

Energy Performance Certificate



3 Tafel Court, Ware Road, HERTFORD, SG13 7HJ

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

Reference number: 0341-3843-7250-9796-2411
Type of assessment: SAP, new dwelling
Total floor area: 62 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:

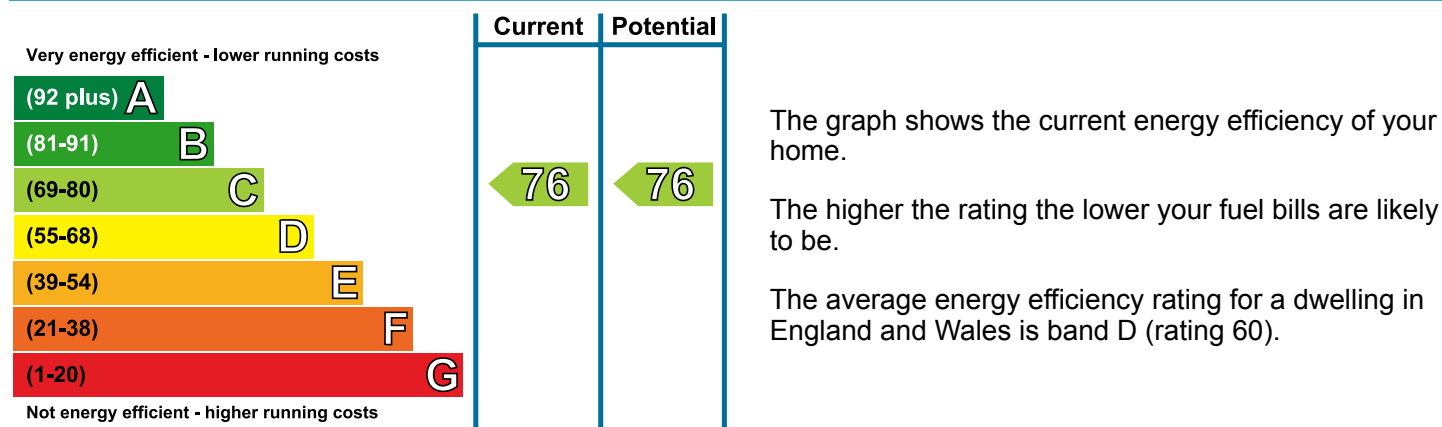
£ 1,377

Estimated energy costs of this home

	Current costs	Potential costs	Potential future savings
Lighting	£ 132 over 3 years	£ 132 over 3 years	Not applicable
Heating	£ 975 over 3 years	£ 975 over 3 years	
Hot Water	£ 270 over 3 years	£ 270 over 3 years	
Totals	£ 1,377	£ 1,377	

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 0.87 W/m ² K	★ ★ ★ ☆ ☆
Roof	Average thermal transmittance 0.14 W/m ² K	★ ★ ★ ★ ★
Floor	(other premises below)	—
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: 158 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

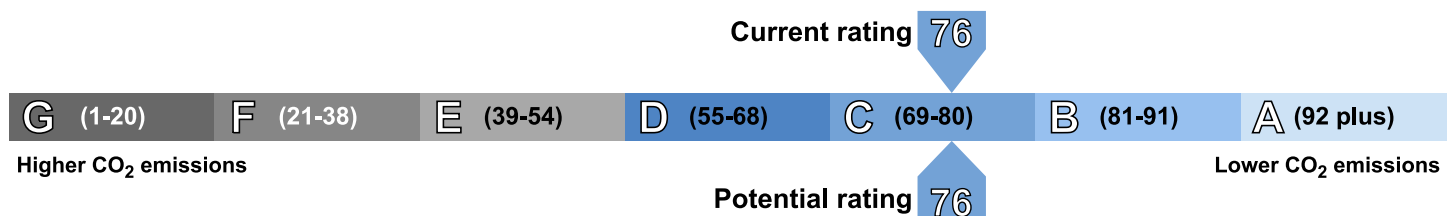
Further information about Energy Performance Certificates can be found under Frequently Asked Questions at www.epcregister.com.

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 1.7 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)	4,638
Water heating (kWh per year)	1,846

Summary Information

Property Reference: A998-0001-16-56-7

Issued on Date: 17.May.2016

Survey Reference: 16-56-7

Prop Type Ref: Conversion

Property: 3 Tafel Court, Ware Road, HERTFORD, SG13 7HJ

SAP Rating: 76 C **CO2 Emissions (t/year):** 1.74 **DER:** N/A **TER:** N/A **Percentage DER<TER:** N/A

Environmental: 76 C **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, Mid-Terrace
2.0 Number of Storeys	2
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:	13.60	40.80	2.40
1st Storey:	12.50	21.44	2.50

7.0 Living Area 18.88

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		32.64	26.76
Stud wall to Loft	Other	0.27		14.00	14.00
Dormer Cheeks	Timber framed wall (one layer of plasterboard)	0.22		7.70	2.03

9.1 Party walls	Construction	Kappa	Area
Description			
Stairwell	Other		7.20
Party Wall	Other		42.40

10.0 External Roofs	Construction	U-Value	Kappa	Gross Area	Nett Area
Description					
External Roof	Plasterboard, insulated slope	0.12		31.00	31.00
Dormer Roof	Plasterboard, insulated flat roof	0.21		2.52	2.52
Ceiling	Plasterboard, insulated at ceiling level	0.15		19.36	19.36

11.1 Party Floors	Construction	Kappa	Area
Description			
Party Floor	Other		40.80

12.0 Opening Types	Data Source	Type	Glazing	Glazing Gap	Argon Filled	Solar Trans	Frame Type	Frame Factor	U value
Description									
Windows	SAP table	Window	Double glazed	12 mm	No	0.76	PVC	0.70	2.80

13.0 Openings	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width	Height	Count	Area	Curtain Closed
Name											
NE Elevation	Window	[3] Dormer Cheeks	North East	None	0.00					3.24	

SW Elevation	Window	[3] Dormer Cheeks	South West	None	0.00	2.43
NE Elevation	Window	[1] External Wall	North East	None	0.00	4.12
SW Elevation	Window	[1] External Wall	South West	None	0.00	1.76
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	
-------------------------------------	--

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

33.0 Photovoltaic Unit

Apportioned KWh/Year

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: A998-0001-16-56-7

Issued on Date: 17.May.2016

Survey Reference: 16-56-7

Prop Type Ref: Conversion

Property: 3 Tafel Court, Ware Road, HERTFORD, SG13 7HJ

SAP Rating: 76 C	CO2 Emissions (t/year): 1.74	DER: N/A	TER: N/A	Percentage DER<TER: N/A
Environmental: 76 C	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 '16-56-7'
SAP2012 - 9.92 input data (DesignData) -

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SAP2012 Input Data (Flat)	18/05/2016
FullRefNo:	16-56-7
Regs Region:	England
SAP Region:	Thames Valley
Postcode:	SG13 7HJ
DwellingOrientation:	North East
Property Type:	Flat, Mid-Terrace
Storeys:	2
Date Built:	2016
Sheltered Sides:	2
Sunlight Shade:	Average or unknown
Measurements	Perimeter, Floor Area, Storey Height
1st Storey:	13.6, 40.8, 2.4
2nd Storey:	12.5, 21.44, 2.5
Living Area:	18.88 m2, fraction: 30.3%
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	26.76, 32.64, 0, Other, Cavity, 0, 1.23, Gross
Stud wall to Loft	14, 14, 0, Other, TimberFrame, 0, 0.27, Gross
Dormer Cheeks	2.03, 7.7, 9, TimberWallOneLayer, TimberFrame, 0, 0.22, Gross
Party Walls	Area, Kappa, Element, Construction, Type, ShelterFactor, UValueFinal
Stairwell	7.2, 0, Other, Solid, 0, 0
Party Wall	42.4, 0, Other, Solid, 0, 0
External Roofs	Nett Area, Gross Area, Kappa, Construction, Element, UValueFinal
External Roof	31, 31, 9, Plasterboard, insulated slope, 0.12
Dormer Roof	2.52, 2.52, 9, Plasterboard, insulated flat roof, 0.21
Ceiling	19.36, 19.36, 9, Plasterboard, insulated at ceiling level, 0.15
Heat Loss Floors	Area, Kappa, Construction, Element, Type, ShelterFactor, UValueFinal
Party Floors	Area, Kappa, Construction, Element
Party Floor	40.8, 0
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, Dormer Cheeks, North East, , None, 0, , 0, 0, 0, 3.24,
SW Elevation	Window, Dormer Cheeks, South West, , None, 0, , 0, 0, 0, 2.43,
NE Elevation	Window, External Wall, North East, , None, 0, , 0, 0, 0, 4.12,
SW Elevation	Window, External Wall, South West, , None, 0, , 0, 0, 0, 1.76,
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	40.8000 (1b)	x 2.4000 (2b)	= 97.9200 (1b) - (3b)
First floor	21.4400 (1c)	x 2.5000 (2c)	= 53.6000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.2400		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 151.5200 (5)
Dwelling volume			

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) = 0.1320 (8)
Pressure test					No
Measured/design q50					15.0000
Infiltration rate					0.8820 (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) =	0.7497 (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	0.8059	0.7684	0.7872	0.7122	0.7122	0.6185	0.6185	0.6560	0.6372	0.6935	0.6935	0.7497 (22b)
Effective ac	0.8248	0.7952	0.8098	0.7536	0.7536	0.6913	0.6913	0.7152	0.7030	0.7404	0.7404	0.7810 (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)			11.5500	2.5180	29.0827		(27)
External Wall	32.6400	5.8800	26.7600	0.6000	16.0560		(29a)
Stud wall to Loft	14.0000		14.0000	0.2700	3.7800		(29a)
Dormer Cheeks	7.7000	5.6700	2.0300	0.2200	0.4466		(29a)
External Roof	31.0000		31.0000	0.1200	3.7200		(30)
Dormer Roof	2.5200		2.5200	0.2100	0.5292		(30)
Ceiling	19.3600		19.3600	0.1500	2.9040		(30)
Total net area of external elements Aum(A, m2)			107.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.5185		(33)
Stairwell			7.2000	0.0000	0.0000		(32)
Party Wall			42.4000	0.0000	0.0000		(32)
Party Floor			40.8000				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							450.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)							16.0830 (36)
Total fabric heat loss							(33) + (36) = 72.6015 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0442 (42)
Average daily hot water use (litres/day)												82.7499 (43)
Daily hot water use	Jan 91.0249	Feb 87.7149	Mar 84.4049	Apr 81.0949	May 77.7849	Jun 74.4749	Jul 74.4749	Aug 77.7849	Sep 81.0949	Oct 84.4049	Nov 87.7149	Dec 91.0249 (44)
Energy conte	134.9873	118.0608	121.8282	106.2127	101.9137	87.9437	81.4928	93.5142	94.6310	110.2833	120.3829	130.7280 (45)
Energy content (annual)												1301.9787 (45)
Distribution loss (46)m = 0.15 x (45)m	20.2481	17.7091	18.2742	15.9319	15.2870	13.1916	12.2239	14.0271	14.1947	16.5425	18.0574	19.6092 (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	46.4491	41.8947	46.2888	44.6886	46.1003	44.5235	45.9517	46.0481	44.6134	46.2108	44.8443	46.4181 (61)
Total heat required for water heating calculated for each month	181.4365	159.9554	168.1169	150.9013	148.0140	132.4672	127.4445	139.5622	139.2445	156.4942	165.2271	177.1461 (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	0.0000 (63)
Output from w/h	181.4365	159.9554	168.1169	150.9013	148.0140	132.4672	127.4445	139.5622	139.2445	156.4942	165.2271	177.1461	0.0000 (63)
RHI water heating demand													
Heat gains from water heating, kWh/month	56.4956	49.7289	52.0801	46.4879	45.4114	40.3722	38.5843	42.6055	42.6182	48.2219	51.2384	55.0716	1846.0100 (64)
													1846 (64)

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	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.4574	35.9339	29.2234	22.1240	16.5380	13.9620	15.0865	19.6100	26.3205	33.4199	39.0059	41.5818	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	266.5057	269.2712	262.3023	247.4662	228.7383	211.1367	199.3778	196.6123	203.5812	218.4173	237.1452	254.7468	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	(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)	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	(71)
Water heating gains (Table 5)	75.9349	74.0013	70.0001	64.5665	61.0368	56.0724	51.8606	57.2654	59.1919	64.8144	71.1644	74.0210	(72)
Total internal gains	473.0917	469.4001	451.7194	424.3503	396.5066	371.3648	356.5184	363.6813	379.2872	406.8452	437.5092	460.5432	(73)

6. Solar gains

[Jan]													
			Area		Solar flux		g		FF		Access		Gains
			m2		Table 6a		W/m2		Specific data		factor		W
					or Table 6b				or Table 6c		Table 6d		
Northeast			7.3600		12.9326		0.7600		0.7000		0.7700		35.0920 (75)
Southwest			4.1900		40.6744		0.7600		0.7000		0.7700		62.8318 (79)
Solar gains	97.9238	163.7120	248.0081	361.6891	437.0638	484.0754	455.7883	390.2262	305.2622	198.0048	122.3894	81.5996	(83)
Total gains	571.0155	633.1121	699.7275	786.0394	833.5704	855.4402	812.3067	753.9075	684.5494	604.8500	559.8986	542.1428	(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, nli,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	68.3411	69.2385	68.7922	70.5452	70.5452	72.5975	72.5975	71.7973	72.2011	70.9691	70.9691	69.6796	
util living area	5.5561	5.6159	5.5861	5.7030	5.7030	5.8398	5.8398	5.7865	5.8134	5.7313	5.7313	5.6453	
	0.9990	0.9980	0.9937	0.9721	0.8876	0.6422	0.4206	0.4710	0.8278	0.9818	0.9974	0.9992	(86)
MIT	19.9055	20.0247	20.2555	20.5833	20.8483	20.9838	20.9989	20.9978	20.9307	20.6032	20.2216	19.8977	(87)
Th 2	19.4497	19.4663	19.4581	19.4897	19.4897	19.5252	19.5252	19.5116	19.5185	19.4972	19.4972	19.4743	(88)
util rest of house	0.9983	0.9966	0.9890	0.9495	0.8016	0.4758	0.2276	0.2603	0.6798	0.9618	0.9953	0.9987	(89)
MIT 2	18.5065	18.6386	18.8608	19.2016	19.4201	19.5227	19.5252	19.5115	19.4998	19.2325	18.8603	18.5186	(90)
Living area fraction													0.3033 (91)
MIT	18.9309	19.0591	19.2839	19.6207	19.8533	19.9659	19.9722	19.9624	19.9339	19.6483	19.2733	18.9369	(92)
Temperature adjustment													0.0000
adjusted MIT	18.9309	19.0591	19.2839	19.6207	19.8533	19.9659	19.9722	19.9624	19.9339	19.6483	19.2733	18.9369	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9980	0.9961	0.9883	0.9521	0.8264	0.5279	0.2864	0.3248	0.7281	0.9646	0.9948	0.9985	(94)
Ext temp.	569.8473	630.6211	691.5114	748.3587	688.8672	451.6039	232.6779	244.9041	498.3881	583.4327	557.0080	541.3188	(95)
Heat loss rate W	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)
Month fracti	1608.6717	1546.0415	1366.6144	1094.0961	788.8961	457.1624	232.7903	245.1528	531.6465	904.2168	1268.7199	1589.6095	(97)
Space heating kWh	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	772.8853	615.1625	502.2766	248.9309	74.4215	0.0000	0.0000	0.0000	0.0000	238.6634	512.4326	779.9283	(98)
RHI space heating demand												3744.7010	(98)
												3745	(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	40.8000 (1b)	x 2.4000 (2b)	= 97.9200 (1b) - (3b)
First floor	21.4400 (1c)	x 2.5000 (2c)	= 53.6000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.2400		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 151.5200 (5)
Dwelling volume			

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) = 0.1320 (8)
Pressure test					No
Measured/design q50					15.0000
Infiltration rate					0.8820 (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) =	0.7497 (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	0.9559	0.9371	0.9184	0.8247	0.8059	0.7122	0.7122	0.6935	0.7497	0.8059	0.8434	0.8809 (22b)
Effective ac	0.9568	0.9391	0.9217	0.8400	0.8248	0.7536	0.7536	0.7404	0.7810	0.8248	0.8557	0.8880 (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)			11.5500	2.5180	29.0827		(27)
External Wall	32.6400	5.8800	26.7600	1.2300	32.9148		(29a)
Stud wall to Loft	14.0000		14.0000	0.2700	3.7800		(29a)
Dormer Cheeks	7.7000	5.6700	2.0300	0.2200	0.4466		(29a)
External Roof	31.0000		31.0000	0.1200	3.7200		(30)
Dormer Roof	2.5200		2.5200	0.2100	0.5292		(30)
Ceiling	19.3600		19.3600	0.1500	2.9040		(30)
Total net area of external elements Aum(A, m ²)			107.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	73.3773		(33)
Stairwell			7.2000	0.0000	0.0000		(32)
Party Wall			42.4000	0.0000	0.0000		(32)
Party Floor			40.8000				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							450.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)							16.0830 (36)
Total fabric heat loss						(33) + (36) =	89.4603 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	47.8434	46.9564	46.0869	42.0032	41.2391	37.6823	37.6823	37.0237	39.0524	41.2391	42.7848	44.4007 (38)
Heat transfer coeff	137.3037	136.4167	135.5473	131.4635	130.6995	127.1427	127.1427	126.4840	128.5127	130.6995	132.2451	133.8611 (39)
Average = Sum(39)m / 12 =												131.4599 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	2.2060	2.1918	2.1778	2.1122	2.0999	2.0428	2.0428	2.0322	2.0648	2.0999	2.1248	2.1507 (40)
HLP (average)												2.1121 (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												2.0442 (42)
Average daily hot water use (litres/day)												82.7499 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	91.0249	87.7149	84.4049	81.0949	77.7849	74.4749	74.4749	77.7849	81.0949	84.4049	87.7149	91.0249 (44)
Energy conte	134.9873	118.0608	121.8282	106.2127	101.9137	87.9437	81.4928	93.5142	94.6310	110.2833	120.3829	130.7280 (45)
Energy content (annual)										Total = Sum(45)m =		1301.9787 (45)
Distribution loss (46)m = 0.15 x (45)m	20.2481	17.7091	18.2742	15.9319	15.2870	13.1916	12.2239	14.0271	14.1947	16.5425	18.0574	19.6092 (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	46.4491	41.8947	46.2888	44.6886	46.1003	44.5235	45.9517	46.0481	44.6134	46.2108	44.8443	46.4181 (61)
Total heat required for water heating calculated for each month	181.4365	159.9554	168.1169	150.9013	148.0140	132.4672	127.4445	139.5622	139.2445	156.4942	165.2271	177.1461 (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	0.0000 (63)
Output from w/h	181.4365	159.9554	168.1169	150.9013	148.0140	132.4672	127.4445	139.5622	139.2445	156.4942	165.2271	177.1461	1846.0100 (64)
Heat gains from water heating, kWh/month	56.4956	49.7289	52.0801	46.4879	45.4114	40.3722	38.5843	42.6055	42.6182	48.2219	51.2384	55.0716	605.0716 (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	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.4574	35.9339	29.2234	22.1240	16.5380	13.9620	15.0865	19.6100	26.3205	33.4199	39.0059	41.5818	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	266.5057	269.2712	262.3023	247.4662	228.7383	211.1367	199.3778	196.6123	203.5812	218.4173	237.1452	254.7468	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	(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)	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	(71)
Water heating gains (Table 5)	75.9349	74.0013	70.0001	64.5665	61.0368	56.0724	51.8606	57.2654	59.1919	64.8144	71.1644	74.0210	(72)
Total internal gains	473.0917	469.4001	451.7194	424.3503	396.5066	371.3648	356.5184	363.6813	379.2872	406.8452	437.5092	460.5432	(73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast			7.3600	11.2829	0.7600	0.7000	0.7700	30.6158 (75)				
Southwest			4.1900	36.7938	0.7600	0.7000	0.7700	56.8374 (79)				
Solar gains	87.4531	159.1343	244.7461	348.5277	431.7054	446.7611	423.1607	358.3274	280.2476	183.1603	106.6006	73.6433 (83)
Total gains	560.5448	628.5344	696.4655	772.8780	828.2120	818.1259	779.6792	722.0087	659.5348	590.0055	544.1098	534.1865 (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, nll,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.6627	57.0311	57.3970	59.1799	59.5259	61.1911	61.1911	61.5098	60.5388	59.5259	58.8301	58.1200	
alpha	4.7775	4.8021	4.8265	4.9453	4.9684	5.0794	5.0794	5.1007	5.0359	4.9684	4.9220	4.8747	
util living area	0.9991	0.9982	0.9957	0.9853	0.9473	0.8332	0.6742	0.7348	0.9307	0.9910	0.9982	0.9993	(86)
MIT	19.5670	19.7008	19.9452	20.3079	20.6398	20.8890	20.9716	20.9568	20.7711	20.3526	19.9203	19.5739	(87)
Th 2	19.1995	19.2085	19.2174	19.2596	19.2675	19.3050	19.3050	19.3120	19.2905	19.2675	19.2515	19.2347	(88)
util rest of house	0.9985	0.9971	0.9925	0.9728	0.8969	0.6841	0.4372	0.5019	0.8390	0.9809	0.9968	0.9989	(89)
MIT 2	17.9707	18.1111	18.3611	18.7504	19.0618	19.2726	19.3024	19.3070	19.1951	18.8044	18.3639	18.0050	(90)
Living area fraction									fLA = Living area / (4) =			0.3033	(91)
MIT	18.4549	18.5933	18.8417	19.2228	19.5405	19.7629	19.8088	19.8074	19.6732	19.2741	18.8360	18.4809	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4549	18.5933	18.8417	19.2228	19.5405	19.7629	19.8088	19.8074	19.6732	19.2741	18.8360	18.4809	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	559.4943	626.2990	690.5098	751.5707	751.5572	598.9675	400.5794	417.9258	571.6385	578.7498	542.0750	533.4166	(94)
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	1943.5220	1868.0012	1672.8773	1357.0732	1024.7440	656.4270	407.9702	430.9865	716.2255	1133.6951	1552.0353	1911.6556	(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	1029.7167	834.4239	730.8814	435.9618	203.2510	0.0000	0.0000	0.0000	0.0000	412.8793	727.1714	1025.4098	(98)
Space heating												5399.6953	(98)
Space heating per m2												86.7560	(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													6006.3351 (211)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1029.7167	834.4239	730.8814	435.9618	203.2510	0.0000	0.0000	0.0000	0.0000	0.0000	412.8793	727.1714	1025.4098	(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)													

1145.4023	928.1690	812.9938	484.9408	226.0857	0.0000	0.0000	0.0000	0.0000	459.2651	808.8670	1140.6115 (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 (215)
Water heating requirement	181.4365	159.9554	168.1169	150.9013	148.0140	132.4672	127.4445	139.5622	139.2445	156.4942	177.1461 (64)
Efficiency of water heater (217)m	89.5007	89.4714	89.4021	89.2168	88.7858	87.3000	87.3000	87.3000	87.3000	89.1701	87.3000 (216)
Fuel for water heating, kWh/month	202.7207	178.7784	188.0459	169.1401	166.7091	151.7379	145.9845	159.8651	159.5011	175.5008	197.9125 (219)
Water heating fuel used											2080.6995 (219)
Annual totals kWh/year											
Space heating fuel - main system											6006.3351 (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)											285.7961 (232)
Total delivered energy for all uses											8417.8307 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6006.3351	3.4800	209.0205 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2080.6995	3.4800	72.4083 (247)
Pumps and fans for heating	45.0000	13.1900	5.9355 (249)
Energy for lighting	285.7961	13.1900	37.6965 (250)
Additional standing charges			120.0000 (251)
Total energy cost			445.0608 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.7431 (257)
SAP value		75.6843
SAP rating (Section 12)		76 (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	6006.3351	0.2160	1297.3684 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2080.6995	0.2160	449.4311 (264)
Space and water heating			1746.7995 (265)
Pumps and fans	45.0000	0.5190	23.3550 (267)
Energy for lighting	285.7961	0.5190	148.3282 (268)
Total kg/year			1918.4827 (272)
CO2 emissions per m2			30.8200 (273)
EI value			76.0279
EI rating			76 (274)
EI band			C

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	$3.48 / 0.8864 = 3.926$, stars = 4
Water heating environmental impact	$0.216 / 0.8864 = 0.2437$, 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	40.8000 (1b)	x 2.4000 (2b)	= 97.9200 (1b) - (3b)
First floor	21.4400 (1c)	x 2.5000 (2c)	= 53.6000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.2400		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 151.5200 (5)
Dwelling volume			

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					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) = 0.1320 (8)
Pressure test					No
Measured/design q50					15.0000
Infiltration rate					0.8820 (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) =	0.7497 (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	0.8059	0.7684	0.7872	0.7122	0.7122	0.6185	0.6185	0.6560	0.6372	0.6935	0.6935	0.7497 (22b)
Effective ac	0.8248	0.7952	0.8098	0.7536	0.7536	0.6913	0.6913	0.7152	0.7030	0.7404	0.7404	0.7810 (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)			11.5500	2.5180	29.0827		(27)
External Wall	32.6400	5.8800	26.7600	1.2300	32.9148		(29a)
Stud wall to Loft	14.0000		14.0000	0.2700	3.7800		(29a)
Dormer Cheeks	7.7000	5.6700	2.0300	0.2200	0.4466		(29a)
External Roof	31.0000		31.0000	0.1200	3.7200		(30)
Dormer Roof	2.5200		2.5200	0.2100	0.5292		(30)
Ceiling	19.3600		19.3600	0.1500	2.9040		(30)
Total net area of external elements Aum(A, m ²)			107.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	73.3773		(33)
Stairwell			7.2000	0.0000	0.0000		(32)
Party Wall			42.4000	0.0000	0.0000		(32)
Party Floor			40.8000				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							450.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)							16.0830 (36)
Total fabric heat loss						(33) + (36) =	89.4603 (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	41.2391	39.7637	40.4927	37.6823	37.6823	34.5646	34.5646	35.7590	35.1531	37.0237	37.0237	39.0524 (38)
Heat transfer coeff	130.6995	129.2241	129.9530	127.1427	127.1427	124.0250	124.0250	125.2194	124.6134	126.4840	126.4840	128.5127 (39)
Average = Sum(39)m / 12 =												126.9604 (39)
HLP	2.0999	2.0762	2.0879	2.0428	2.0428	1.9927	1.9927	2.0119	2.0021	2.0322	2.0322	2.0648 (40)
HLP (average)												2.0399 (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												2.0442 (42)
Average daily hot water use (litres/day)												82.7499 (43)
Daily hot water use	91.0249	87.7149	84.4049	81.0949	77.7849	74.4749	74.4749	77.7849	81.0949	84.4049	87.7149	91.0249 (44)
Energy conte	134.9873	118.0608	121.8282	106.2127	101.9137	87.9437	81.4928	93.5142	94.6310	110.2833	120.3829	130.7280 (45)
Energy content (annual)										Total = Sum(45)m =		1301.9787 (45)
Distribution loss (46)m = 0.15 x (45)m	20.2481	17.7091	18.2742	15.9319	15.2870	13.1916	12.2239	14.0271	14.1947	16.5425	18.0574	19.6092 (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	46.4491	41.8947	46.2888	44.6886	46.1003	44.5235	45.9517	46.0481	44.6134	46.2108	44.8443	46.4181 (61)
Total heat required for water heating calculated for each month	181.4365	159.9554	168.1169	150.9013	148.0140	132.4672	127.4445	139.5622	139.2445	156.4942	165.2271	177.1461 (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	0.0000 (63)
Output from w/h	181.4365	159.9554	168.1169	150.9013	148.0140	132.4672	127.4445	139.5622	139.2445	156.4942	165.2271	177.1461	0.0000 (63)
Heat gains from water heating, kWh/month	56.4956	49.7289	52.0801	46.4879	45.4114	40.3722	38.5843	42.6055	42.6182	48.2219	51.2384	55.0716	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													177.1461 (64)
Total per year (kWh/year) = Sum(64)m =													1846.0100 (64)

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	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	122.6525	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.4574	35.9339	29.2234	22.1240	16.5380	13.9620	15.0865	19.6100	26.3205	33.4199	39.0059	41.5818	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	266.5057	269.2712	262.3023	247.4662	228.7383	211.1367	199.3778	196.6123	203.5812	218.4173	237.1452	254.7468	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	49.3095	(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)	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	-81.7683	(71)
Water heating gains (Table 5)	75.9349	74.0013	70.0001	64.5665	61.0368	56.0724	51.8606	57.2654	59.1919	64.8144	71.1644	74.0210	(72)
Total internal gains	473.0917	469.4001	451.7194	424.3503	396.5066	371.3648	356.5184	363.6813	379.2872	406.8452	437.5092	460.5432	(73)

6. Solar gains

[Jan]		Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast		7.3600		12.9326		0.7600		0.7000		0.7700		35.0920 (75)	
Southwest		4.1900		40.6744		0.7600		0.7000		0.7700		62.8318 (79)	
Solar gains		97.9238	163.7120	248.0081	361.6891	437.0638	484.0754	455.7883	390.2262	305.2622	198.0048	122.3894	81.5996 (83)
Total gains		571.0155	633.1121	699.7275	786.0394	833.5704	855.4402	812.3067	753.9075	684.5494	604.8500	559.8986	542.1428 (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, n _{li} ,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.5259	60.2055	59.8678	61.1911	61.1911	62.7293	62.7293	62.1310	62.4331	61.5098	61.5098	60.5388
alpha	4.9684	5.0137	4.9912	5.0794	5.0794	5.1820	5.1820	5.1421	5.1622	5.1007	5.1007	5.0359
util living area	0.9989	0.9980	0.9944	0.9783	0.9167	0.7119	0.4824	0.5366	0.8723	0.9854	0.9976	0.9992 (86)
MIT	19.7071	19.8297	20.0816	20.4387	20.7553	20.9591	20.9958	20.9927	20.8729	20.4798	20.0544	19.6974 (87)
Th 2	19.2675	19.2830	19.2754	19.3050	19.3050	19.3382	19.3382	19.3254	19.3319	19.3120	19.3120	19.2905 (88)
util rest of house	0.9982	0.9966	0.9901	0.9592	0.8386	0.5182	0.2348	0.2697	0.7249	0.9682	0.9955	0.9986 (89)
MIT 2	18.1636	18.2978	18.5420	18.9122	19.1867	19.3315	19.3381	19.3253	19.2951	18.9626	18.5450	18.1719 (90)
Living area fraction	0.9982	0.9966	0.9901	0.9592	0.8386	0.5182	0.2348	0.2697	0.7249	0.9682	0.9955	0.9986 (89)
MIT	18.6318	18.7625	19.0090	19.3752	19.6625	19.8253	19.8410	19.8311	19.7737	19.4228	19.0029	18.6346 (92)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT	18.6318	18.7625	19.0090	19.3752	19.6625	19.8253	19.8410	19.8311	19.7737	19.4228	19.0029	18.6346 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	569.7404	630.5709	692.1040	754.8154	716.5096	496.6789	252.7165	266.0228	529.6821	586.6250	557.0334	541.2212 (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	1807.8077	1739.6767	1534.6159	1230.1362	885.2288	511.6347	253.1310	266.8507	594.8721	1014.7607	1429.6332	1790.7781 (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	921.1221	745.3191	626.8289	342.2310	125.5270	0.0000	0.0000	0.0000	0.0000	318.5330	628.2719	929.6703 (98)
Space heating												4637.5032 (98)
Space heating per m ²												74.5100 (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	5158.5131 (211)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	921.1221	745.3191	626.8289	342.2310	125.5270	0.0000	0.0000	0.0000	0.0000	318.5330	628.2719	929.6703 (98)
Space heating fuel (main heating system)	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)

1024.6074	829.0535	697.2512	380.6796	139.6296	0.0000	0.0000	0.0000	0.0000	354.3192	698.8564	1034.1161	(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	(215)
Water heating requirement	181.4365	159.9554	168.1169	150.9013	148.0140	132.4672	127.4445	139.5622	139.2445	156.4942	165.2271	177.1461 (64)
Efficiency of water heater (217)m	89.4616	89.4294	89.3373	89.0881	88.4742	87.3000	87.3000	87.3000	87.3000	89.0265	89.3459	87.3000 (216)
Fuel for water heating, kWh/month	202.8094	178.8623	188.1822	169.3844	167.2962	151.7379	145.9845	159.8651	159.5011	175.7838	184.9297	89.4735 (217)
Water heating fuel used												197.9873 (219)
Annual totals kWh/year												2082.3239 (219)
Space heating fuel - main system												5158.5131 (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)												285.7961 (232)
Total delivered energy for all uses												7571.6331 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5158.5131	4.3200	222.8478 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2082.3239	4.3200	89.9564 (247)
Pumps and fans for heating	45.0000	15.3200	6.8940 (249)
Energy for lighting	285.7961	15.3200	43.7840 (250)
Additional standing charges			95.0000 (251)
Total energy cost			458.4821 (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	5158.5131	0.2160	1114.2388 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2082.3239	0.2160	449.7820 (264)
Space and water heating			1564.0208 (265)
Pumps and fans	45.0000	0.5190	23.3550 (267)
Energy for lighting	285.7961	0.5190	148.3282 (268)
Total kg/year			1735.7040 (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	5158.5131	1.2200	6293.3859 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2082.3239	1.2200	2540.4351 (264)
Space and water heating			8833.8211 (265)
Pumps and fans	45.0000	3.0700	138.1500 (267)
Energy for lighting	285.7961	3.0700	877.3941 (268)
Primary energy kWh/year			9849.3652 (272)
Primary energy kWh/m2/year			158.2482 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: C 76
Current environmental impact rating: C 76

(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
O3	Not considered

Recommended measures: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: C 76
 Potential environmental impact rating: C 76

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	£51	£51	£0
Mains gas	£408	£408	£0
Space heating	£325	£325	£0
Water heating	£90	£90	£0
Lighting	£44	£44	£0
Total cost of fuels	£459	£459	£0
Total cost of uses	£459	£459	£0
Delivered energy	122 kWh/m²	122 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.7 tonnes	1.7 tonnes	0.0 tonnes
CO2 emissions per m²	28 kg/m²	28 kg/m²	0 kg/m²
Primary energy	158 kWh/m²	158 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