Energy Performance Certificate

© Crown copyright 2009

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

Dwelling type:	Ground-floor flat	**Reference number:**	0949-3843-7159-9796-2445
Date of assessment:	17 May 2016	**Type of assessment:**	SAP, new dwelling
Date of certificate:	17 May 2016	**Total floor area:**	69 m²

Use this document to:

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

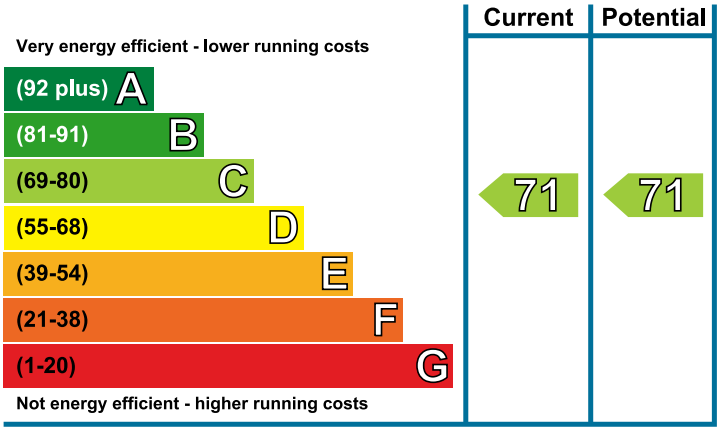
Estimated energy costs of dwelling for 3 years:	**£ 1,791**

Estimated energy costs of this home

	Current costs	Potential costs	Potential future savings
Lighting	£ 144 over 3 years	£ 144 over 3 years	Not applicable
Heating	£ 1,368 over 3 years	£ 1,368 over 3 years	
Hot Water	£ 279 over 3 years	£ 279 over 3 years	
Totals	**£ 1,791**	**£ 1,791**	

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



The graph shows the current energy efficiency of your home.

The higher the rating the lower your fuel bills are likely to be.

The average energy efficiency rating for a dwelling in England and Wales is band D (rating 60).

Summary of this home's energy performance related features

Element	Description	Energy Efficiency
Walls	Average thermal transmittance 1.23 W/m²K	—
Roof	(other premises above)	—
Floor	Average thermal transmittance 0.50 W/m²K	—
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: 199 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

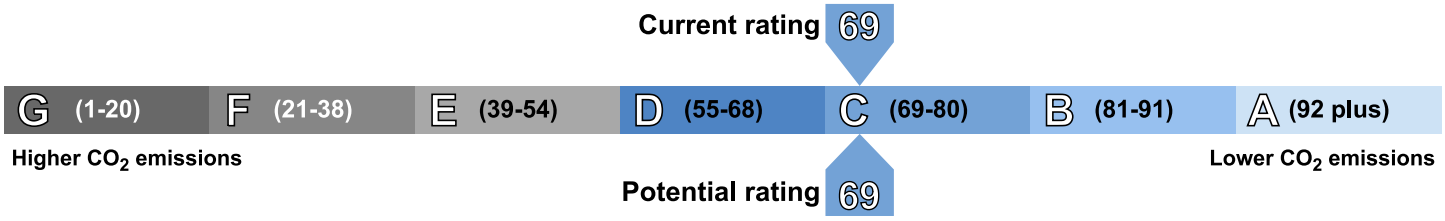
Further information about Energy Performance Certificates can be found under Frequently Asked Questions at **www.epcregister.com**.

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 2.4 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 (CO_2) 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)	7,366
Water heating (kWh per year)	1,913

Summary Information

Property Reference: A998-0001-16-56-5
Survey Reference: 16-56-5
Property: 1 Tafel Court, Ware Road, HERTFORD, SG13 7HJ

Issued on Date: 17.May.2016
Prop Type Ref: Conversion

SAP Rating: 71 C **CO2 Emissions (t/year):** 2.42 **DER:** N/A **TER:** N/A **Percentage DER<TER:** N/A
Environmental: 69 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

Orientation	North East
1.0 Property Type	Flat, Mid-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:	23.00	69.00	2.40

7.0 Living Area	27.00
8.0 Thermal Mass Parameter	Simple calculation - High

9.0 External Walls

Description	Construction	U-Value	Kappa	Gross Area	Nett Area
External Wall	Other	1.23		55.20	42.95

9.1 Party walls

Description	Construction	Kappa	Area
Stairwell	Other		28.80

10.1 Party Ceilings

Description	Construction	Kappa	Area
Party Ceilings	Other		69.00

11.0 HeatLoss Floors

Description	Construction	U-Value	Kappa	Area
Heat Loss Floor	Other	0.50		69.00

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					9.52	
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 ?	

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

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 Efficiences) %
Efficiency (Split Efficiences) %
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

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

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	HWP From main heating 1
Water use <= 125 litres/person/day	Yes
SAP Code	901
Immersion Heater	
Summer Immersion	
Suplementary 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	None
Cylinder Stat	
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

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

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

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

Full SAP Calculation Printout

Property Reference: A998-0001-16-56-5
Survey Reference: 16-56-5
Issued on Date: 17.May.2016
Prop Type Ref: Conversion
Property: 1 Tafel Court, Ware Road, HERTFORD, SG13 7HJ

SAP Rating:	71 C	**CO2 Emissions (t/year):**	2.42	**DER:** N/A	**TER:** N/A	**Percentage DER<TER:**	N/A
Environmental:	69 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 '16-56-5'
SAP2012 - 9.92 input data (DesignData) -

SAP2012 Input Data (Flat)	18/05/2016
FullRefNo:	16-56-5
Regs Region:	England
SAP Region:	Thames Valley
Postcode:	SG13 7HJ
DwellingOrientation:	North East
Property Type:	Flat, Mid-Terrace
Storeys:	1
Date Built:	2016
Sheltered Sides:	2
Sunlight Shade:	Average or unknown
Measurements	Perimeter, Floor Area, Storey Height
1st Storey:	23, 69, 2.4
Living Area:	27 m2, fraction: 39.1%
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	42.95, 55.2, 0, Other, Cavity, 0, 1.23, Calculate
Party Walls	Area, Kappa, Element, Construction, Type, ShelterFactor, UValueFinal
Stairwell	28.8, 0, Other, Solid, 0, 0
External Roofs	Nett Area, Gross Area, Kappa, Construction, Element, UValueFinal
Party Ceilings	Area, Kappa, Construction, Element
Party Ceilings	69, 0, Other
Heat Loss Floors	Area, Kappa, Construction, Element, Type, ShelterFactor, UValueFinal
Heat Loss Floor	69, 0, Other, Ground Floor - Solid, 0, 0.5
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, 9.52,
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 Efficiences
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

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

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

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

SAP 2012 WORKSHEET FOR Conversion - new dwelling (Version 9.92, January 2014)
CALCULATION OF HEAT DEMAND 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	69.0000 (1b)	x	2.4000 (2b)	=	165.6000 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	165.6000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							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) =	0.1208	(8)
Pressure test		No	
Measured/design q50		15.0000	
Infiltration rate		0.8708	(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) =	0.7402	(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	0.7957	0.7587	0.7772	0.7031	0.7031	0.6106	0.6106	0.6476	0.6291	0.6846	0.6846	0.7402	(22b)
Effective ac	0.8165	0.7878	0.8020	0.7472	0.7472	0.6864	0.6864	0.7097	0.6979	0.7344	0.7344	0.7739	(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)			12.2500	2.5180	30.8453			(27)
Heat Loss Floor			69.0000	0.5000	34.5000			(28a)
External Wall	55.2000	12.2500	42.9500	0.6000	25.7700			(29a)
Total net area of external elements Aum(A, m2)			124.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		91.1153			(33)
Stairwell			28.8000	0.0000	0.0000			(32)
Party Ceilings			69.0000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		450.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)		18.6300 (36)
Total fabric heat loss	(33) + (36) =	109.7453 (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	44.6225	43.0508	43.8273	40.8335	40.8335	37.5123	37.5123	38.7846	38.1391	40.1318	40.1318	42.2930	(38)
Heat transfer coeff	154.3678	152.7961	153.5726	150.5788	150.5788	147.2576	147.2576	148.5299	147.8844	149.8772	149.8772	152.0383	(39)
Average = Sum(39)m / 12 =												150.3847	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2372	2.2144	2.2257	2.1823	2.1823	2.1342	2.1342	2.1526	2.1433	2.1721	2.1721	2.2035	(40)
HLP (average)												2.1795	(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	2.2216 (42)
Average daily hot water use (litres/day)	86.9631 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.6594	92.1809	88.7024	85.2238	81.7453	78.2668	78.2668	81.7453	85.2238	88.7024	92.1809	95.6594	(44)
Energy conte	141.8601	124.0718	128.0310	111.6205	107.1025	92.4213	85.6420	98.2754	99.4491	115.8984	126.5121	137.3840	(45)
Energy content (annual)										Total = Sum(45)m =		1368.2681	(45)
Distribution loss (46)m = 0.15 x (45)m	21.2790	18.6108	19.2046	16.7431	16.0654	13.8632	12.8463	14.7413	14.9174	17.3848	18.9768	20.6076	(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	46.5518	41.9812	46.3747	44.7605	46.1666	44.5782	46.0024	46.1088	44.6775	46.2886	44.9325	46.5175	(61)
Total heat required for water heating calculated for each month	188.4119	166.0529	174.4056	156.3810	153.2691	136.9995	131.6443	144.3842	144.1266	162.1869	171.4446	183.9015	(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	188.4119	166.0529	174.4056	156.3810	153.2691	136.9995	131.6443	144.3842	144.1266	162.1869	171.4446	183.9015	(64)
								Total per year (kWh/year) = Sum(64)m =				1913.2083	(64)
RHI water heating demand												1913	(64)

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

Heat gains from water heating, kWh/month

58.8064	51.7492	54.1640	48.3039	47.1532	41.8746	39.9765	44.2038	44.2362	50.1083	53.2984	57.3095 (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	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

44.4777	39.5047	32.1274	24.3225	18.1813	15.3495	16.5856	21.5586	28.9359	36.7408	42.8820	45.7139	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

290.9731	293.9925	286.3837	270.1855	249.7383	230.5207	217.6822	214.6628	222.2716	238.4697	258.9170	278.1346	(68)

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

50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	(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)

-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	(71)

Water heating gains (Table 5)

79.0409	77.0077	72.8010	67.0888	63.3780	58.1592	53.7319	59.4137	61.4392	67.3499	74.0255	77.0290	(72)

Total internal gains

509.4750	505.4881	486.2954	456.5801	426.2809	399.0127	382.9831	390.6184	407.6300	437.5438	470.8078	495.8607	(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	9.5200	12.9326	0.7600	0.7000	0.7700	45.3907	(75)
Southwest	2.7300	40.6744	0.7600	0.7000	0.7700	40.9382	(79)

Solar gains	86.3289	148.8575	236.3306	360.6672	447.8723	501.0792	469.8079	394.1427	296.6002	183.1832	108.8245	71.3558	(83)
Total gains	595.8038	654.3456	722.6260	817.2473	874.1532	900.0919	852.7910	784.7612	704.2303	620.7270	579.6324	567.2165	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.8730	56.4478	56.1624	57.2790	57.2790	58.5708	58.5708	58.0691	58.3226	57.5471	57.5471	56.7291	
alpha	4.7249	4.7632	4.7442	4.8186	4.8186	4.9047	4.9047	4.8713	4.8882	4.8365	4.8365	4.7819	
util living area													
	0.9991	0.9985	0.9960	0.9846	0.9387	0.7665	0.5387	0.5993	0.9103	0.9902	0.9982	0.9993	(86)
MIT	19.5831	19.6991	19.9581	20.3294	20.6790	20.9320	20.9911	20.9851	20.8152	20.3831	19.9411	19.5739	(87)
Th 2	19.1799	19.1942	19.1871	19.2146	19.2146	19.2454	19.2454	19.2335	19.2395	19.2210	19.2210	19.2011	(88)
util rest of house													
	0.9985	0.9975	0.9928	0.9701	0.8722	0.5625	0.2494	0.2898	0.7786	0.9777	0.9966	0.9989	(89)
MIT 2	17.9717	18.0984	18.3507	18.7362	19.0512	19.2335	19.2453	19.2332	19.1805	18.7980	18.3610	17.9789	(90)
Living area fraction									fLA = Living area / (4) =			0.3913	(91)
MIT	18.6022	18.7248	18.9797	19.3596	19.6882	19.8981	19.9284	19.9188	19.8202	19.4183	18.9793	18.6031	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6022	18.7248	18.9797	19.3596	19.6882	19.8981	19.9284	19.9188	19.8202	19.4183	18.9793	18.6031	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9982	0.9970	0.9922	0.9718	0.8951	0.6486	0.3658	0.4164	0.8352	0.9798	0.9963	0.9986	(94)
Useful gains	594.7610	652.4136	717.0157	794.1814	782.4297	583.7937	311.9584	326.7439	588.1479	608.1692	577.4780	566.4469	(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													
	2130.6202	2051.2538	1809.0414	1454.5344	1052.2681	618.2068	313.4247	329.5527	712.8265	1201.7525	1690.5151	2113.7980	(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													
	1142.6792	940.0206	812.4671	475.4542	200.7597	0.0000	0.0000	0.0000	0.0000	441.6260	801.3867	1151.2292	(98)
Space heating												5965.6228	(98)
RHI space heating demand												5966	(98)

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	69.0000 (1b)	x	2.4000 (2b)	=	165.6000 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	165.6000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40	=	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20	=	0.0000	(6b)
Number of intermittent fans							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) =	0.1208	(8)
Pressure test		No	
Measured/design q50		15.0000	
Infiltration rate		0.8708	(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) =	0.7402	(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	0.9437	0.9252	0.9067	0.8142	0.7957	0.7031	0.7031	0.6846	0.7402	0.7957	0.8327	0.8697	(22b)
Effective ac	0.9453	0.9280	0.9110	0.8314	0.8165	0.7472	0.7472	0.7344	0.7739	0.8165	0.8467	0.8782	(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)			12.2500	2.5180	30.8453			(27)
Heat Loss Floor			69.0000	0.5000	34.5000			(28a)
External Wall	55.2000	12.2500	42.9500	1.2300	52.8285			(29a)
Total net area of external elements Aum(A, m2)			124.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		118.1738			(33)
Stairwell			28.8000	0.0000	0.0000			(32)
Party Ceilings			69.0000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	450.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	18.6300	(36)
Total fabric heat loss (33) + (36) =	136.8038	(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	51.6579	50.7130	49.7868	45.4365	44.6225	40.8335	40.8335	40.1318	42.2930	44.6225	46.2691	47.9905	(38)
Heat transfer coeff	188.4618	187.5168	186.5906	182.2403	181.4263	177.6373	177.6373	176.9357	179.0968	181.4263	183.0729	184.7944	(39)
Average = Sum(39)m / 12 =												182.2364	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.7313	2.7176	2.7042	2.6412	2.6294	2.5745	2.5745	2.5643	2.5956	2.6294	2.6532	2.6782	(40)
HLP (average)												2.6411	(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	2.2216 (42)
Average daily hot water use (litres/day)	86.9631 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.6594	92.1809	88.7024	85.2238	81.7453	78.2668	78.2668	81.7453	85.2238	88.7024	92.1809	95.6594	(44)
Energy conte	141.8601	124.0718	128.0310	111.6205	107.1025	92.4213	85.6420	98.2754	99.4491	115.8984	126.5121	137.3840	(45)
Energy content (annual)										Total = Sum(45)m =		1368.2681	(45)
Distribution loss (46)m = 0.15 x (45)m	21.2790	18.6108	19.2046	16.7431	16.0654	13.8632	12.8463	14.7413	14.9174	17.3848	18.9768	20.6076	(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	46.5518	41.9812	46.3747	44.7605	46.1666	44.5782	46.0024	46.1088	44.6775	46.2886	44.9325	46.5175	(61)
Total heat required for water heating calculated for each month	188.4119	166.0529	174.4056	156.3810	153.2691	136.9995	131.6443	144.3842	144.1266	162.1869	171.4446	183.9015	(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	188.4119	166.0529	174.4056	156.3810	153.2691	136.9995	131.6443	144.3842	144.1266	162.1869	171.4446	183.9015	(64)
								Total per year (kWh/year) = Sum(64)m =				1913.2083	(64)

Heat gains from water heating, kWh/month

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

58.8064 51.7492 54.1640 48.3039 47.1532 41.8746 39.9765 44.2038 44.2362 50.1083 53.2984 57.3095 (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	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	44.4777	39.5047	32.1274	24.3225	18.1813	15.3495	16.5856	21.5586	28.9359	36.7408	42.8820	45.7139	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	290.9731	293.9925	286.3837	270.1855	249.7383	230.5207	217.6822	214.6628	222.2716	238.4697	258.9170	278.1346	(68)

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

	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	(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)

	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	(71)

Water heating gains (Table 5)

	79.0409	77.0077	72.8010	67.0888	63.3780	58.1592	53.7319	59.4137	61.4392	67.3499	74.0255	77.0290	(72)

Total internal gains

	509.4750	505.4881	486.2954	456.5801	426.2809	399.0127	382.9831	390.6184	407.6300	437.5438	470.8078	495.8607	(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	9.5200	11.2829	0.7600	0.7000	0.7700	39.6008	(75)
Southwest	2.7300	36.7938	0.7600	0.7000	0.7700	37.0325	(79)

Solar gains	76.6333	143.6886	231.5398	345.4519	440.3883	460.7160	434.3947	359.9732	270.4205	168.2269	94.1844	64.0321	(83)
Total gains	586.1082	649.1767	717.8352	802.0320	866.6692	859.7287	817.3777	750.5916	678.0505	605.7707	564.9923	559.8928	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.7653	45.9959	46.2242	47.3276	47.5400	48.5540	48.5540	48.7465	48.1583	47.5400	47.1124	46.6735	
alpha	4.0510	4.0664	4.0816	4.1552	4.1693	4.2369	4.2369	4.2498	4.2106	4.1693	4.1408	4.1116	
util living area	0.9991	0.9985	0.9967	0.9904	0.9688	0.9029	0.7905	0.8408	0.9623	0.9940	0.9985	0.9993	(86)
MIT	19.1844	19.3175	19.5859	19.9915	20.3934	20.7406	20.9026	20.8683	20.5812	20.0806	19.5858	19.1871	(87)
Th 2	18.8904	18.8978	18.9052	18.9401	18.9468	18.9779	18.9779	18.9837	18.9658	18.9468	18.9334	18.9195	(88)
util rest of house	0.9985	0.9974	0.9942	0.9815	0.9322	0.7664	0.5010	0.5778	0.8942	0.9867	0.9972	0.9988	(89)
MIT 2	17.3563	17.4946	17.7675	18.1949	18.5840	18.8924	18.9686	18.9668	18.7755	18.2908	17.7888	17.3803	(90)
Living area fraction									fLA = Living area / (4) =			0.3913	(91)
MIT	18.0716	18.2079	18.4791	18.8979	19.2920	19.6156	19.7254	19.7109	19.4821	18.9912	18.4920	18.0873	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0716	18.2079	18.4791	18.8979	19.2920	19.6156	19.7254	19.7109	19.4821	18.9912	18.4920	18.0873	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9969	0.9934	0.9812	0.9409	0.8232	0.6305	0.6984	0.9197	0.9870	0.9967	0.9985	(94)
Useful gains	585.0139	647.1629	713.0957	786.9711	815.4282	707.7275	515.3427	524.1836	623.6252	597.8809	563.1440	559.0556	(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	2595.4269	2495.4582	2235.1847	1822.0240	1377.3919	890.9594	555.1829	585.8111	963.9118	1522.3769	2085.5657	2566.2941	(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	1495.7473	1242.0544	1132.4342	745.2381	418.1010	0.0000	0.0000	0.0000	0.0000	687.8250	1096.1436	1493.3855	(98)
Space heating												8310.9291	(98)
Space heating per m2											(98) / (4) =	120.4482	(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	9244.6375	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1495.7473	1242.0544	1132.4342	745.2381	418.1010	0.0000	0.0000	0.0000	0.0000	687.8250	1096.1436	1493.3855	(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)	1663.7901	1381.5956	1259.6599	828.9634	465.0734	0.0000	0.0000	0.0000	0.0000	765.1001	1219.2921	1661.1630	(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

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

	188.4119	166.0529	174.4056	156.3810	153.2691	136.9995	131.6443	144.3842	144.1266	162.1869	171.4446	183.9015 (64)
Efficiency of water heater												87.3000 (216)
(217)m	89.6015	89.5854	89.5441	89.4380	89.1875	87.3000	87.3000	87.3000	87.3000	89.3920	89.5393	89.6074 (217)
Fuel for water heating, kWh/month												
	210.2777	185.3572	194.7707	174.8485	171.8505	156.9296	150.7953	165.3886	165.0935	181.4334	191.4741	205.2302 (219)
Water heating fuel used												2153.4492 (219)
Annual totals kWh/year												
Space heating fuel - main system												9244.6375 (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)												314.1959 (232)
Total delivered energy for all uses												11757.2826 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	9244.6375	3.4800	321.7134 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2153.4492	3.4800	74.9400 (247)
Pumps and fans for heating	45.0000	13.1900	5.9355 (249)
Energy for lighting	314.1959	13.1900	41.4424 (250)
Additional standing charges			120.0000 (251)
Total energy cost			564.0314 (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] =	2.0780 (257)
SAP value		71.0118
SAP rating (Section 12)		71 (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	9244.6375	0.2160	1996.8417 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2153.4492	0.2160	465.1450 (264)
Space and water heating			2461.9867 (265)
Pumps and fans	45.0000	0.5190	23.3550 (267)
Energy for lighting	314.1959	0.5190	163.0677 (268)
Total kg/year			2648.4094 (272)
CO2 emissions per m2			38.3800 (273)
EI value			68.8696
EI rating			69 (274)
EI band			C

Calculation of stars for heating and DHW

Main heating energy efficiency	3.48 × (1 + 0.29 × 0.00) / 0.8990 = 3.871, stars = 4
Main heating environmental impact	0.216 × (1 + 0.29 × 0.00) / 0.8990 = 0.2403, stars = 4
Water heating energy efficiency	3.48 / 0.8876 = 3.921, stars = 4
Water heating environmental impact	0.216 / 0.8876 = 0.2434, stars = 4

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	69.0000 (1b)	x	2.4000 (2b)	=	165.6000 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	165.6000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							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) =	0.1208	(8)
Pressure test		No	
Measured/design q50		15.0000	
Infiltration rate		0.8708	(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) =	0.7402	(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	0.7957	0.7587	0.7772	0.7031	0.7031	0.6106	0.6106	0.6476	0.6291	0.6846	0.6846	0.7402	(22b)
Effective ac	0.8165	0.7878	0.8020	0.7472	0.7472	0.6864	0.6864	0.7097	0.6979	0.7344	0.7344	0.7739	(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)			12.2500	2.5180	30.8453			(27)
Heat Loss Floor			69.0000	0.5000	34.5000			(28a)
External Wall	55.2000	12.2500	42.9500	1.2300	52.8285			(29a)
Total net area of external elements Aum(A, m2)			124.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		118.1738			(33)
Stairwell			28.8000	0.0000	0.0000			(32)
Party Ceilings			69.0000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	450.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	18.6300	(36)
Total fabric heat loss (33) + (36) =	136.8038	(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	44.6225	43.0508	43.8273	40.8335	40.8335	37.5123	37.5123	38.7846	38.1391	40.1318	40.1318	42.2930	(38)
Heat transfer coeff	181.4263	179.8546	180.6311	177.6373	177.6373	174.3161	174.3161	175.5884	174.9429	176.9357	176.9357	179.0968	(39)

Average = Sum(39)m / 12 = 177.4432 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.6294	2.6066	2.6178	2.5745	2.5745	2.5263	2.5263	2.5448	2.5354	2.5643	2.5643	2.5956	(40)
HLP (average)												2.5716	(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	2.2216 (42)
Average daily hot water use (litres/day)	86.9631 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.6594	92.1809	88.7024	85.2238	81.7453	78.2668	78.2668	81.7453	85.2238	88.7024	92.1809	95.6594	(44)
Energy conte	141.8601	124.0718	128.0310	111.6205	107.1025	92.4213	85.6420	98.2754	99.4491	115.8984	126.5121	137.3840	(45)
Energy content (annual)										Total = Sum(45)m =		1368.2681	(45)
Distribution loss (46)m = 0.15 x (45)m	21.2790	18.6108	19.2046	16.7431	16.0654	13.8632	12.8463	14.7413	14.9174	17.3848	18.9768	20.6076	(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	46.5518	41.9812	46.3747	44.7605	46.1666	44.5782	46.0024	46.1088	44.6775	46.2886	44.9325	46.5175	(61)
Total heat required for water heating calculated for each month	188.4119	166.0529	174.4056	156.3810	153.2691	136.9995	131.6443	144.3842	144.1266	162.1869	171.4446	183.9015	(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	188.4119	166.0529	174.4056	156.3810	153.2691	136.9995	131.6443	144.3842	144.1266	162.1869	171.4446	183.9015	(64)
									Total per year (kWh/year) = Sum(64)m =			1913.2083	(64)

Heat gains from water heating, kWh/month

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

58.8064 51.7492 54.1640 48.3039 47.1532 41.8746 39.9765 44.2038 44.2362 50.1083 53.2984 57.3095 (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	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	133.2962	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	44.4777	39.5047	32.1274	24.3225	18.1813	15.3495	16.5856	21.5586	28.9359	36.7408	42.8820	45.7139	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	290.9731	293.9925	286.3837	270.1855	249.7383	230.5207	217.6822	214.6628	222.2716	238.4697	258.9170	278.1346	(68)

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

	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	50.5512	(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)

	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	-88.8642	(71)

Water heating gains (Table 5)

	79.0409	77.0077	72.8010	67.0888	63.3780	58.1592	53.7319	59.4137	61.4392	67.3499	74.0255	77.0290	(72)

Total internal gains

	509.4750	505.4881	486.2954	456.5801	426.2809	399.0127	382.9831	390.6184	407.6300	437.5438	470.8078	495.8607	(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	9.5200	12.9326	0.7600	0.7000	0.7700	45.3907	(75)
Southwest	2.7300	40.6744	0.7600	0.7000	0.7700	40.9382	(79)

Solar gains	86.3289	148.8575	236.3306	360.6672	447.8723	501.0792	469.8079	394.1427	296.6002	183.1832	108.8245	71.3558	(83)
Total gains	595.8038	654.3456	722.6260	817.2473	874.1532	900.0919	852.7910	784.7612	704.2303	620.7270	579.6324	567.2165	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.5400	47.9554	47.7492	48.5540	48.5540	49.4791	49.4791	49.1205	49.3018	48.7465	48.7465	48.1583	
alpha	4.1693	4.1970	4.1833	4.2369	4.2369	4.2986	4.2986	4.2747	4.2868	4.2498	4.2498	4.2106	
util living area													
	0.9990	0.9983	0.9960	0.9867	0.9525	0.8217	0.6133	0.6722	0.9323	0.9912	0.9980	0.9992	(86)
MIT	19.3226	19.4433	19.7297	20.1360	20.5383	20.8668	20.9749	20.9625	20.7161	20.2198	19.7219	19.3109	(87)
Th 2	18.9468	18.9596	18.9532	18.9779	18.9779	19.0055	19.0055	18.9949	19.0003	18.9837	18.9837	18.9658	(88)
util rest of house													
	0.9983	0.9972	0.9927	0.9735	0.8931	0.6028	0.2460	0.2887	0.8083	0.9793	0.9963	0.9986	(89)
MIT 2	17.5356	17.6655	17.9462	18.3645	18.7372	18.9812	19.0053	18.9943	18.9060	18.4551	17.9618	17.5381	(90)
Living area fraction									fLA = Living area / (4) =			0.3913	(91)
MIT	18.2348	18.3612	18.6441	19.0577	19.4420	19.7191	19.7760	19.7645	19.6143	19.1457	18.6505	18.2318	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2348	18.3612	18.6441	19.0577	19.4420	19.7191	19.7760	19.7645	19.6143	19.1457	18.6505	18.2318	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9979	0.9966	0.9920	0.9743	0.9119	0.6984	0.3990	0.4526	0.8617	0.9808	0.9958	0.9983	(94)
Useful gains	594.5369	652.1334	716.8119	796.2224	797.1500	628.6260	340.2409	355.1913	606.8661	608.8150	577.2211	566.2558	(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													
	2437.4348	2349.1142	2067.1594	1662.2814	1197.6295	700.5865	344.4438	362.4982	807.2385	1370.4860	1937.5399	2423.5050	(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													
	1371.1161	1140.3711	1004.6586	623.5625	297.9567	0.0000	0.0000	0.0000	0.0000	566.6832	979.4295	1381.7934	(98)
Space heating												7365.5710	(98)
Space heating per m2											(98) / (4) =	106.7474	(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 8193.0712 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1371.1161	1140.3711	1004.6586	623.5625	297.9567	0.0000	0.0000	0.0000	0.0000	566.6832	979.4295	1381.7934	(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)													
	1525.1569	1268.4884	1117.5290	693.6179	331.4313	0.0000	0.0000	0.0000	0.0000	630.3484	1089.4655	1537.0338	(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

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

	188.4119	166.0529	174.4056	156.3810	153.2691	136.9995	131.6443	144.3842	144.1266	162.1869	171.4446	183.9015 (64)
Efficiency of water heater												87.3000 (216)
(217)m	89.5777	89.5610	89.5057	89.3664	88.9997	87.3000	87.3000	87.3000	87.3000	89.3081	89.5029	89.5866 (217)
Fuel for water heating, kWh/month												
	210.3335	185.4077	194.8542	174.9887	172.2131	156.9296	150.7953	165.3886	165.0935	181.6037	191.5520	205.2779 (219)
Water heating fuel used												2154.4379 (219)
Annual totals kWh/year												
Space heating fuel - main system												8193.0712 (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)												314.1959 (232)
Total delivered energy for all uses												10706.7049 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	8193.0712	4.3200	353.9407 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2154.4379	4.3200	93.0717 (247)
Pumps and fans for heating	45.0000	15.3200	6.8940 (249)
Energy for lighting	314.1959	15.3200	48.1348 (250)
Additional standing charges			95.0000 (251)
Total energy cost			597.0412 (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	8193.0712	0.2160	1769.7034 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2154.4379	0.2160	465.3586 (264)
Space and water heating			2235.0620 (265)
Pumps and fans	45.0000	0.5190	23.3550 (267)
Energy for lighting	314.1959	0.5190	163.0677 (268)
Total kg/year			2421.4846 (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	8193.0712	1.2200	9995.5469 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2154.4379	1.2200	2628.4142 (264)
Space and water heating			12623.9611 (265)
Pumps and fans	45.0000	3.0700	138.1500 (267)
Energy for lighting	314.1959	3.0700	964.5814 (268)
Primary energy kWh/year			13726.6924 (272)
Primary energy kWh/m2/year			198.9376 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: C 71
Current environmental impact rating: C 69

(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

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

Q3 Not considered
O3 Not considered

Recommended measures: SAP change Cost change CO2 change
(none)

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

Potential energy efficiency rating: C 71
Potential environmental impact rating: C 69

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	£55	£55	£0
Mains gas	£542	£542	£0
Space heating	£456	£456	£0
Water heating	£93	£93	£0
Lighting	£48	£48	£0
Total cost of fuels	£597	£597	£0
Total cost of uses	£597	£597	£0
Delivered energy	155 kWh/m²	155 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.4 tonnes	2.4 tonnes	0.0 tonnes
CO2 emissions per m²	35 kg/m²	35 kg/m²	0 kg/m²
Primary energy	199 kWh/m²	199 kWh/m²	0 kWh/m²

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

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

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB

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

© Elmhurst Energy Systems Limited Registered Office Unit 16, St Johns Business Park, Lutterworth, Leicestershire LE17 4HB