m2                                                                                  (98) / (4) =    31.6415 (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												2813.1211	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	510.7286	400.0759	332.7035	184.1220	81.0629	0.0000	0.0000	0.0000	0.0000	173.0455	346.1004	518.0357	(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)													
	564.3410	442.0728	367.6282	203.4498	89.5723	0.0000	0.0000	0.0000	0.0000	191.2105	382.4314	572.4151	(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	89.6927	89.6227	89.4744	89.1279	88.5081	87.3000	87.3000	87.3000	87.3000	89.0496	89.5112	89.7187	(217)
Fuel for water heating, kWh/month													
	185.3154	162.6520	169.1831	149.5864	145.6698	129.1359	121.3447	136.8559	137.7842	155.3943	166.8003	179.9162	(219)
Water heating fuel used												1839.6382	(219)
Annual totals kWh/year													
Space heating fuel - main system												2813.1211	(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												5170.4150	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2813.1211	3.4800	97.8966	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1839.6382	3.4800	64.0194	(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			350.1948	(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] =	1.1723	(257)
SAP value		83.6459	
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	2813.1211	0.2160	607.6342	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1839.6382	0.2160	397.3619	(264)
Space and water heating			1004.9960	(265)
Pumps and fans	133.7367	0.5190	69.4093	(267)
Energy for lighting	383.9190	0.5190	199.2540	(268)
Total kg/year			1273.6593	(272)
CO2 emissions per m2			15.8300	(273)
EI value			86.3964	
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

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water heating energy efficiency	3.48 / 0.8866 = 3.925, stars = 4
Water heating environmental impact	0.216 / 0.8866 = 0.2436, 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)
```

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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	
Northeast	2.1390	15.4538	0.5000	0.0000	0.7700	12.7264	(75)
Southeast	4.4760	47.2368	0.5000	0.0000	0.7700	81.4013	(77)
Northwest	3.1820	15.4538	0.5000	0.0000	0.7700	18.9320	(81)

```
Solar gains   113.0597  171.8782  259.0588  366.2429  424.7211  466.7224  410.1227  375.0991  302.0546  199.5372  132.3791   91.9093 (83)
Total gains   673.7487  727.7511  792.8440  866.1029  890.0153  901.2773  826.9575  800.6437  747.3668  678.9868  649.5497  637.4526 (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
              0.9565    0.9429    0.9139    0.8506    0.7487    0.5849    0.4892    0.4926    0.6677    0.8545    0.9292    0.9603 (86)

MIT          19.7261   19.8748   20.1105   20.4523   20.7317   20.9195   20.9664   20.9668   20.8746   20.5493   20.1481   19.7273 (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
              0.9472    0.9310    0.8959    0.8203    0.6980    0.5108    0.3967    0.3979    0.5899    0.8152    0.9116    0.9515 (89)
MIT 2        18.8228   18.9785   19.2049   19.5432   19.7906   19.9579   19.9884   19.9921   19.9196   19.6284   19.2500   18.8278 (90)
Living area fraction                                                                          fLA = Living area / (4) =     0.1769 (91)
MIT          18.9825   19.1370   19.3651   19.7040   19.9570   20.1279   20.1614   20.1645   20.0885   19.7913   19.4088   18.9869 (92)
Temperature adjustment                                                                                                   -0.1500
adjusted MIT 18.8325   18.9870   19.2151   19.5540   19.8070   19.9779   20.0114   20.0145   19.9385   19.6413   19.2588   18.8369 (93)
```

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8. Space heating requirement

```
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
Utilisation   0.9346    0.9171    0.8805    0.8059    0.6885    0.5089    0.3976    0.3988    0.5855    0.8008    0.8967    0.9394 (94)
Useful gains  629.6544  667.4203  698.0814  697.9577  612.8099  458.6541  328.8171  319.2820  437.6105  543.7186  582.4537  598.8238 (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
            1203.5947 1170.5185 1089.4306  929.9474  717.0978  484.1892  336.8856  327.1165  478.0067  723.1737  950.0720 1170.8767 (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
             427.0116  338.0820  291.1638  167.0326   77.5902    0.0000    0.0000    0.0000    0.0000  133.5146  264.6852  425.6074 (98)
Space heating                                                                                                           2124.6874 (98)
Space heating per m2                                                                                        (98) / (4) =   26.4068 (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												2347.7209	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	427.0116	338.0820	291.1638	167.0326	77.5902	0.0000	0.0000	0.0000	0.0000	133.5146	264.6852	425.6074	(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)													
	471.8360	373.5713	321.7280	184.5664	85.7350	0.0000	0.0000	0.0000	0.0000	147.5300	292.4698	470.2844	(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	89.5800	89.5115	89.3793	89.0511	88.4754	87.3000	87.3000	87.3000	87.3000	88.8426	89.3192	89.5969	(217)
Fuel for water heating, kWh/month													
	185.5487	162.8540	169.3631	149.7155	145.7237	129.1359	121.3447	136.8559	137.7842	155.7564	167.1587	180.1607	(219)
Water heating fuel used												1841.4015	(219)
Annual totals kWh/year													
Space heating fuel - main system												2347.7209	(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												4706.7781	(238)

10a. Fuel costs - using BEDF prices (479)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2347.7209	3.7400	87.8048	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1841.4015	3.7400	68.8684	(247)
Mechanical ventilation fans	58.7367	19.1200	11.2305	(249)
Pumps and fans for heating	75.0000	19.1200	14.3400	(249)
Energy for lighting	383.9190	19.1200	73.4053	(250)
Additional standing charges			94.0000	(251)
Total energy cost			349.6490	(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	2347.7209	0.2160	507.1077	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1841.4015	0.2160	397.7427	(264)
Space and water heating			904.8504	(265)
Pumps and fans	133.7367	0.5190	69.4093	(267)
Energy for lighting	383.9190	0.5190	199.2540	(268)
Total kg/year			1173.5138	(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	2347.7209	1.2200	2864.2195	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1841.4015	1.2200	2246.5098	(264)
Space and water heating			5110.7293	(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			6699.9324	(272)
Primary energy kWh/m2/year			83.2704	(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	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 86

Fuel prices for cost data on this page from database revision number 479 TEST (30 Jun 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	£99	£99	£0
Mains gas	£251	£251	£0
Space heating	£207	£207	£0
Water heating	£69	£69	£0
Lighting	£73	£73	£0
Total cost of fuels	£350	£350	£0
Total cost of uses	£349	£349	£0
Delivered energy	58 kWh/m²	58 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.2 tonnes	1.2 tonnes	0.0 tonnes
CO2 emissions per m²	15 kg/m²	15 kg/m²	0 kg/m²
Primary energy	83 kWh/m²	83 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
```

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

Property Reference	015 - PRJ011408	**Issued on Date**	22/07/2021
Assessment Reference	015 S	**Prop Type Ref**	Elgar
Property	PL 15 - S		

SAP Rating	84 B	**DER**	17.63	**TER**	18.79
Environmental	86 B	**% DER<TER**	6.19		
CO_2 Emissions (t/year)	1.17	**DFEE**	46.27	**TFEE**	52.97
General Requirements Compliance	Pass	**% DFEE<TFEE**	12.64		

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)	18.79	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	17.63	$kgCO_2/m^2$	Pass
	-1.16 (-6.2%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.97	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	46.27	$kWh/m^2/yr$	
	-6.7 (-12.6%)	$kWh/m^2/yr$	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 North East Windows facing South East Windows facing North West	2.14 m², No overhang 4.48 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.