

Energy Performance Certificate



1 Green Court, Ware Road, HERTFORD, SG13 7DY

Dwelling type: Ground-floor flat
Date of assessment: 17 May 2016
Date of certificate: 17 May 2016

Reference number: 8546-7735-4440-0453-3996
Type of assessment: SAP, new dwelling
Total floor area: 81 m²

Use this document to:

- Compare current ratings of properties to see which properties are more energy efficient

Estimated energy costs of dwelling for 3 years:

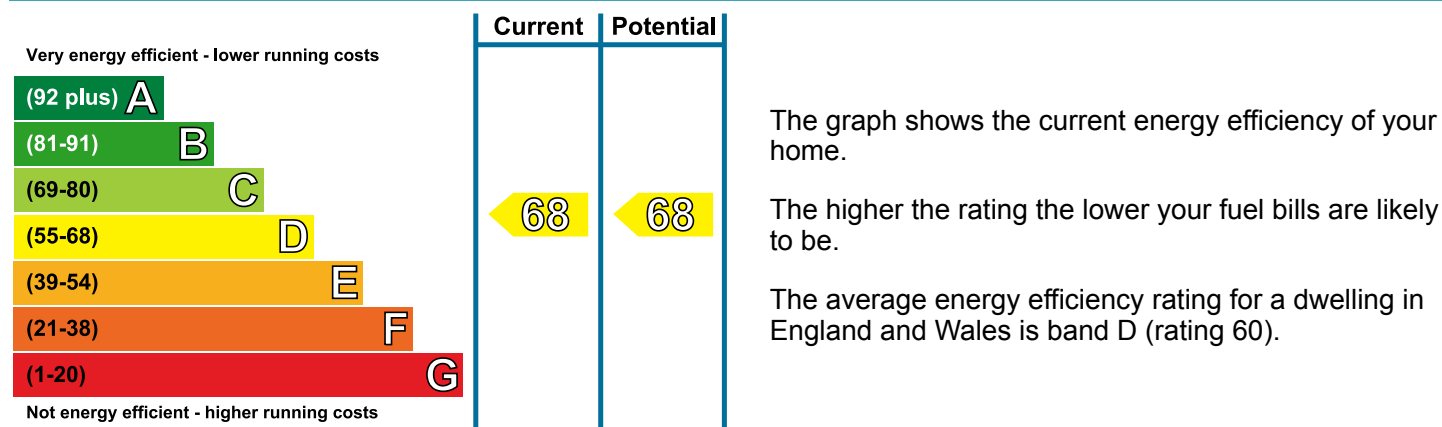
£ 2,187

Estimated energy costs of this home

	Current costs	Potential costs	Potential future savings
Lighting	£ 168 over 3 years	£ 168 over 3 years	Not applicable
Heating	£ 1,725 over 3 years	£ 1,725 over 3 years	
Hot Water	£ 294 over 3 years	£ 294 over 3 years	
Totals	£ 2,187	£ 2,187	

These figures show how much the average household would spend in this property for heating, lighting and hot water. This excludes energy use for running appliances like TVs, computers and cookers, and any electricity generated by microgeneration.

Energy Efficiency Rating



Summary of this home's energy performance related features

Element	Description	Energy Efficiency
Walls	Average thermal transmittance 1.23 W/m ² K	—
Roof	(other premises above)	—
Floor	Average thermal transmittance 0.57 W/m ² K	—
Windows	Fully double glazed	★★★★☆
Main heating	Boiler and radiators, mains gas	★★★★☆
Main heating controls	Programmer, room thermostat and TRVs	★★★★☆
Secondary heating	None	—
Hot water	From main system	★★★★☆
Lighting	Low energy lighting in all fixed outlets	★★★★★
Air tightness	(not tested)	—

Thermal transmittance is a measure of the rate of heat loss through a building element; the lower the value the better the energy performance.

Current primary energy use per square metre of floor area: 215 kWh/m² per year

Low and zero carbon energy sources

Low and zero carbon energy sources are sources of energy that release either very little or no carbon dioxide into the atmosphere when they are used. Installing these sources may help reduce energy bills as well as cutting carbon. There are none provided for this home.

Recommendations

None.

About this document

The Energy Performance Certificate for this dwelling was produced following an energy assessment undertaken by a qualified assessor, accredited by Elmhurst Energy Systems Ltd. You can get contact details of the accreditation scheme at www.elmhurstenergy.co.uk, together with details of their procedures for confirming authenticity of a certificate and for making a complaint. A copy of this EPC has been lodged on a national register. It will be publicly available and some of the underlying data may be shared with others for compliance and marketing of relevant energy efficiency information. The Government may use some of this data for research or statistical purposes. Green Deal financial details that are obtained by the Government for these purposes will not be disclosed to non-authorised recipients. The current property owner and/or tenant may opt out of having their information shared for marketing purposes.

Assessor's accreditation number: EES/004715
Assessor's name: Andrew Underwood
Phone number: 07870 638 476
E-mail address: info@sap-calculations.co.uk
Related party disclosure: No related party

Further information about Energy Performance Certificates can be found under Frequently Asked Questions at www.epcregister.com.

About the impact of buildings on the environment

One of the biggest contributors to global warming is carbon dioxide. The energy we use for heating, lighting and power in homes produces over a quarter of the UK's carbon dioxide emissions.

The average household causes about 6 tonnes of carbon dioxide every year. Based on this assessment, your home currently produces approximately 3.1 tonnes of carbon dioxide every year. You could reduce emissions by switching to renewable energy sources.

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.



Your home's heat demand

This table shows the energy used for space and water heating by an average household in this property.

Heat demand

Space heating (kWh per year)	9,845
Water heating (kWh per year)	2,012

Summary Information

Property Reference: A998-0001-16-56-1

Issued on Date: 17.May.2016

Survey Reference: 16-56-1

Prop Type Ref: Conversion

Property: 1 Green Court, Ware Road, HERTFORD, SG13 7DY

SAP Rating: 68 D **CO2 Emissions (t/year):** 3.07 **DER:** N/A **TER:** N/A **Percentage DER<TER:** N/A

Environmental: 64 D **General Requirements Compliance:** N/A **DFEE:** N/A **TFEE:** N/A **Percentage DFEE<TFEE:** N/A

CfSH Results Version: **ENE1 Credits:** N/A **ENE2 Credits:** N/A **ENE7 Credits:** N/A **CfSH Level:** N/A

Surveyor: Andrew Underwood, Tel: 07870 638476

Surveyor ID: A998-0001

Address: Beechwood Place, Narberth, Pembrokeshire, SA67 7EE

Client:
Software Version: Elmhurst Energy Systems SAP2012 Calculator (Design System) version 3.05r04

SAP version: SAP 2012, **Regs Region:** England (Part L1A 2013), **Calculation Type:** Conversion - new dwelling

SUMMARY FOR INPUT DATA FOR Conversion - new dwelling

Page 1 of 4

Orientation	North East
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2016
3.0 Property Age Band	
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:			33.00			81.00			2.40		
7.0 Living Area			32.70								
8.0 Thermal Mass Parameter			Simple calculation - High								
9.0 External Walls			Construction			U-Value	Kappa	Gross Area	Nett Area		
Description											
External Wall			Other			1.23			79.20 66.84		
9.1 Party walls			Construction			Kappa	Area				
Description											
Stairwell			Other			14.40					
10.1 Party Ceilings			Construction			Kappa	Area				
Description											
Party Ceilings			Other			81.00					
11.0 HeatLoss Floors			Construction			U-Value	Kappa	Area			
Description											
Heat Loss Floor			Other			0.57 81.00					
12.0 Opening Types											
Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	Solar Trans	Frame Type	Frame Factor	U value		
Windows	SAP table	Window	Double glazed	12 mm	No	0.76	PVC	0.70	2.80		
13.0 Openings											
Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width	Height	Count	Area	Curtain Closed
NE Elevation	Window	[1] External Wall	North East	None	0.00					5.74	
SE Elevation	Window	[1] External Wall	South East	None	0.00					3.89	
SW Elevation	Window	[1] External Wall	South West	None	0.00					2.73	
14.0 Conservatory			None								
15.0 Draught Proofing			100								
16.0 Draught Lobby			Yes								
17.0 Thermal Bridging			Default								
Y-value			0.150								
Description											
18.0 Pressure Testing			No								

Designed q50	15.00			
Property Tested ?				
As Built q50				
Same As Designed ?				
19.0 Mechanical Ventilation				
Mechanical Ventilation System	No			
Present				
Approved Installation				
Windows open in hot weather	Windows fully open			
Cross ventilation possible	Yes			
Night Ventilation	Yes			
Air change rate	6.00			
Mechanical Ventilation data Type				
Type				
MV Reference Number				
Configuration				
MVHR Duct Insulated				
Manufacturer SFP				
Duct Type				
MVHR Efficiency				
Wet Rooms				
Brand, Model				
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				2
Number of passive vents				0
Number of flueless gas fires				0
21.0 Cooling System	No			
22.0 Lighting				
Internal				
Total number of light fittings	15			
Total number of L.E.L. fittings	15			
Percentage of L.E.L. fittings	100.00			
External				
External lights fitted	No			
Light and motion sensors				
23.0 Electricity Tariff	Standard			
24.0 Heating Systems				
Main Heating 1	Database			
Description	Boiler			
Percentage of Heat	100 %			
Main Heating 2	None			
Description				
Percentage of Heat	%			
Community Heating				
Secondary Heating	None			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery	No			
Instantaneous System 1				
Waste Water Heat Recovery	No			
Instantaneous System 2				
Waste Water Heat Recovery Storage	No			
System				
Solar Panel	No			
25.0 Main Heating 1				
Database Ref. No.	16136			
Fuel Type	Mains gas			
Main Heating	BGW			
TestMethod				
SAP Code	104			
Efficiency (Split Efficiencies) %				
Efficiency (Split Efficiencies) %				
In Winter	89.9			
In Summer	87.3			
Model Name				
Manufacturer				
Controls	CBE Programmer, room thermostat and TRVs			
PCDF Controls	0			
Delayed Start Stat	No			
Sap Code	2106			
Burner Control				

Boiler Compensator	
HETAS approved System	
Oil Pump Inside	
FI Case	
FI Water	
Flue Type	Balanced
Smoke Control Area	
Fan Assisted Flue	Yes
Is MHS Pumped	No pump
Heat Emitter	Radiators
Underfloor Heating	
Flow Temperature	Normal (> 45°C)
Electric CPSU Temperature	
Combi boiler type	Standard Combi
Combi keep hot type	Gas/Oil, time clock
Combi store type	

27.0 Community Heating

Space Community Heating	
PCDF Index	
Distribution Loss	
Distribution Loss Value	
Controls	
SAP Code	
Water Community Heating	
PCDF Index	
Distribution Loss	
Distribution Loss Value	
Charging Linked To Heat Use	

28.0 Secondary Heating

Description	
SHS efficiency %	
SAP Code	
HETAS Approved System	
Smoke Control Area	
Test Method	
Manufacturer	
Model Name	

29.0 Water Heating

Water use <= 125 litres/person/day	HWP From main heating 1
SAP Code	Yes
Immersion Heater	901
Summer Immersion	
Supplementary Immersion	
Immersion Only Heating Hot Water	

29.1 Flue Gas Heat Recovery System

Database ID	
Brand Model	
Details	

29.2 Waste Water Heat Recovery

System

Total rooms with shower and/or bath	
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30.0 Hot Water Cylinder

Cylinder Stat	None
Cylinder In Heated Space	
Independent Time Control	
Insulation Type	
Insulation Thickness	
Cylinder Volume	
Loss (kwh/day)	
Pipes insulation	
In Airing Cupboard	

31.0 Solar Panel

Solar Panel Area	
Area Type	
Panel Type	
n0, a1, a2, A/G ratio	
Orientation	
Elevation	
Overshading	
Solar Storage Volume	
Pump electrically powered	
Combined Cylinder	

32.0 Thermal Store

Thermal Store Pipework	
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33.0 Photovoltaic Unit

Apportioned KWh/Year	
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34.0 Wind Turbines

Terrain Type Urban
Wind Turbines
Count
Apportioned Kwh/year
Rotor Diameter
Hub Height

35.0 Small-scale Hydro

Electricity Generated
Description
Apportioned kWh/Year

Recommendations

None

Further measures to achieve even higher
standards

None

Full SAP Calculation Printout

Property Reference: A998-0001-16-56-1

Issued on Date: 17.May.2016

Survey Reference: 16-56-1

Prop Type Ref: Conversion

Property: 1 Green Court, Ware Road, HERTFORD, SG13 7DY

SAP Rating: 68 D	CO2 Emissions (t/year): 3.07	DER: N/A	TER: N/A	Percentage DER<TER: N/A
Environmental: 64 D	General Requirements Compliance: N/A	DFEE: N/A	TFEE: N/A	Percentage DFEE<TFEE: N/A
CfSH Results	Version:	ENE1 Credits: N/A	ENE2 Credits: N/A	ENE7 Credits: N/A
CfSH Level: N/A				
Surveyor: Andrew Underwood, Tel: 07870 638476	Surveyor ID: A998-0001			
Address: Beechwood Place, Narberth, Pembrokeshire, SA67 7EE				
Client:				

Software Version: Elmhurst Energy Systems SAP2012 Calculator (Design System) version 3.05r04

SAP version: SAP 2012, Regs Region: England (Part L1A 2013), Calculation Type: Conversion - new dwelling

CALCULATION DETAILS for survey reference no '16-56-1'
SAP2012 - 9.92 input data (DesignData) -

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SAP2012 Input Data (Flat)	18/05/2016
FullRefNo:	16-56-1
Regs Region:	England
SAP Region:	Thames Valley
Postcode:	SG13 7DY
DwellingOrientation:	North East
Property Type:	Flat, End-Terrace
Storeys:	1
Date Built:	2016
Sheltered Sides:	2
Sunlight Shade:	Average or unknown
Measurements	Perimeter, Floor Area, Storey Height
1st Storey:	33, 81, 2.4
Living Area:	32.7 m2, fraction: 40.4%
Thermal Mass:	Simple calculation
Thermal Mass Simple:	High
Thermal MassValue:	450
External Walls	Nett Area, Gross Area, Kappa, Element, Construction, Type, ShelterFactor, UValueFinal
External Wall	66.84, 79.2, 0, Other, Cavity, 0, 1.23, Calculate
Party Walls	Area, Kappa, Element, Construction, Type, ShelterFactor, UValueFinal
Stairwell	14.4, 0, Other, Solid, 0, 0
External Roofs	Nett Area, Gross Area, Kappa, Construction, Element, UValueFinal
Party Ceilings	Area, Kappa, Construction, Element
Party Ceilings	81, 0, Other
Heat Loss Floors	Area, Kappa, Construction, Element, Type, ShelterFactor, UValueFinal
Heat Loss Floor	81, 0, Other, Ground Floor - Solid, 0, 0.57
Description	Data Source, Type, Glazing, Glazing Gap, Argon Filled, Solar Trans, Frame Type, Frame Factor, U Value
Windows	SAP table, Window, Double glazed, 12 mm, False, 0.76, PVC, 0.7, 2.80
Openings	Opening Type, Location, Orientation, Pitch, Curtain Type, Overhang Ratio, Wide Overhang, Width, Height, Count, Area, Curtain Closed
NE Elevation	Window, External Wall, North East, , None, 0, , 0, 0, 0, 5.74,
SE Elevation	Window, External Wall, South East, , None, 0, , 0, 0, 0, 3.89,
SW Elevation	Window, External Wall, South West, , None, 0, , 0, 0, 0, 2.73,
Conservatory:	None
Draught Proofing:	100
Draught Lobby:	Yes
Thermal Bridges	
Bridging:	Default
Y	0.15
Pressure Test:	False
Designed q50:	15
AsBuilt q50:	15
Property Tested:	False
Mechanical Ventilation	None
Chimneys MHS:	0
Chimneys SHS:	0
Chimneys Other:	0
Chimneys Total:	0
Open Flues MHS:	0
Open Flues SHS:	0
Open Flues Other:	0
Open Flues Total:	0
Intermittent Fans:	2
Passive Vents:	0
Flueless Gas Fires:	0
Cooling System	None
Light Fittings:	15
LEL Fittings:	15
Percentage of LEL Fittings:	100
External Lights Fitted:	No
External LELs Fitted:	No
Electricity Tariff:	Standard
Main Heating 1	
Description	Boiler
Percentage	100
Sedbuk ID	16136
Fuel Type	Mains gas
MHS	Mains gas BGW Post 98 Combi condens. with auto ign.
SAP Code	104
Boiler Efficiency Type	Split Efficiencies
Efficiency Winter	89.9
Efficiency Summer	87.3
Controls by PCDF	0
MHS Controls	CBE Programmer, room thermostat and TRVs
Boiler Interlock	Yes
Compensator	0
Delayed Start Stat	No
Ctrl SAP Code	2106

Flue Type	Balanced
Fan Assisted Flue	Yes
Pumped	No pump
Heat Emitter	Radiators
Flow Temperature	Normal (> 45°C)
Combi boiler type	Standard Combi
Combi keep hot type	Gas/oil, time clock
Main Heating 2	None
Heating Systems Interaction	Each system heats separate parts of dwelling
Smoke Control Area	Unknown
Community Heating	None
Secondary Heating	None
Water Heating	
Type	MainHeating1
WHS	HWP From main heating 1
Low Water Usage	Yes
SAP Code	901
Showers in Property	Non-electric only
Hot Water Cylinder	None
Flue Gas Heat Recovery System	None
Waste Water Heat Recovery	none
PV Unit	None
Wind Turbine	None
Terrain Type:	Urban
Small Scale Hydro	None
Special Features	None

SAP 2012 WORKSHEET FOR Conversion - new dwelling (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	81.0000 (1b)	x 2.4000 (2b)	= 194.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	194.4000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					2 * 10 = 20.0000 (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) =					20.0000 / (5) = 0.1029 (8)
Pressure test					No
Measured/design q50					15.0000
Infiltration rate					0.8529 (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) =	0.7249 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.1000	4.2000	3.8000	3.8000	3.3000	3.3000	3.5000	3.4000	3.7000	3.7000	4.0000 (22)
Wind factor	1.0750	1.0250	1.0500	0.9500	0.9500	0.8250	0.8250	0.8750	0.8500	0.9250	0.9250	1.0000 (22a)
Adj infilt rate	0.7793	0.7431	0.7612	0.6887	0.6887	0.5981	0.5981	0.6343	0.6162	0.6706	0.6706	0.7249 (22b)
Effective ac	0.8037	0.7761	0.7897	0.7372	0.7372	0.6789	0.6789	0.7012	0.6899	0.7248	0.7248	0.7628 (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 = 2.80)			12.3600	2.5180	31.1223		(27)					
Heat Loss Floor			81.0000	0.5700	46.1700		(28a)					
External Wall	79.2000	12.3600	66.8400	0.6000	40.1040		(29a)					
Total net area of external elements Aum(A, m2)			160.2000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		117.3963		(33)					
Stairwell			14.4000	0.0000	0.0000		(32)					
Party Ceilings			81.0000				(32b)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							450.0000 (35)					
Thermal bridges (Default value 0.150 * total exposed area)							24.0300 (36)					
Total fabric heat loss						(33) + (36) =	141.4263 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 51.5570	Feb 49.7870	Mar 50.6615	Apr 47.2899	May 47.2899	Jun 43.5497	Jul 43.5497	Aug 44.9826	Sep 44.2556	Oct 46.4997	Nov 46.4997	Dec 48.9336 (38)
Heat transfer coeff	192.9833	191.2133	192.0878	188.7162	188.7162	184.9760	184.9760	186.4089	185.6819	187.9260	187.9260	190.3599 (39)
Average = Sum(39)m / 12 =												188.4976 (39)
HLP	Jan 2.3825	Feb 2.3607	Mar 2.3715	Apr 2.3298	May 2.3298	Jun 2.2837	Jul 2.2837	Aug 2.3013	Sep 2.2924	Oct 2.3201	Nov 2.3201	Dec 2.3501 (40)
HLP (average)												2.3271 (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												2.4816 (42)
Average daily hot water use (litres/day)												93.1371 (43)
Daily hot water use	Jan 102.4508	Feb 98.7253	Mar 94.9998	Apr 91.2743	May 87.5489	Jun 83.8234	Jul 83.8234	Aug 87.5489	Sep 91.2743	Oct 94.9998	Nov 98.7253	Dec 102.4508 (44)
Energy conte	151.9316	132.8803	137.1206	119.5450	114.7063	98.9828	91.7221	105.2525	106.5095	124.1266	135.4939	147.1376 (45)
Energy content (annual)												Total = Sum(45)m = 1465.4089 (45)
Distribution loss (46)m = 0.15 x (45)m	22.7897	19.9320	20.5681	17.9318	17.2059	14.8474	13.7583	15.7879	15.9764	18.6190	20.3241	22.0706 (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	46.6816	42.1157	46.5083	44.8724	46.2695	44.6633	46.0812	46.2033	44.7772	46.4095	45.0696	46.6433 (61)
Total heat required for water heating calculated for each month	198.6132	174.9960	183.6288	164.4175	160.9759	143.6461	137.8034	151.4558	151.2868	170.5361	180.5635	193.7809 (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	198.6132	174.9960	183.6288	164.4175	160.9759	143.6461	137.8034	151.4558	151.2868	170.5361	180.5635	193.7809 (64)
Total per year (kWh/year) = Sum(64)m =												2011.7039 (64)
RHI water heating demand												2012 (64)

Heat gains from water heating, kWh/month
62.1876 54.7116 57.2197 50.9668 49.7072 44.0776 42.0179 46.5473 46.6087 52.8745 56.3191 60.5841 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.0042	46.1897	37.5640	28.4384	21.2580	17.9469	19.3923	25.2068	33.8325	42.9581	50.1385	53.4496 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	330.6236	334.0545	325.4088	307.0034	283.7698	261.9335	247.3455	243.9147	252.5603	270.9657	294.1993	316.0356 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624 (71)
Water heating gains (Table 5)	83.5855	81.4161	76.9081	70.7873	66.8108	61.2189	56.4757	62.5636	64.7343	71.0678	78.2210	81.4302 (72)
Total internal gains	568.2155	563.6624	541.8831	508.2312	473.8407	443.1014	425.2156	433.6872	453.1293	486.9939	524.5610	552.9176 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	5.7400	12.9326	0.7600	0.7000	0.7700	27.3679 (75)
Southeast	3.8900	40.6744	0.7600	0.7000	0.7700	58.3331 (77)
Southwest	2.7300	40.6744	0.7600	0.7000	0.7700	40.9382 (79)

Solar gains	126.6392	206.0731	298.6887	415.6485	487.2578	533.3961	504.7077	442.1876	360.5241	245.3201	157.1238	106.2532 (83)
Total gains	694.8548	769.7355	840.5718	923.8796	961.0986	976.4976	929.9233	875.8748	813.6534	732.3140	681.6848	659.1708 (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	52.4657	52.9513	52.7103	53.6520	53.6520	54.7368	54.7368	54.3161	54.5287	53.8776	53.8776	53.1887
alpha	4.4977	4.5301	4.5140	4.5768	4.5768	4.6491	4.6491	4.6211	4.6352	4.5918	4.5918	4.5459
util living area	0.9991	0.9984	0.9962	0.9876	0.9558	0.8246	0.6058	0.6550	0.9243	0.9905	0.9981	0.9993 (86)
MIT	19.4814	19.6024	19.8664	20.2342	20.5934	20.8896	20.9820	20.9739	20.7719	20.3223	19.8572	19.4690 (87)
Th 2	19.0905	19.1037	19.0972	19.1225	19.1225	19.1509	19.1509	19.1400	19.1455	19.1285	19.1285	19.1101 (88)
util rest of house	0.9985	0.9973	0.9931	0.9754	0.9013	0.6192	0.2683	0.3056	0.7990	0.9782	0.9965	0.9988 (89)
MIT 2	17.8017	17.9325	18.1905	18.5720	18.9055	19.1297	19.1507	19.1395	19.0702	18.6661	18.2060	17.8043 (90)
Living area fraction										fLA = Living area / (4) =		0.4037 (91)
MIT	18.4798	18.6066	18.8671	19.2431	19.5869	19.8402	19.8900	19.8801	19.7572	19.3347	18.8726	18.4764 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4798	18.6066	18.8671	19.2431	19.5869	19.8402	19.8900	19.8801	19.7572	19.3347	18.8726	18.4764 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9982	0.9969	0.9925	0.9765	0.9196	0.7110	0.4116	0.4567	0.8546	0.9802	0.9961	0.9986 (94)
Useful gains	693.5895	767.3464	834.2637	902.1505	883.8311	694.3307	382.7534	400.0322	695.3258	717.8098	679.0513	658.2434 (95)
Ext temp.	4.8000	5.3000	7.2000	9.7000	12.7000	15.7000	17.8000	17.7000	15.0000	11.4000	7.7000	4.7000 (96)
Heat loss rate W	2639.9785	2544.4062	2241.1020	1800.9303	1299.6752	765.8309	386.5970	406.3825	883.3209	1491.1334	2099.6184	2622.4643 (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	1448.1134	1194.1842	1046.6877	647.1214	309.3880	0.0000	0.0000	0.0000	0.0000	575.3527	1022.8083	1461.3803 (98)
Space heating												7705.0361 (98)
RHI space heating demand												7705 (98)

SAP 2012 WORKSHEET FOR Conversion - new dwelling (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	81.0000 (1b)	x 2.4000 (2b)	= 194.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	194.4000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					2 * 10 = 20.0000 (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) =					20.0000 / (5) = 0.1029 (8)
Pressure test					No
Measured/design q50					15.0000
Infiltration rate					0.8529 (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) =	0.7249 (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	0.9243	0.9062	0.8881	0.7974	0.7793	0.6887	0.6887	0.6706	0.7249	0.7793	0.8156	0.8518 (22b)
Effective ac	0.9272	0.9106	0.8943	0.8180	0.8037	0.7372	0.7372	0.7248	0.7628	0.8037	0.8326	0.8628 (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
Windows (Uw = 2.80)			12.3600	2.5180	31.1223		(27)
Heat Loss Floor			81.0000	0.5700	46.1700		(28a)
External Wall	79.2000	12.3600	66.8400	1.2300	82.2132		(29a)
Total net area of external elements Aum(A, m ²)			160.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	159.5055		(33)
Stairwell			14.4000	0.0000	0.0000		(32)
Party Ceilings			81.0000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							450.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)							24.0300 (36)
Total fabric heat loss						(33) + (36) =	183.5355 (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	59.4801	58.4159	57.3729	52.4736	51.5570	47.2899	47.2899	46.4997	48.9336	51.5570	53.4113	55.3500 (38)
Average = Sum(39)m / 12 =	243.0156	241.9514	240.9084	236.0091	235.0925	230.8254	230.8254	230.0352	232.4691	235.0925	236.9468	238.8855 (39)
												236.0048 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	3.0002	2.9871	2.9742	2.9137	2.9024	2.8497	2.8497	2.8399	2.8700	2.9024	2.9253	2.9492 (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												2.4816 (42)
Average daily hot water use (litres/day)												93.1371 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	102.4508	98.7253	94.9998	91.2743	87.5489	83.8234	83.8234	87.5489	91.2743	94.9998	98.7253	102.4508 (44)
Energy content (annual)	151.9316	132.8803	137.1206	119.5450	114.7063	98.9828	91.7221	105.2525	106.5095	124.1266	135.4939	147.1376 (45)
Distribution loss (46)m = 0.15 x (45)m	22.7897	19.9320	20.5681	17.9318	17.2059	14.8474	13.7583	15.7879	15.9764	18.6190	20.3241	22.0706 (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	46.6816	42.1157	46.5083	44.8724	46.2695	44.6633	46.0812	46.2033	44.7772	46.4095	45.0696	46.6433 (61)
Total heat required for water heating calculated for each month	198.6132	174.9960	183.6288	164.4175	160.9759	143.6461	137.8034	151.4558	151.2868	170.5361	180.5635	193.7809 (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	198.6132	174.9960	183.6288	164.4175	160.9759	143.6461	137.8034	151.4558	151.2868	170.5361	180.5635	193.7809 (64)
Heat gains from water heating, kWh/month												2011.7039 (64)
Total per year (kWh/year) = Sum(64)m =												

62.1876 54.7116 57.2197 50.9668 49.7072 44.0776 42.0179 46.5473 46.6087 52.8745 56.3191 60.5841 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.0042	46.1897	37.5640	28.4384	21.2580	17.9469	19.3923	25.2068	33.8325	42.9581	50.1385	53.4496 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	330.6236	334.0545	325.4088	307.0034	283.7698	261.9335	247.3455	243.9147	252.5603	270.9657	294.1993	316.0356 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624 (71)
Water heating gains (Table 5)	83.5855	81.4161	76.9081	70.7873	66.8108	61.2189	56.4757	62.5636	64.7343	71.0678	78.2210	81.4302 (72)
Total internal gains	568.2155	563.6624	541.8831	508.2312	473.8407	443.1014	425.2156	433.6872	453.1293	486.9939	524.5610	552.9176 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W			
Northeast				5.7400	11.2829	0.7600	0.7000	0.7700	23.8770	(75)			
Southeast				3.8900	36.7938	0.7600	0.7000	0.7700	52.7679	(77)			
Southwest				2.7300	36.7938	0.7600	0.7000	0.7700	37.0325	(79)			
Solar gains	113.6773	201.5654	296.8567	403.1297	483.7682	494.4464	470.7994	408.4722	333.3180	228.4527	137.6035	96.3495	(83)
Total gains	681.8928	765.2278	838.7398	911.3609	957.6089	937.5478	896.0150	842.1594	786.4473	715.4465	662.1645	649.2671	(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	41.6640	41.8472	42.0284	42.9009	43.0682	43.8643	43.8643	44.0150	43.5542	43.0682	42.7311	42.3843
alpha	3.7776	3.7898	3.8019	3.8601	3.8712	3.9243	3.9243	3.9343	3.9036	3.8712	3.8487	3.8256
util living area	0.9990	0.9983	0.9966	0.9917	0.9766	0.9313	0.8436	0.8770	0.9675	0.9939	0.9983	0.9992 (86)
MIT	19.0118	19.1542	19.4318	19.8416	20.2567	20.6393	20.8449	20.8090	20.4975	19.9699	19.4394	19.0098 (87)
Th 2	18.7499	18.7565	18.7630	18.7938	18.7996	18.8270	18.8270	18.8322	18.8164	18.7996	18.7878	18.7756 (88)
util rest of house	0.9983	0.9971	0.9940	0.9837	0.9468	0.8125	0.5442	0.6129	0.9039	0.9863	0.9969	0.9987 (89)
MIT 2	17.0833	17.2301	17.5115	17.9400	18.3467	18.6993	18.8112	18.8063	18.5867	18.0736	17.5374	17.0996 (90)
Living area fraction									fLA = Living area / (4) =			0.4037 (91)
MIT	17.8619	18.0068	18.2868	18.7077	19.1178	19.4825	19.6322	19.6148	19.3581	18.8392	18.3052	17.8707 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8619	18.0068	18.2868	18.7077	19.1178	19.4825	19.6322	19.6148	19.3581	18.8392	18.3052	17.8707 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9979	0.9965	0.9932	0.9832	0.9532	0.8630	0.6890	0.7425	0.9280	0.9866	0.9964	0.9983 (94)
Useful gains	680.4851	762.5710	832.9951	896.0679	912.7804	809.1194	617.3349	625.3408	729.7841	705.8239	659.7893	648.1895 (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	3295.7429	3171.2196	2839.5310	2314.7068	1743.8577	1127.0041	699.9160	739.5136	1222.3431	1936.9629	2655.0398	3265.7403 (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	1945.7518	1618.6119	1492.8628	1021.4200	618.3215	0.0000	0.0000	0.0000	0.0000	915.9674	1436.5804	1947.4578 (98)
Space heating												10996.9735 (98)
Space heating per m2										(98) / (4) =		135.7651 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.9000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												12232.4510 (211)
Space heating requirement	1945.7518	1618.6119	1492.8628	1021.4200	618.3215	0.0000	0.0000	0.0000	0.0000	915.9674	1436.5804	1947.4578 (98)
Space heating efficiency (main heating system 1)	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000 (210)
Space heating fuel (main heating system)	2164.3512	1800.4582	1660.5815	1136.1736	687.7881	0.0000	0.0000	0.0000	0.0000	1018.8736	1597.9759	2166.2489 (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	198.6132	174.9960	183.6288	164.4175	160.9759	143.6461	137.8034	151.4558	151.2868	170.5361	180.5635	193.7809 (64)
Efficiency of water heater	89.6527	89.6395	89.6077	89.5303	89.3503	87.3000	87.3000	87.3000	87.3000	89.4817	89.6020	87.3000 (216)
(217)m												89.6583 (217)
Fuel for water heating, kWh/month	221.5362	195.2219	204.9253	183.6445	180.1626	164.5431	157.8504	173.4889	173.2953	190.5821	201.5172	216.1325 (219)
Water heating fuel used												2262.8999 (219)
Annual totals kWh/year												
Space heating fuel - main system												12232.4510 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												45.0000 (231)
Electricity for lighting (calculated in Appendix L)												367.3644 (232)
Total delivered energy for all uses												14907.7154 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kwh/year	Fuel price p/kwh	Fuel cost £/year
Space heating - main system 1	12232.4510	3.4800	425.6893 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2262.8999	3.4800	78.7489 (247)
Pumps and fans for heating	45.0000	13.1900	5.9355 (249)
Energy for lighting	367.3644	13.1900	48.4554 (250)
Additional standing charges			120.0000 (251)
Total energy cost			678.8291 (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] =	2.2628 (257)
SAP value		68.4344
SAP rating (Section 12)		68 (258)
SAP band		D

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	12232.4510	0.2160	2642.2094 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2262.8999	0.2160	488.7864 (264)
Space and water heating			3130.9958 (265)
Pumps and fans	45.0000	0.5190	23.3550 (267)
Energy for lighting	367.3644	0.5190	190.6621 (268)
Total kg/year			3345.0129 (272)
CO2 emissions per m2			41.3000 (273)
EI value			64.4261
EI rating			64 (274)
EI band			D

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.8990 = 3.871$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.8990 = 0.2403$, stars = 4
Water heating energy efficiency	$3.48 / 0.8881 = 3.918$, stars = 4
Water heating environmental impact	$0.216 / 0.8881 = 0.2432$, stars = 4

SAP 2012 WORKSHEET FOR Conversion - new dwelling (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		81.0000 (1b)	x 2.4000 (2b)	= 194.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.0000			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 194.4000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 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					2 * 10 = 20.0000 (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) =					20.0000 / (5) = 0.1029 (8)
Pressure test					No
Measured/design q50					15.0000
Infiltration rate					0.8529 (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) =	0.7249 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.1000	4.2000	3.8000	3.8000	3.3000	3.3000	3.5000	3.4000	3.7000	3.7000	4.0000 (22)
Wind factor	1.0750	1.0250	1.0500	0.9500	0.9500	0.8250	0.8250	0.8750	0.8500	0.9250	0.9250	1.0000 (22a)
Adj infilt rate	0.7793	0.7431	0.7612	0.6887	0.6887	0.5981	0.5981	0.6343	0.6162	0.6706	0.6706	0.7249 (22b)
Effective ac	0.8037	0.7761	0.7897	0.7372	0.7372	0.6789	0.6789	0.7012	0.6899	0.7248	0.7248	0.7628 (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
Windows (Uw = 2.80)			12.3600	2.5180	31.1223		(27)
Heat Loss Floor			81.0000	0.5700	46.1700		(28a)
External Wall	79.2000	12.3600	66.8400	1.2300	82.2132		(29a)
Total net area of external elements Aum(A, m ²)			160.2000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	159.5055		(33)
Stairwell			14.4000	0.0000	0.0000		(32)
Party Ceilings			81.0000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							450.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)							24.0300 (36)
Total fabric heat loss						(33) + (36) =	183.5355 (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
	51.5570	49.7870	50.6615	47.2899	47.2899	43.5497	43.5497	44.9826	44.2556	46.4997	46.4997	48.9336 (38)
Heat transfer coeff	235.0925	233.3225	234.1970	230.8254	230.8254	227.0852	227.0852	228.5181	227.7911	230.0352	230.0352	232.4691 (39)
Average = Sum(39)m / 12 =												230.6068 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.9024	2.8805	2.8913	2.8497	2.8497	2.8035	2.8035	2.8212	2.8122	2.8399	2.8399	2.8700 (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												2.4816 (42)
Average daily hot water use (litres/day)												93.1371 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.4508	98.7253	94.9998	91.2743	87.5489	83.8234	83.8234	87.5489	91.2743	94.9998	98.7253	102.4508 (44)
Energy conte	151.9316	132.8803	137.1206	119.5450	114.7063	98.9828	91.7221	105.2525	106.5095	124.1266	135.4939	147.1376 (45)
Energy content (annual)												Total = Sum(45)m = 1465.4089 (45)
Distribution loss (46)m = 0.15 x (45)m	22.7897	19.9320	20.5681	17.9318	17.2059	14.8474	13.7583	15.7879	15.9764	18.6190	20.3241	22.0706 (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	46.6816	42.1157	46.5083	44.8724	46.2695	44.6633	46.0812	46.2033	44.7772	46.4095	45.0696	46.6433 (61)
Total heat required for water heating calculated for each month	198.6132	174.9960	183.6288	164.4175	160.9759	143.6461	137.8034	151.4558	151.2868	170.5361	180.5635	193.7809 (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	198.6132	174.9960	183.6288	164.4175	160.9759	143.6461	137.8034	151.4558	151.2868	170.5361	180.5635	193.7809 (64)
Heat gains from water heating, kWh/month												Total per year (kWh/year) = Sum(64)m = 2011.7039 (64)

62.1876 54.7116 57.2197 50.9668 49.7072 44.0776 42.0179 46.5473 46.6087 52.8745 56.3191 60.5841 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937	148.8937 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.0042	46.1897	37.5640	28.4384	21.2580	17.9469	19.3923	25.2068	33.8325	42.9581	50.1385	53.4496 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	330.6236	334.0545	325.4088	307.0034	283.7698	261.9335	247.3455	243.9147	252.5603	270.9657	294.1993	316.0356 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709	52.3709 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624	-99.2624 (71)
Water heating gains (Table 5)	83.5855	81.4161	76.9081	70.7873	66.8108	61.2189	56.4757	62.5636	64.7343	71.0678	78.2210	81.4302 (72)
Total internal gains	568.2155	563.6624	541.8831	508.2312	473.8407	443.1014	425.2156	433.6872	453.1293	486.9939	524.5610	552.9176 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d		Gains W
Northeast				5.7400	12.9326		0.7600		0.7000	0.7700		27.3679 (75)
Southeast				3.8900	40.6744		0.7600		0.7000	0.7700		58.3331 (77)
Southwest				2.7300	40.6744		0.7600		0.7000	0.7700		40.9382 (79)
Solar gains	126.6392	206.0731	298.6887	415.6485	487.2578	533.3961	504.7077	442.1876	360.5241	245.3201	157.1238	106.2532 (83)
Total gains	694.8548	769.7355	840.5718	923.8796	961.0986	976.4976	929.9233	875.8748	813.6534	732.3140	681.6848	659.1708 (84)

7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, n _{il,m} (see Table 9a)												
tau	43.0682	43.3949	43.2328	43.8643	43.8643	44.5868	44.5868	44.3072	44.4486	44.0150	44.0150	43.5542
alpha	3.8712	3.8930	3.8822	3.9243	3.9243	3.9725	3.9725	3.9538	3.9632	3.9343	3.9343	3.9036
util living area	0.9989	0.9982	0.9960	0.9889	0.9656	0.8728	0.6907	0.7345	0.9439	0.9913	0.9979	0.9991 (86)
MIT	19.1497	19.2767	19.5758	19.9882	20.4102	20.7894	20.9494	20.9337	20.6413	20.1141	19.5782	19.1344 (87)
Th 2	18.7996	18.8109	18.8053	18.8270	18.8270	18.8515	18.8515	18.8421	18.8468	18.8322	18.8322	18.8164 (88)
util rest of house	0.9981	0.9969	0.9927	0.9775	0.9173	0.6605	0.2559	0.2962	0.8270	0.9793	0.9960	0.9985 (89)
MIT 2	17.2563	17.3911	17.6852	18.1084	18.5090	18.8091	18.8510	18.8411	18.7250	18.2391	17.7076	17.2531 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.4037 (91)
MIT	18.0207	18.1523	18.4485	18.8673	19.2765	19.6085	19.6981	19.6859	19.4986	18.9960	18.4628	18.0126 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0207	18.1523	18.4485	18.8673	19.2765	19.6085	19.6981	19.6859	19.4986	18.9960	18.4628	18.0126 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9976	0.9963	0.9919	0.9778	0.9318	0.7591	0.4515	0.4988	0.8789	0.9808	0.9955	0.9981 (94)
Useful gains	693.2191	766.8588	833.7584	903.3945	895.5453	741.2297	419.8884	436.9192	715.1006	718.2260	678.5894	657.9308 (95)
Ext temp.	4.8000	5.3000	7.2000	9.7000	12.7000	15.7000	17.8000	17.7000	15.0000	11.4000	7.7000	4.7000 (96)
Heat loss rate W	3108.0844	2998.7253	2634.3530	2116.0448	1518.0330	887.5668	431.0345	453.8157	1024.7375	1747.3574	2475.8168	3094.7646 (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	1796.6598	1499.8143	1339.6424	873.1082	463.1308	0.0000	0.0000	0.0000	0.0000	765.6738	1294.0037	1813.0043 (98)
Space heating												9845.0374 (98)
Space heating per m2										(98) / (4) =		121.5437 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.9000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												10951.0983 (211)
Space heating requirement	1796.6598	1499.8143	1339.6424	873.1082	463.1308	0.0000	0.0000	0.0000	0.0000	765.6738	1294.0037	1813.0043 (98)
Space heating efficiency (main heating system 1)	89.9000	89.9000	89.9000	89.9000	89.9000	0.0000	0.0000	0.0000	0.0000	89.9000	89.9000	89.9000 (210)
Space heating fuel (main heating system)	1998.5092	1668.3140	1490.1473	971.1993	515.1622	0.0000	0.0000	0.0000	0.0000	851.6950	1439.3812	2016.6900 (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	198.6132	174.9960	183.6288	164.4175	160.9759	143.6461	137.8034	151.4558	151.2868	170.5361	180.5635	193.7809 (64)
Efficiency of water heater	89.6343	89.6211	89.5784	89.4777	89.2147	87.3000	87.3000	87.3000	87.3000	89.4149	89.5733	87.3000 (216)
(217)m	89.6343	89.6211	89.5784	89.4777	89.2147	87.3000	87.3000	87.3000	87.3000	89.4149	89.5733	89.6422 (217)
Fuel for water heating, kwh/month	221.5817	195.2620	204.9923	183.7524	180.4365	164.5431	157.8504	173.4889	173.2953	190.7245	201.5818	216.1715 (219)
Water heating fuel used												2263.6804 (219)
Annual totals kwh/year												
Space heating fuel - main system												10951.0983 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
main heating flue fan												45.0000 (230e)
Total electricity for the above, kwh/year												45.0000 (231)
Electricity for lighting (calculated in Appendix L)												367.3644 (232)
Total delivered energy for all uses												13627.1431 (238)

10a. Fuel costs - using BEDF prices (393)

	Fuel kwh/year	Fuel price p/kwh	Fuel cost £/year
Space heating - main system 1	10951.0983	4.3200	473.0874 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2263.6804	4.3200	97.7910 (247)
Pumps and fans for heating	45.0000	15.3200	6.8940 (249)
Energy for lighting	367.3644	15.3200	56.2802 (250)
Additional standing charges			95.0000 (251)
Total energy cost			729.0527 (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	10951.0983	0.2160	2365.4372 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2263.6804	0.2160	488.9550 (264)
Space and water heating			2854.3922 (265)
Pumps and fans	45.0000	0.5190	23.3550 (267)
Energy for lighting	367.3644	0.5190	190.6621 (268)
Total kg/year			3068.4093 (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	10951.0983	1.2200	13360.3399 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2263.6804	1.2200	2761.6900 (264)
Space and water heating			16122.0300 (265)
Pumps and fans	45.0000	3.0700	138.1500 (267)
Energy for lighting	367.3644	3.0700	1127.8087 (268)
Primary energy kwh/year			17387.9887 (272)
Primary energy kwh/m2/year			214.6665 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: D 68
Current environmental impact rating: D 64

(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	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
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
Q3 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: D 68
Potential environmental impact rating: D 64

Fuel prices for cost data on this page from database revision number 393 TEST (20 Apr 2016)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£63	£63	£0
Mains gas	£666	£666	£0
Space heating	£575	£575	£0
Water heating	£98	£98	£0
Lighting	£56	£56	£0
Total cost of fuels	£729	£729	£0
Total cost of uses	£729	£729	£0
Delivered energy	168 kWh/m²	168 kWh/m²	0 kWh/m²
Carbon dioxide emissions	3.1 tonnes	3.1 tonnes	0.0 tonnes
CO2 emissions per m²	38 kg/m²	38 kg/m²	0 kg/m²
Primary energy	215 kWh/m²	215 kWh/m²	0 kWh/m²

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

No improvements selected / applicable

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

No improvements selected / applicable