



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client: Cablemark Ltd

Project: Lynn Lane Farm, Plot 5, Lynn Lane
Shenstone, WS14 0EN

Contact: Kim Oliver
Energy Services (Midlands) Ltd
kim@energyservice.co.uk

Report Issue Date: 17/09/2020

EXCELLENCE
IN ENERGY
ASSESSMENT

SUMMARY FOR INPUT DATA

Calculation Type: Conversion (As Designed)

Property Reference	SAP04054 - Plot 5 - LPG		Issued on Date	17/09/2020	
Assessment Reference	As Designed	Prop Type Ref	Conversion- House - Mid		
Property	Lynn Lane Farm, Plot 5, Lynn Lane, Shenstone, WS14 0EN				
SAP Rating	73 C	DER	N/A	TER	N/A
Environmental	82 B	% DER<TER	N/A		
CO ₂ Emissions (t/year)	2.56	DFEE	N/A	TFEE	N/A
General Requirements Compliance	N/A	% DFEE<TFEE	N/A		
Assessor Details	Ms. Kim Oliver, Energy Services (Midlands) Ltd, Tel: 0121 5528425, kim@energyservice.co.uk			Assessor ID	L757-0001
Client	Cablemark Ltd, Cablemark Ltd				

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Rural
1.0 Property Type	House, Mid-Terrace
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	14.60 m	111.47 m ²	2.33 m
1st Storey:	14.70 m	49.99 m ²	2.50 m

7.0 Living Area	61.48	m ²
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8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction			
125mm Cavity	Cavity Wall	Other	0.20	70.33	51.83

9.1 Party Walls			U-Value (W/m ² K)	Area (m ²)
Description	Type	Construction		
Party Wall	Filled Cavity with Edge Sealing	Dense plaster both sides. lightweight aggregate blocks, cavity or cavity fill	0.00	125.29

10.0 External Roofs			U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction			
Insulated Rafter	External Slope Roof	Other	0.15	51.45	51.45
Flat Warm Deck 140mm PIR	External Flat Roof	Other	0.15	61.48	53.48

11.0 Heat Loss Floors			U-Value (W/m ² K)	Area (m ²)
Description	Type	Construction		
150mm PIR Insulation	Ground Floor - Solid	Other	0.09	111.47

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12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
New A Rated	Manufacture	Window	Double Low-E Soft 0.05			0.63		0.70	1.40
Half Glazed Door	Manufacture	Half Glazed Door	Double Low-E Soft 0.05			0.63		0.70	1.50
Solid Door	Manufacture	Solid Door							1.80
New Lantern	Manufacture	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
Front - Snug	Window	[1] 125mm Cavity	South West	None	0.00					0.96	
Front - Entrance	Half Glazed Door	[1] 125mm Cavity	South West							3.33	
Front - Bed 2	Window	[1] 125mm Cavity	South West	None	0.00					0.55	
Front - Bed 3	Window	[1] 125mm Cavity	South West	None	0.00					0.96	
Front - Bathroom	Window	[1] 125mm Cavity	South West	None	0.00					0.41	
Rear - Sitting	Window	[1] 125mm Cavity	North East	None	0.00					8.53	
Rear - Bed 1	Window	[1] 125mm Cavity	North East	None	0.00					3.35	
Rear - Ensuite	Window	[1] 125mm Cavity	North East	None	0.00					0.41	
Kitchen Lantern	Roof Window	[2] Flat Warm Deck 140mm PIR	Horizontal	None						8.00	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	12.23	0.028	No	CBA-313
Independently assessed	E3 Sill	10.65	0.016	No	CBA-314
Independently assessed	E4 Jamb	18.90	0.011	No	CBA-315
Independently assessed	E5 Ground floor (normal)	14.60	0.059	No	CBA-302
Independently assessed	E6 Intermediate floor within a dwelling	14.70	0.000	No	CBA-303
Independently assessed	E11 Eaves (insulation at rafter level)	8.80	-0.002	No	CBA-309
Table K1 - Default	E14 Flat roof	5.80	0.080	No	
Independently assessed	E16 Corner (normal)	2.30	0.000	No	
Independently assessed	E18 Party wall between dwellings	24.20	0.039	No	CBA-305
Table K1 - Default	P1 Party wall - Ground floor	37.30	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	15.80	0.000	No	
Independently assessed	P5 Party wall - Roof (insulation at rafter level)	14.00	0.023	No	CBA-307

Y-value W/m²K

18.0 Pressure Testing

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	<input type="text" value="Windows fully open"/>
Cross ventilation possible	<input type="text" value="Yes"/>
Night Ventilation	<input type="text" value="No"/>
Air change rate	<input type="text" value="6.00"/>

Mechanical Ventilation

Mechanical Ventilation System Present

SUMMARY FOR INPUT DATA

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No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				6
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	25	
Total number of L.E.L. fittings	25	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted No

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Database	Database	
Percentage of Heat	100	%
Database Ref. No.	18461	
Fuel Type	Bulk LPG	
Main Heating	BLB	
SAP Code	102	
In Winter	92.2	
In Summer	81.5	
Controls	CBI Time and temperature zone control	
PCDF Controls	0	
Delayed Start Stat	Yes	
Sap Code	2110	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Normal (> 45°C)	

25.0 Main Heating 2

None

Community Heating None

28.0 Water Heating

Water Heating	HWP From main heating 1
Flue Gas Heat Recovery System	Main Heating 1
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No

SUMMARY FOR INPUT DATA

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Waste Water Heat Recovery Storage System	<input type="text" value="No"/>
Solar Panel	<input type="text" value="No"/>
Water use <= 125 litres/person/day	<input type="text" value="Yes"/>
SAP Code	<input type="text" value="901"/>
29.0 Hot Water Cylinder	<input type="text" value="Hot Water Cylinder"/>
Cylinder Stat	<input type="text" value="Yes"/>
Cylinder In Heated Space	<input type="text" value="Yes"/>
Independent Time Control	<input type="text" value="Yes"/>
Insulation Type	<input type="text" value="Measured Loss"/>
Cylinder Volume	<input type="text" value="250.00"/>
Loss	<input type="text" value="1.67"/>
Pipes insulation	<input type="text" value="Fully insulated primary pipework"/>
31.0 Thermal Store	<input type="text" value="None"/>

L
kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£78	C 76	
Solar photovoltaic panels, 2.5 kWp	£3,500 - £5,500	£328	B 82	
Wind turbine	£15,000 - £25,000	£669	A 96	

U-VALUE CALCULATOR REPORT

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Building Elements

Roof 000001 - No Insulation between rafters

Roof Type: Pitched Roof, insulated sloping ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Tata Urban Standing Seam						
	Main construction	0.7	17.0000	0.0000	100.00	7800	450
Layer 2	Sarking felt						
	Main construction	0.1	0.2300	0.0004	100.00		
Layer 3	Plywood						
	Main construction	18	0.1300	0.1385	100.00		
Layer 4	Xtratherm PIR Insulation						
	Main construction	140	0.0220	6.3636	100.00	40	1400
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 5	Standard cavity between rafters						
	Main construction	200	1.2500	0.1600	90.00		
	Main construction	200	0.1300	1.5385	10.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Int surface				0.1000			

Total resistance: Upper limit = 6.919 m² K/W Lower limit = 6.818 m² K/W Average = 6.869 m² K/W
 Total correction = 0.0086 m² K/W U-value (unrounded) = 0.15 W/m² K

Unheated space: None

Total thickness: 359 mm

U-value: 0.15 W/m² K

Kappa: 0.00 kJ/m² K

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Building Elements

Roof 000002 - 121mm Thermarof TR31

Roof Type: Flat Roof standard (no precipitation)

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	EPDM Rubberised Roofing Membrane						
	Main construction	2	1.5000	0.0013	100.00	1150	1000
Layer 2	Xtratherm PIR						
	Main construction	140	0.0220	6.3636	100.00	40	1400
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Polythene,1000 gauge						
	Main construction	2	0.0000	0.0000	100.00		
Layer 4	Plywood						
	Main construction	18	0.1300	0.1385	100.00	500	1600
Layer 5	Air layer unventilated between joists						
	Main construction	254	1.5875	0.1600	90.00		
	Main construction	254	0.1300	1.9538	10.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 6	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Layer 7	Plaster Skim						
	Main construction	3	0.1800	0.0167	100.00	600	1000
Int surface				0.1000			

Total resistance: Upper limit = 7.025 m² K/W Lower limit = 6.896 m² K/W Average = 6.960 m² K/W
 Total correction = 0.0084 m² K/W U-value (unrounded) = 0.15 W/m² K

Unheated space: None

Total thickness: 432 mm

U-value: 0.15 W/m² K

Kappa: 10.90 kJ/m² K

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Building Elements

Wall 125mm Cavity - Dense Outer/Acc Int 125cav

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Blockwork, medium						
	Main construction	100	0.5700	0.1754	93.43		
	Main construction	100	0.8803	0.1136	6.57		
Layer 2	Dritherm 32						
	Main construction	125	0.0320	3.9063	100.00	20	1030
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Thermalite Sheild						
	Main construction	100	0.1500	0.6667	93.43	1400	1000
	Main construction	100	0.8803	0.1136	6.57	1400	1000
Layer 4	airspace/plaster dabs						
	Main construction	15	0.0882	0.1700	80.00	1	1000
	Main construction	15	0.0882	0.1700	20.00	1	1000
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 5	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Layer 6	Plaster Skim						
	Main construction	2.5	0.1800	0.0139	100.00	1	1000
Int surface				0.1300			

Total resistance: Upper limit = 5.117 m² K/W Lower limit = 4.994 m² K/W Average = 5.056 m² K/W
 Total correction = 0.0060 m² K/W U-value (unrounded) = 0.2 W/m² K

Unheated space: None

Total thickness: 355 mm

U-value: 0.20 W/m² K

Kappa: 105.72 kJ/m² K

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Building Elements

Floor 150mm PIR Insulation - floor - slab-on-ground floor

Floor Type: Slab On Ground Floor

Area = 111.47 m², Perimeter = 14.60 m, Wall thickness = 300.00 mm, Soil: Clay

Horizontal edge insulation: none

Vertical edge insulation: Width D = 75.0 mm, Thickness dn = 25.0 mm, Lambda = 0.023

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Celotex						
	Main construction	150	0.0220	6.8182	100.00	40	1400
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Breather membrane						
	Main construction	0.1	0.0000	0.0000	100.00		
Layer 3	Screed						
	Main construction	65	1.1500	0.0565	100.00	1800	1000
Int surface				0.1700			

Total resistance: Upper limit = 6.875 m² K/W Lower limit = 6.875 m² K/W Average = 6.875 m² K/W

Total correction = 0.0098 m² K/W

U-value (unrounded) = 0.09 W/m² K

Unheated space: None

Total thickness: 215 mm

U-value: 0.09 W/m² K

Kappa: 117.00 kJ/m² K

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	111.4700 (1b)	x 2.3300 (2b)	= 259.7251 (1b) - (3b)
First floor	49.9900 (1c)	x 2.5000 (2c)	= 124.9750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.4600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 384.7001 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					6 * 10 = 60.0000 (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) =	60.0000 / (5) = 0.1560 (8)
Pressure test	No
Measured/design AP50	15.0000
Infiltration rate	0.9060 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7701 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.2000	4.1000	3.7000	3.5000	3.2000	3.1000	3.0000	3.2000	3.5000	3.7000	3.9000 (22)
Wind factor	1.0750	1.0500	1.0250	0.9250	0.8750	0.8000	0.7750	0.7500	0.8000	0.8750	0.9250	0.9750 (22a)
Adj infiltr rate	0.8278	0.8086	0.7893	0.7123	0.6738	0.6161	0.5968	0.5776	0.6161	0.6738	0.7123	0.7508 (22b)
Effective ac	0.8426	0.8269	0.8115	0.7537	0.7270	0.6898	0.6781	0.6668	0.6898	0.7270	0.7537	0.7819 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
New A Rated (Uw = 1.40)			15.1700	1.3258	20.1117		(27)
Half Glazed Door			3.3300	1.5000	4.9950		(26a)
New Lantern (Uw = 1.40)			8.0000	1.3258	10.6061		(27a)
150mm PIR Insulation			111.4700	0.0900	10.0323		(28a)
125mm Cavity	70.3300	18.5000	51.8300	0.2000	10.3660		(29a)
Insulated Rafter	51.4500		51.4500	0.1500	7.7175		(30)
Flat Warm Deck 140mm PIR	61.4800	8.0000	53.4800	0.1500	8.0220		(30)
Total net area of external elements Aum(A, m ²)			294.7300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	71.8506	(33)
Party Wall			125.2900	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.2623 (36)
Total fabric heat loss	(33) + (36) = 81.1129 (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	106.9750	104.9753	103.0227	95.6826	92.2948	87.5661	86.0840	84.6489	87.5661	92.2948	95.6826	99.2585 (38)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF HEAT DEMAND 09 Jan 2014

Heat transfer coeff	188.0880	186.0883	184.1356	176.7955	173.4078	168.6791	167.1969	165.7618	168.6791	173.4078	176.7955	180.3715 (39)
Average = Sum(39)m / 12 =												175.7839 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1649	1.1525	1.1404	1.0950	1.0740	1.0447	1.0355	1.0266	1.0447	1.0740	1.0950	1.1171 (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												2.9509 (42)
Average daily hot water use (litres/day)												104.2850 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.7135	110.5421	106.3707	102.1993	98.0279	93.8565	93.8565	98.0279	102.1993	106.3707	110.5421	114.7135 (44)
Energy content (annual)	170.1168	148.7852	153.5330	133.8538	128.4359	110.8304	102.7007	117.8505	119.2580	138.9837	151.7116	164.7490 (45)
Distribution loss (46)m = 0.15 x (45)m	25.5175	22.3178	23.0300	20.0781	19.2654	16.6246	15.4051	17.6776	17.8887	20.8476	22.7567	24.7124 (46)
Water storage loss:												250.0000 (47)
Store volume												1.6700 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.9018 (55)
Enter (49) or (54) in (55)												
Total storage loss	27.9558	25.2504	27.9558	27.0540	27.9558	27.0540	27.9558	27.9558	27.0540	27.9558	27.0540	27.9558 (56)
If cylinder contains dedicated solar storage	27.9558	25.2504	27.9558	27.0540	27.9558	27.0540	27.9558	27.9558	27.0540	27.9558	27.0540	27.9558 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	221.3350	195.0468	204.7512	183.4198	179.6541	160.3964	153.9189	169.0687	168.8240	190.2019	201.2776	215.9672 (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)
Output from w/h	221.3350	195.0468	204.7512	183.4198	179.6541	160.3964	153.9189	169.0687	168.8240	190.2019	201.2776	215.9672 (64)
RHI water heating demand												2244 (64)
Heat gains from water heating, kWh/month	97.5384	86.4804	92.0243	84.1592	83.6795	76.5039	75.1225	80.1599	79.3061	87.1867	90.0969	95.7536 (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	177.0568	177.0568	177.0568	177.0568	177.0568	177.0568	177.0568	177.0568	177.0568	177.0568	177.0568	177.0568 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.0024	69.2810	56.3431	42.6554	31.8854	26.9190	29.0869	37.8083	50.7462	64.4339	75.2039	80.1703 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	496.6178	501.7711	488.7849	461.1387	426.2403	393.4408	371.5287	366.3754	379.3616	407.0078	441.9062	474.7057 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6566	55.6566	55.6566	55.6566	55.6566	55.6566	55.6566	55.6566	55.6566	55.6566	55.6566	55.6566 (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)	-118.0379	-118.0379	-118.0379	-118.0379	-118.0379	-118.0379	-118.0379	-118.0379	-118.0379	-118.0379	-118.0379	-118.0379 (71)
Water heating gains (Table 5)	131.1000	128.6910	123.6886	116.8878	112.4724	106.2554	100.9712	107.7417	110.1474	117.1864	125.1346	128.7011 (72)
Total internal gains	823.3957	817.4187	786.4921	738.3574	688.2737	644.2908	619.2623	629.6010	657.9307	706.3037	759.9202	801.2526 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
Northeast	12.2900	12.1063	0.6300	0.7000	0.7700	45.4709 (75)						
Southwest	2.8800	38.7358	0.6300	0.7000	0.7700	34.0939 (79)						
Horizontal	8.0000	28.0000	0.6300	0.7000	1.0000	88.9056 (82)						
Solar gains	168.4704	311.6183	540.2312	830.3237	1047.0201	1144.3150	1070.8306	885.2903	663.1249	391.7631	207.7494	134.3298 (83)
Total gains	991.8661	1129.0370	1326.7233	1568.6810	1735.2938	1788.6058	1690.0929	1514.8913	1321.0556	1098.0668	967.6696	935.5824 (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	59.6131	60.2537	60.8926	63.4207	64.6597	66.4724	67.0616	67.6422	66.4724	64.6597	63.4207	62.1634
alpha	4.9742	5.0169	5.0595	5.2280	5.3106	5.4315	5.4708	5.5095	5.4315	5.3106	5.2280	5.1442
util living area	0.9978	0.9953	0.9843	0.9347	0.7938	0.5544	0.4135	0.4666	0.7793	0.9707	0.9953	0.9984 (86)
MIT	20.0094	20.1295	20.3663	20.6671	20.8678	20.9409	20.9488	20.9480	20.8977	20.6226	20.2896	20.0194 (87)
Th 2	19.9482	19.9582	19.9679	20.0049	20.0221	20.0462	20.0538	20.0612	20.0462	20.0221	20.0049	19.9869 (88)
util rest of house												

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	0.9970	0.9937	0.9787	0.9123	0.7363	0.4714	0.3215	0.3668	0.7009	0.9567	0.9935	0.9979 (89)
MIT 2	18.6229	18.8059	19.1567	19.6082	19.8738	19.9678	19.9806	19.9880	19.9337	19.5693	19.0768	18.6677 (90)
Living area fraction										fLA = Living area / (4) =		0.3808 (91)
MIT	19.1509	19.3099	19.6173	20.0114	20.2523	20.3383	20.3493	20.3536	20.3008	19.9703	19.5386	19.1824 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.0009	19.1599	19.4673	19.8614	20.1023	20.1883	20.1993	20.2036	20.1508	19.8203	19.3886	19.0324 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9961	0.9921	0.9751	0.9085	0.7414	0.4841	0.3357	0.3822	0.7103	0.9530	0.9919	0.9972 (94)
Useful gains	987.9785	1120.0698	1293.7142	1425.1463	1286.6218	865.8590	567.3775	578.9346	938.3586	1046.4933	959.7955	932.9272 (95)
Ext temp.	4.3000	4.9000	6.7000	9.1000	12.0000	15.0000	16.8000	16.7000	14.2000	10.6000	7.1000	4.1000 (96)
Heat loss rate W	2765.0594	2653.5953	2350.9130	1902.5682	1404.9952	875.1609	568.3495	580.7577	1003.7723	1598.8801	2172.5674	2693.3766 (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	1322.1482	1030.5292	786.5559	343.7438	88.0698	0.0000	0.0000	0.0000	0.0000	410.9757	873.1957	1309.7744 (98)
Space heating												6164.9926 (98)
RHI space heating demand												6165 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	111.4700 (1b)	2.3300 (2b)	259.7251 (1b) - (3b)
First floor	49.9900 (1c)	2.5000 (2c)	124.9750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.4600		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) = 384.7001 (5)
Dwelling volume			

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				6 * 10 =	60.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				60.0000 / (5) =	0.1560 (8)							
Pressure test				No								
Measured/design AP50				15.0000								
Infiltration rate				0.9060 (18)								
Number of sides sheltered				2 (19)								
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.7701 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.9818	0.9626	0.9433	0.8471	0.8278	0.7316	0.7316	0.7123	0.7701	0.8278	0.8663	0.9048 (22b)
Effective ac	0.9820	0.9633	0.9449	0.8588	0.8426	0.7676	0.7676	0.7537	0.7965	0.8426	0.8753	0.9094 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
New A Rated (Uw = 1.40)			15.1700	1.3258	20.1117		(27)					
Half Glazed Door			3.3300	1.5000	4.9950		(26a)					
New Lantern (Uw = 1.40)			8.0000	1.3258	10.6061		(27a)					
150mm PIR Insulation			111.4700	0.0900	10.0323		(28a)					
125mm Cavity	70.3300	18.5000	51.8300	0.2000	10.3660		(29a)					
Insulated Rafter	51.4500		51.4500	0.1500	7.7175		(30)					
Flat Warm Deck 140mm PIR	61.4800	8.0000	53.4800	0.1500	8.0220		(30)					
Total net area of external elements Aum(A, m ²)			294.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	71.8506	(33)					
Party Wall			125.2900	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2623 (36)					
Total fabric heat loss						(33) + (36) =	81.1129 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 124.6666	Feb 122.2904	Mar 119.9614	Apr 109.0218	May 106.9750	Jun 97.4470	Jul 97.4470	Aug 95.6826	Sep 101.1171	Oct 106.9750	Nov 111.1156	Dec 115.4444 (38)
Heat transfer coeff	205.7795	203.4034	201.0743	190.1347	188.0880	178.5600	178.5600	176.7955	182.2300	188.0880	192.2286	196.5573 (39)
Average = Sum(39)m / 12 =												190.1249 (39)
HLP	Jan 1.2745	Feb 1.2598	Mar 1.2454	Apr 1.1776	May 1.1649	Jun 1.1059	Jul 1.1059	Aug 1.0950	Sep 1.1286	Oct 1.1649	Nov 1.1906	Dec 1.2174 (40)
HLP (average)												1.1775 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9509 (42)
Average daily hot water use (litres/day)												104.2850 (43)
Daily hot water use	114.7135	110.5421	106.3707	102.1993	98.0279	93.8565	93.8565	98.0279	102.1993	106.3707	110.5421	114.7135 (44)
Energy conte	170.1168	148.7852	153.5330	133.8538	128.4359	110.8304	102.7007	117.8505	119.2580	138.9837	151.7116	164.7490 (45)
Energy content (annual)												Total = Sum(45)m = 1640.8088 (45)
Distribution loss (46)m = 0.15 x (45)m	25.5175	22.3178	23.0300	20.0781	19.2654	16.6246	15.4051	17.6776	17.8887	20.8476	22.7567	24.7124 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													92.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													7760.0021 (211)
Space heating requirement	1494.5795	1171.1742	949.4313	443.6030	144.9241	0.0000	0.0000	0.0000	0.0000	500.2306	996.0120	1454.7672	(98)
Space heating efficiency (main heating system 1)	92.2000	92.2000	92.2000	92.2000	92.2000	0.0000	0.0000	0.0000	0.0000	92.2000	92.2000	92.2000	(210)
Space heating fuel (main heating system)	1621.0190	1270.2540	1029.7520	481.1312	157.1845	0.0000	0.0000	0.0000	0.0000	542.5495	1080.2734	1577.8386	(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 requirement	221.3350	195.0468	204.7512	183.4198	179.6541	160.3964	153.9189	169.0687	168.8240	190.2019	201.2776	215.9672	(64)
Efficiency of water heater (217)m	90.6646	90.5037	90.1015	88.7900	85.9539	81.5000	81.5000	81.5000	81.5000	88.9817	90.2090	90.6614	(217)
Fuel for water heating, kWh/month	244.1250	215.5126	227.2451	206.5771	209.0122	196.8054	188.8575	207.4463	207.1461	213.7539	223.1237	238.2130	(219)
Water heating fuel used													2577.8178 (219)
Annual totals kWh/year													
Space heating fuel - main system													7760.0021 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													551.0186 (232)
Total delivered energy for all uses													10963.8385 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	7760.0021	7.6000	589.7602	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	2577.8178	7.6000	195.9142	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	551.0186	13.1900	72.6794	(250)
Additional standing charges			70.0000	(251)
Total energy cost			938.2462	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.9087	(257)
SAP value		73.3741	
SAP rating (Section 12)		73	(258)
SAP band		C	

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	7760.0021	0.2410	1870.1605	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2577.8178	0.2410	621.2541	(264)
Space and water heating			2491.4146	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	551.0186	0.5190	285.9786	(268)
Total kg/year			2816.3182	(272)
CO2 emissions per m2			17.4400	(273)
EI value			81.7211	
EI rating			82	(274)
EI band			B	

Calculation of stars for heating and DHW

Main heating energy efficiency	$7.60 \times (1 + 0.29 \times 0.25) / 0.9220 = 8.841$, stars = 2
Main heating environmental impact	$0.241 \times (1 + 0.29 \times 0.25) / 0.9220 = 0.2803$, stars = 4
Water heating energy efficiency	$7.60 / 0.8682 = 8.754$, stars = 2
Water heating environmental impact	$0.241 / 0.8682 = 0.2776$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	111.4700 (1b)	2.3300 (2b)	259.7251 (1b) - (3b)
First floor	49.9900 (1c)	2.5000 (2c)	124.9750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.4600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 384.7001 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				6 * 10 =	60.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				60.0000 / (5) =	0.1560 (8)
Pressure test				No	
Measured/design AP50				15.0000	
Infiltration rate				0.9060 (18)	
Number of sides sheltered				2 (19)	
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.7701 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.2000	4.1000	3.7000	3.5000	3.2000	3.1000	3.0000	3.2000	3.5000	3.7000	3.9000 (22)
Wind factor	1.0750	1.0500	1.0250	0.9250	0.8750	0.8000	0.7750	0.7500	0.8000	0.8750	0.9250	0.9750 (22a)
Adj infilt rate												
Effective ac	0.8278	0.8086	0.7893	0.7123	0.6738	0.6161	0.5968	0.5776	0.6161	0.6738	0.7123	0.7508 (22b)
	0.8426	0.8269	0.8115	0.7537	0.7270	0.6898	0.6781	0.6668	0.6898	0.7270	0.7537	0.7819 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
New A Rated (Uw = 1.40)			15.1700	1.3258	20.1117		(27)
Half Glazed Door			3.3300	1.5000	4.9950		(26a)
New Lantern (Uw = 1.40)			8.0000	1.3258	10.6061		(27a)
150mm PIR Insulation			111.4700	0.0900	10.0323		(28a)
125mm Cavity	70.3300	18.5000	51.8300	0.2000	10.3660		(29a)
Insulated Rafter	51.4500		51.4500	0.1500	7.7175		(30)
Flat Warm Deck 140mm PIR	61.4800	8.0000	53.4800	0.1500	8.0220		(30)
Total net area of external elements Aum(A, m ²)			294.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.8506		(33)
Party Wall			125.2900	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2623 (36)
 Total fabric heat loss (33) + (36) = 81.1129 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	106.9750	104.9753	103.0227	95.6826	92.2948	87.5661	86.0840	84.6489	87.5661	92.2948	95.6826	99.2585 (38)
Average = Sum(39)m / 12 =	188.0880	186.0883	184.1356	176.7955	173.4078	168.6791	167.1969	165.7618	168.6791	173.4078	176.7955	180.3715 (39)
												175.7839 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1649	1.1525	1.1404	1.0950	1.0740	1.0447	1.0355	1.0266	1.0447	1.0740	1.0950	1.1171 (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 2.9509 (42)
 Average daily hot water use (litres/day) 104.2850 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.7135	110.5421	106.3707	102.1993	98.0279	93.8565	93.8565	98.0279	102.1993	106.3707	110.5421	114.7135 (44)
Energy content (annual)	170.1168	148.7852	153.5330	133.8538	128.4359	110.8304	102.7007	117.8505	119.2580	138.9837	151.7116	164.7490 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1640.8088 (45)
Water storage loss:	25.5175	22.3178	23.0300	20.0781	19.2654	16.6246	15.4051	17.6776	17.8887	20.8476	22.7567	24.7124 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Designed)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													92.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													6686.5430 (211)
Space heating requirement	1322.1482	1030.5292	786.5559	343.7438	88.0698	0.0000	0.0000	0.0000	0.0000	410.9757	873.1957	1309.7744	(98)
Space heating efficiency (main heating system 1)	92.2000	92.2000	92.2000	92.2000	92.2000	0.0000	0.0000	0.0000	0.0000	92.2000	92.2000	92.2000	(210)
Space heating fuel (main heating system)	1434.0002	1117.7106	853.0975	372.8241	95.5203	0.0000	0.0000	0.0000	0.0000	445.7438	947.0670	1420.5796	(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 requirement	221.3350	195.0468	204.7512	183.4198	179.6541	160.3964	153.9189	169.0687	168.8240	190.2019	201.2776	215.9672	(64)
Efficiency of water heater (217)m	90.4963	90.3130	89.7658	88.1723	84.7349	81.5000	81.5000	81.5000	81.5000	88.5230	89.9869	90.5178	(217)
Fuel for water heating, kWh/month	244.5792	215.9676	228.0949	208.0243	212.0191	196.8054	188.8575	207.4463	207.1461	214.8616	223.6744	238.5908	(219)
Water heating fuel used													2586.0673 (219)
Annual totals kWh/year													
Space heating fuel - main system													6686.5430 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													551.0186 (232)
Total delivered energy for all uses													9898.6288 (238)

10a. Fuel costs - using BEDF prices (463)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6686.5430	6.8100	455.3536 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2586.0673	6.8100	176.1112 (247)
Pumps and fans for heating	75.0000	18.7000	14.0250 (249)
Energy for lighting	551.0186	18.7000	103.0405 (250)
Additional standing charges			61.0000 (251)
Total energy cost			809.5302 (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	6686.5430	0.2410	1611.4569 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2586.0673	0.2410	623.2422 (264)
Space and water heating			2234.6991 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	551.0186	0.5190	285.9786 (268)
Total kg/year			2559.6027 (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	6686.5430	1.0900	7288.3319 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2586.0673	1.0900	2818.8133 (264)
Space and water heating			10107.1452 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	551.0186	3.0700	1691.6271 (268)
Primary energy kWh/year			12029.0222 (272)
Primary energy kWh/m2/year			74.5016 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: C 73
Current environmental impact rating: B 82

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Designed)

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 2.5	-£ 78	-282 kg (11.0%)
U Solar photovoltaic panels	+ 6.5	-£ 328	-910 kg (40.0%)
V2 Wind turbine	+ 13.4	-£ 669	-1856 kg (135.7%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£78	1.75 kg/m ²	C 76 B 84
Solar photovoltaic panels	£328	5.64 kg/m ²	B 82 B 89
Wind turbine	£669	11.49 kg/m ²	A 96 A 101
Total Savings	£1074	18.88 kg/m²	

Potential energy efficiency rating: A 96
 Potential environmental impact rating: A 101

Fuel prices for cost data on this page from database revision number 463 TEST (27 Jul 2020)
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£117	£126	-£9
Bulk LPG	£692	£605	£87
Space heating	£530	£534	-£3
Water heating	£176	£95	£81
Lighting	£103	£103	£0
Generated (PV)	-£0	-£328	£328
Generated (wind)	-£0	-£669	£669
Total cost of fuels	£809	-£266	£1075
Total cost of uses	£809	-£265	£1075
Delivered energy	61 kWh/m ²	21 kWh/m ²	41 kWh/m ²
Carbon dioxide emissions	2.6 tonnes	-0.5 tonnes	3.0 tonnes
CO2 emissions per m ²	16 kg/m ²	-3 kg/m ²	19 kg/m ²
Primary energy	75 kWh/m ²	-35 kWh/m ²	109 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	111.4700 (1b)	x 2.3300 (2b)	= 259.7251 (1b) - (3b)
First floor	49.9900 (1c)	x 2.5000 (2c)	= 124.9750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.4600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 384.7001 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					6 * 10 = 60.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					60.0000 / (5) = 0.1560 (8)
Pressure test					No
Measured/design AP50					15.0000
Infiltration rate					0.9060 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.7701 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.9818	0.9626	0.9433	0.8471	0.8278	0.7316	0.7316	0.7123	0.7701	0.8278	0.8663	0.9048 (22b)
	0.9820	0.9633	0.9449	0.8588	0.8426	0.7676	0.7676	0.7537	0.7965	0.8426	0.8753	0.9094 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
New A Rated (Uw = 1.40)			15.1700	1.3258	20.1117		(27)
Half Glazed Door			3.3300	1.5000	4.9950		(26a)
New Lantern (Uw = 1.40)			8.0000	1.3258	10.6061		(27a)
150mm PIR Insulation			111.4700	0.0900	10.0323		(28a)
125mm Cavity	70.3300	18.5000	51.8300	0.2000	10.3660		(29a)
Insulated Rafter	51.4500		51.4500	0.1500	7.7175		(30)
Flat Warm Deck 140mm PIR	61.4800	8.0000	53.4800	0.1500	8.0220		(30)
Total net area of external elements Aum(A, m ²)			294.7300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	71.8506	(33)
Party Wall			125.2900	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2623 (36)
 Total fabric heat loss (33) + (36) = 81.1129 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	124.6666	122.2904	119.9614	109.0218	106.9750	97.4470	97.4470	95.6826	101.1171	106.9750	111.1156	115.4444 (38)
Heat transfer coeff	205.7795	203.4034	201.0743	190.1347	188.0880	178.5600	178.5600	176.7955	182.2300	188.0880	192.2286	196.5573 (39)
Average = Sum(39)m / 12 =												190.1249 (39)
HLP	1.2745	1.2598	1.2454	1.1776	1.1649	1.1059	1.1059	1.0950	1.1286	1.1649	1.1906	1.2174 (40)
HLP (average)												1.1775 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9509 (42)
Average daily hot water use (litres/day)												104.2850 (43)
Daily hot water use	114.7135	110.5421	106.3707	102.1993	98.0279	93.8565	93.8565	98.0279	102.1993	106.3707	110.5421	114.7135 (44)
Energy conte	170.1168	148.7852	153.5330	133.8538	128.4359	110.8304	102.7007	117.8505	119.2580	138.9837	151.7116	164.7490 (45)
Energy content (annual)												Total = Sum(45)m = 1640.8088 (45)
Distribution loss (46)m = 0.15 x (45)m	25.5175	22.3178	23.0300	20.0781	19.2654	16.6246	15.4051	17.6776	17.8887	20.8476	22.7567	24.7124 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9924	0.9790	0.9256	0.7891	0.5594	0.3860	0.4483	0.7621	0.9611	0.9927	0.9972	(94)
Useful gains	968.0698	1112.7237	1284.1504	1431.7111	1359.5550	965.5561	632.5368	659.3625	974.8371	1030.0307	940.8640	918.6140	(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	2984.7542	2863.2374	2568.6828	2058.0348	1561.2036	989.9620	635.4024	665.1561	1088.4921	1710.1034	2331.9533	2881.8551	(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	1500.4132	1176.3452	955.6921	450.9531	150.0266	0.0000	0.0000	0.0000	0.0000	505.9741	1001.5843	1460.6514	(98)
Space heating per m2													(98) / (4) = 44.6032 (99)

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													92.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													7810.8893 (211)
Space heating requirement	1500.4132	1176.3452	955.6921	450.9531	150.0266	0.0000	0.0000	0.0000	0.0000	505.9741	1001.5843	1460.6514	(98)
Space heating efficiency (main heating system 1)	92.2000	92.2000	92.2000	92.2000	92.2000	0.0000	0.0000	0.0000	0.0000	92.2000	92.2000	92.2000	(210)
Space heating fuel (main heating system)	1627.3462	1275.8625	1036.5424	489.1031	162.7187	0.0000	0.0000	0.0000	0.0000	548.7788	1086.3171	1584.2206	(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 requirement	185.4178	141.5313	116.7269	63.6905	28.9280	12.3101	6.8250	38.7781	69.3037	121.6907	160.5063	184.5422	(64)
Efficiency of water heater (217)m	90.8876	90.9181	90.9010	90.7259	90.2839	81.5000	81.5000	81.5000	81.5000	89.9114	90.5579	90.8619	(217)
Fuel for water heating, kWh/month	204.0078	155.6690	128.4110	70.2011	32.0412	15.1044	8.3742	47.5805	85.0352	135.3452	177.2417	203.1018	(219)
Water heating fuel used													1262.1129 (219)
Annual totals kWh/year													
Space heating fuel - main system													7810.8893 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													125.0000 (231)
Electricity for lighting (calculated in Appendix L)													551.0186 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1080 * 0.80) =										-1727.2394			-1727.2394 (233)
Wind generation													-3575.5408 (234)
Total delivered energy for all uses													4446.2407 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	7810.8893	7.6000	593.6276	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1262.1129	7.6000	95.9206	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	551.0186	13.1900	72.6794	(250)
Additional standing charges			70.0000	(251)
Energy saving/generation technologies				
PV Unit	-1727.2394	13.1900	-227.8229	(252)
Wind Turbine	-3575.5408	13.1900	-471.6138	(252)
Total energy cost			149.2783	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3037	(257)
SAP value		95.7637	
SAP rating (Section 12)		96	(258)
SAP band		A	

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	7810.8893	0.2410	1882.4243 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1262.1129	0.2410	304.1692 (264)
Space and water heating			2186.5935 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	551.0186	0.5190	285.9786 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Wind Turbine	-3575.5408	0.5190	-1855.7056 (269)
Total kg/year			-214.6957 (272)
CO2 emissions per m2			-1.3300 (273)
EI value			101.3935
EI rating			101 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	111.4700 (1b)	x 2.3300 (2b)	= 259.7251 (1b) - (3b)
First floor	49.9900 (1c)	x 2.5000 (2c)	= 124.9750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.4600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 384.7001 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				6 * 10 =	60.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				60.0000 / (5) =	0.1560 (8)							
Pressure test				No								
Measured/design AP50				15.0000								
Infiltration rate				0.9060 (18)								
Number of sides sheltered				2 (19)								
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.7701 (21)							
Wind speed	Jan 4.3000	Feb 4.2000	Mar 4.1000	Apr 3.7000	May 3.5000	Jun 3.2000	Jul 3.1000	Aug 3.0000	Sep 3.2000	Oct 3.5000	Nov 3.7000	Dec 3.9000 (22)
Wind factor	1.0750	1.0500	1.0250	0.9250	0.8750	0.8000	0.7750	0.7500	0.8000	0.8750	0.9250	0.9750 (22a)
Adj infilt rate	0.8278	0.8086	0.7893	0.7123	0.6738	0.6161	0.5968	0.5776	0.6161	0.6738	0.7123	0.7508 (22b)
Effective ac	0.8426	0.8269	0.8115	0.7537	0.7270	0.6898	0.6781	0.6668	0.6898	0.7270	0.7537	0.7819 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
New A Rated (Uw = 1.40)			15.1700	1.3258	20.1117		(27)					
Half Glazed Door			3.3300	1.5000	4.9950		(26a)					
New Lantern (Uw = 1.40)			8.0000	1.3258	10.6061		(27a)					
150mm PIR Insulation			111.4700	0.0900	10.0323		(28a)					
125mm Cavity	70.3300	18.5000	51.8300	0.2000	10.3660		(29a)					
Insulated Rafter	51.4500		51.4500	0.1500	7.7175		(30)					
Flat Warm Deck 140mm PIR	61.4800	8.0000	53.4800	0.1500	8.0220		(30)					
Total net area of external elements Aum(A, m ²)			294.7300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	71.8506	(33)					
Party Wall			125.2900	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2623 (36)					
Total fabric heat loss						(33) + (36) =	81.1129 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 106.9750	Feb 104.9753	Mar 103.0227	Apr 95.6826	May 92.2948	Jun 87.5661	Jul 86.0840	Aug 84.6489	Sep 87.5661	Oct 92.2948	Nov 95.6826	Dec 99.2585 (38)
Heat transfer coeff	188.0880	186.0883	184.1356	176.7955	173.4078	168.6791	167.1969	165.7618	168.6791	173.4078	176.7955	180.3715 (39)
Average = Sum(39)m / 12 =												175.7839 (39)
HLP	Jan 1.1649	Feb 1.1525	Mar 1.1404	Apr 1.0950	May 1.0740	Jun 1.0447	Jul 1.0355	Aug 1.0266	Sep 1.0447	Oct 1.0740	Nov 1.0950	Dec 1.1171 (40)
HLP (average)												1.0887 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9509 (42)
Average daily hot water use (litres/day)												104.2850 (43)
Daily hot water use	114.7135	110.5421	106.3707	102.1993	98.0279	93.8565	93.8565	98.0279	102.1993	106.3707	110.5421	114.7135 (44)
Energy conte	170.1168	148.7852	153.5330	133.8538	128.4359	110.8304	102.7007	117.8505	119.2580	138.9837	151.7116	164.7490 (45)
Energy content (annual)												Total = Sum(45)m = 1640.8088 (45)
Distribution loss (46)m = 0.15 x (45)m	25.5175	22.3178	23.0300	20.0781	19.2654	16.6246	15.4051	17.6776	17.8887	20.8476	22.7567	24.7124 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Designed)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9962	0.9923	0.9759	0.9114	0.7480	0.4901	0.3403	0.3877	0.7162	0.9546	0.9922	0.9973	(94)	
Useful gains	979.1431	1111.4133	1284.4220	1414.6462	1280.9936	865.2344	567.2991	578.7805	935.4217	1038.1949	951.1572	924.0460	(95)	
Ext temp.	4.3000	4.9000	6.7000	9.1000	12.0000	15.0000	16.8000	16.7000	14.2000	10.6000	7.1000	4.1000	(96)	
Heat loss rate W	2764.1232	2652.6819	2349.9297	1901.4809	1404.4260	875.0945	568.3395	580.7386	1003.4748	1598.0359	2171.6920	2692.4674	(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	1328.0252	1035.7326	792.7377	350.5210	91.8337	0.0000	0.0000	0.0000	0.0000	416.5217	878.7851	1315.7055	(98)	
Space heating												6209.8624	(98)	
Space heating per m2												(98) / (4) =	38.4607	(99)

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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 %)													92.2000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													6735.2086	(211)
Space heating requirement	1328.0252	1035.7326	792.7377	350.5210	91.8337	0.0000	0.0000	0.0000	0.0000	416.5217	878.7851	1315.7055	(98)	
Space heating efficiency (main heating system 1)	92.2000	92.2000	92.2000	92.2000	92.2000	0.0000	0.0000	0.0000	0.0000	92.2000	92.2000	92.2000	(210)	
Space heating fuel (main heating system)	1440.3744	1123.3542	859.8023	380.1746	99.6027	0.0000	0.0000	0.0000	0.0000	451.7589	953.1291	1427.0124	(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 requirement	183.9779	142.5374	117.4796	64.7942	32.1891	9.6918	5.3537	37.7959	67.2476	120.3240	159.3111	184.0015	(64)	
Efficiency of water heater (217)m	90.7503	90.7586	90.6637	90.3494	89.1618	81.5000	81.5000	81.5000	81.5000	89.5645	90.3790	90.7384	(217)	
Fuel for water heating, kWh/month	202.7299	157.0512	129.5773	71.7151	36.1019	11.8918	6.5690	46.3754	82.5124	134.3435	176.2700	202.7824	(219)	
Water heating fuel used												1257.9199	(219)	
Annual totals kWh/year														
Space heating fuel - main system													6735.2086	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													551.0186	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 2.50 * 1096 * 0.80) =										-1753.7358			-1753.7358	(233)
Wind generation													-3575.5408	(234)
Total delivered energy for all uses													3339.8706	(238)

10a. Fuel costs - using BEDF prices (463)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6735.2086	6.8100	458.6677	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1257.9199	6.8100	85.6643	(247)
Pumps and fans for heating	75.0000	18.7000	14.0250	(249)
Pump for solar water heating	50.0000	18.7000	9.3500	(249)
Energy for lighting	551.0186	18.7000	103.0405	(250)
Additional standing charges			61.0000	(251)
Energy saving/generation technologies				
PV Unit	-1753.7358	18.7000	-327.9486	(252)
Wind Turbine	-3575.5408	18.7000	-668.6261	(252)
Total energy cost			-264.8272	(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	6735.2086	0.2410	1623.1853	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1257.9199	0.2410	303.1587	(264)
Space and water heating			1926.3440	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	551.0186	0.5190	285.9786	(268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: Conversion (As Designed)

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

Energy saving/generation technologies			
PV Unit	-1753.7358	0.5190	-910.1889 (269)
Wind Turbine	-3575.5408	0.5190	-1855.7056 (269)
Total kg/year			-488.6969 (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	6735.2086	1.0900	7341.3774 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1257.9199	1.0900	1371.1327 (264)
Space and water heating			8712.5101 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	551.0186	3.0700	1691.6271 (268)
Energy saving/generation technologies			
PV Unit	-1753.7358	3.0700	-5383.9688 (269)
Wind Turbine	-3575.5408	3.0700	-10976.9101 (269)
Primary energy kWh/year			-5572.9917 (272)
Primary energy kWh/m2/year			-34.5162 (273)

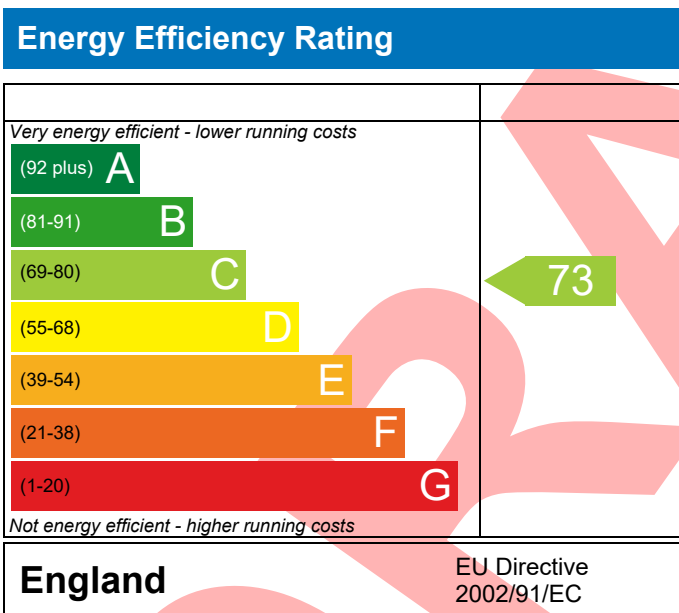
PREDICTED ENERGY ASSESSMENT

Lynn Lane Farm, Plot 5, Lynn Lane,
Shenstone,
WS14 0EN

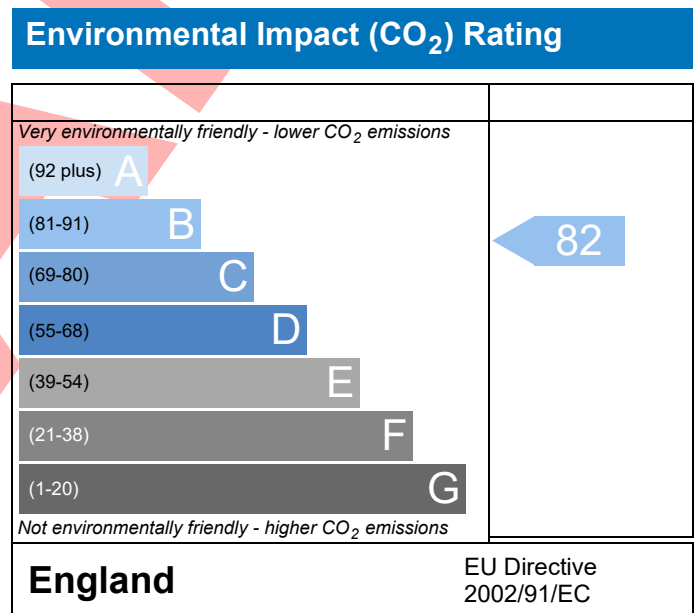
Dwelling type: House, Mid-Terrace
Date of assessment: 17/09/2020
Produced by: Energy Services (Midlands) Ltd
Total floor area: 161.46 m²

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 (CO₂) emissions.



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.



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) 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.

THERMAL BRIDGING

Calculation Type: Conversion (As Designed)

Property Reference	SAP04054 - Plot 5 - LPG		Issued on Date	17/09/2020	
Assessment Reference	As Designed	Prop Type Ref	Conversion- House - Mid		
Property	Lynn Lane Farm, Plot 5, Lynn Lane, Shenstone, WS14 0EN				
SAP Rating	73 C	DER	N/A	TER	N/A
Environmental	82 B	% DER<TER	N/A		
CO ₂ Emissions (t/year)	2.56	DFEE	N/A	TFEE	N/A
General Requirements Compliance	N/A	% DFEE<TFEE	N/A		
Assessor Details	Ms. Kim Oliver, Energy Services (Midlands) Ltd, Tel: 0121 5528425, kim@energyservice.co.uk			Assessor ID	L757-0001
Client	Cablemark Ltd, Cablemark Ltd				

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.028	12.23	0.34	CBA-313
External wall	E3 Sill	Independently assessed	0.016	10.65	0.17	CBA-314
External wall	E4 Jamb	Independently assessed	0.011	18.90	0.21	CBA-315
External wall	E5 Ground floor (normal)	Independently assessed	0.059	14.60	0.86	CBA-302
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	14.70	0.00	CBA-303
External wall	E11 Eaves (insulation at rafter level)	Independently assessed	-0.002	8.80	-0.02	CBA-309
External wall	E14 Flat roof	Table K1 - Default	0.080	5.80	0.46	
External wall	E16 Corner (normal)	Independently assessed	0.000	2.30	0.00	
External wall	E18 Party wall between dwellings	Independently assessed	0.039	24.20	0.94	CBA-305
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	37.30	5.97	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	15.80	0.00	
Party wall	P5 Party wall - Roof (insulation at rafter level)	Independently assessed	0.023	14.00	0.32	CBA-307

Total: **9.26** W/mK:
 Y-Value: **0.031** W/m²K: