36 Salisbury Square
Hatfield
AL9 5AF

Planning Condition 2

Compliance Demonstration

Version	Date	Note
V1	27/03/2020	First issue

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1 Introduction

This document is provided to demonstrate MEP compliance with the services related planning conditions imposed by Welyn Hatfield Burough Council on the 1st March 2018. Application No: 6/2017/1903/FULL.

2 Planning Condition 2

2.1 The following statement has been extracted from the Notice of Decision:

"The applicant shall either install a cooling/air conditioning system or undertake a SAP 2012 Appendix P assessment of the internal temperature in summer, demonstrating that the windows can be kept shut and that the ventilation alone is capable of keeping the room at a temperature which provides thermal comfort, in line with SAP standards."

2.2 In order to demonstrate compliance with this condition a summer overheat assessment been carried out in line with SAP 2010 Appendix P. Please note this is not a standard required assessment under ADL1B 2010. This would typically only form part of a new build project. We have therefore had to carry out the overheat risk calculations using the SAP 2012 software as applied to new builds.

2.3 The calculations carried out show that a minimum of two air changes is required to reduce the risk of overheating to medium as defined under SAP 2012 Criterion 3.

2.4 Please note that the output of the calculation does not provide an output that is directly referred to as thermal comfort. The planning condition states the calculation should be "demonstrating that the windows can be kept shut and that the ventilation alone is capable of keeping the room at a temperature which provides thermal comfort, in line with SAP standards."

2.5 The extract below is from SAP 2012 Appendix P. The calculations carried out state that we are at medium risk of overheating with the windows shut and providing a ventilation rate of two air changes per hour.

Table P2: Levels of threshold temperature corresponding to likelihood of high internal temperature during hot weather

$T_{threshold}$	Likelihood of high internal temperature during hot weather
< 20.5°C	Not significant
≥ 20.5°C and < 22.0°C	Slight
≥ 22.0°C and < 23.5°C	Medium
≥ 23.5°C	High

2.6 The Chartered Institution of Building Services Engineers (CIBSE) definition of thermal comfort is "That state of mind which expresses satisfaction with the thermal environment". An extract from CIBSE Guide A can be seen below.

Table 1.5 Recommended comfort criteria for specific applications

Building/room type	Customary winter operative temperatures for stated activity and clothing levels*			Customary summer operative temperatures (air conditioned buildings†) for stated activity and clothing levels*		
	Temp. / °C	Activity / met	Clothing / clo	Temp. / °C	Activity / met	Clothing / clo
Airport terminals:						
— baggage reclaim	12–19[1]	1.8	1.2	21–25	1.3	0.6
— check–in areas[3]	18–20	1.4	1.2	21–25	1.3	0.6
— concourse (no seats)	19–24[1]	1.8	1.2	21–25	1.3	0.6
— customs area	18–20	1.4	1.2	21–25	1.3	0.6
— departure lounge	19–21	1.3	1.2	22–25	1.2	0.6
Art galleries — see Museums and art galleries						
Banks, building societies, post offices:						
— counters	19–21	1.4	1.0	21–25	1.3	0.6
— public areas	19–21	1.4	1.0	21–25	1.3	0.6
Bars/lounges	20–22	1.3	1.0	22–25	1.3	0.6
Bus/coach stations — see Railway/coach stations						
Churches	19–21	1.3	1.2	22–25	1.3	0.6
Computer rooms[7]	19–21	1.4	1.0	21–25	1.3	0.6
Conference/board rooms	22–23	1.1	1.0	23–25	1.1	0.6
Drawing offices	19–21	1.4	1.0	21–25	1.3	0.6
Dwellings:						
— bathrooms	20–22	—	—	23–25	—	—
— bedrooms	17–19	0.9	2.5	23–25	0.9	1.2
— hall/stairs/landings	19–24[1]	—	—	21–25[1]	—	—
— kitchen	17–19	1.6	1.0	21–25	1.5	0.5
— living rooms	22–23	1.1	1.0	23–25	1.1	0.6

2.7 It can be seen from the provided SAP 2012 extract that the overheating risk with two air changes per hour gives a T threshold of 22-23.5oC. It can be seen from the extract from CIBSE Guide A that the summer operative temperatures for dwellings is 21-25oC. We would therefore surmise that an overheating risk of medium (22-23.5oC) provides thermal comfort.

2.8 In order to achieve the required two air changes per hour it is proposed to install a central mechanical extract ventilation (MEV) system to each apartment.

2.9 The MEV unit will have several control methods. There will a humidistat in each apartment's bathroom/s, a switch in each apartment's kitchen and a temperature sensor in each apartment living space.

The units default operational mode shall be: Off (general/background to be provided via acoustic window trickle vents)
If a humidistat in the bathroom is triggered: On
If the switch in the kitchen is moved to the on position: On
If the temperature sensor senses over 25°C: On

'On' shall mean speed 2 for two-bedroom units (55.6l/s /unit) and speed 3 for one-bedroom units (72.2l/s) to achieve two air changes per hour.

2.10 Ductwork attenuators are to be provided to all MEV's in line with the recommendations of Cole Jarman, Acoustic Consultants.

3 Supporting Documentation

3.1 The following documentation has been calculated and presented in accordance with Approved Document L1B 2010 (with latest amendments). It contains the following information on each apartment: (17 pagers per apartment)

- Predicted energy assessment
- Full SAP calculation printout
- Summary for input data

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit G.01, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

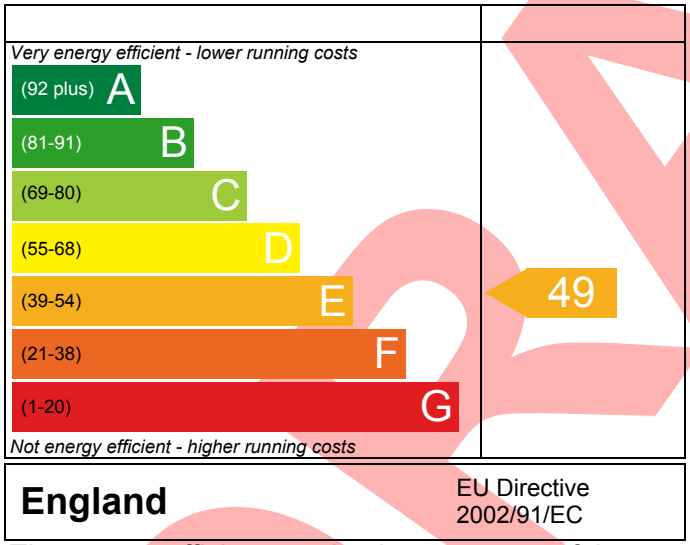
Unit G.01, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	81.75 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

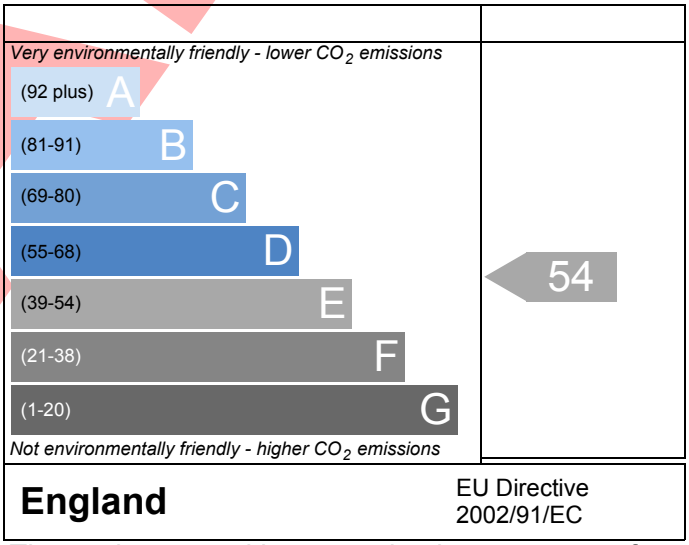
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-1	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit G.01, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	49 E	**DER**	N/A	**TER**	N/A
Environmental	54 E	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	4.06	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.7500 (1b)	x	2.5000 (2b)	=	204.3750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	204.3750	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1957	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9457	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8748	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0060	0.9623	0.9841	0.8748	0.8748	0.7654	0.7873	0.7873	0.8311	0.8748	0.8529	0.9404	(22b)
Effective ac	1.0060	0.9630	0.9843	0.8826	0.8826	0.7929	0.8099	0.8099	0.8453	0.8826	0.8637	0.9422	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			14.0100	1.5038	21.0677			(27)
Heat Loss Floor 1			81.7500	0.2200	17.9850			(28a)
External Wall	66.2500	16.1100	50.1400	0.5500	27.5770			(29a)
Total net area of external elements Aum(A, m2)			148.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.4097			(33)
Party Wall 1			30.9800	0.0000	0.0000			(32)
Party Ceilings 1			81.7500					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	22.2000	(36)
Total fabric heat loss	(33) + (36) = 92.6097	(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	67.8490	64.9470	66.3825	59.5278	59.5278	53.4795	54.6247	54.6247	57.0117	59.5278	58.2536	63.5438	(38)
Heat transfer coeff	160.4586	157.5567	158.9921	152.1374	152.1374	146.0892	147.2343	147.2343	149.6214	152.1374	150.8633	156.1535	(39)
Average = Sum(39)m / 12 =												152.5513	(39)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9628	1.9273	1.9449	1.8610	1.8610	1.7870	1.8010	1.8010	1.8302	1.8610	1.8454	1.9101	(40)
HLP (average)												1.8661	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4952	(42)
Average daily hot water use (litres/day)												93.4616	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	102.8078	99.0693	95.3309	91.5924	87.8539	84.1155	84.1155	87.8539	91.5924	95.3309	99.0693	102.8078	(44)
Energy conte	152.4610	133.3434	137.5984	119.9616	115.1060	99.3278	92.0418	105.6193	106.8807	124.5592	135.9661	147.6504	(45)
Energy content (annual)										Total = Sum(45)m =		1470.5157	(45)
Distribution loss (46)m = 0.15 x (45)m													
	22.8692	20.0015	20.6398	17.9942	17.2659	14.8992	13.8063	15.8429	16.0321	18.6839	20.3949	22.1476	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(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													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(64)
								Total per year (kWh/year) = Sum(64)m =				1816.5357	(64)
RHI water heating demand												1817	(64)
Heat gains from water heating, kWh/month													
	74.2037	65.5719	69.2619	62.6392	61.7832	55.7785	54.1143	58.6288	58.2898	64.9263	67.9607	72.6041	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.2000	45.4754	36.9830	27.9985	20.9292	17.6693	19.0924	24.8170	33.3093	42.2938	49.3631	52.6230	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	332.9240	336.3787	327.6730	309.1394	285.7442	263.7560	249.0665	245.6118	254.3175	272.8510	296.2463	318.2345	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	(71)
Water heating gains (Table 5)													
	99.7361	97.5772	93.0939	86.9990	83.0419	77.4701	72.7343	78.8022	80.9581	87.2666	94.3899	97.5862	(72)
Total internal gains													
	586.2312	581.8024	560.1211	526.5081	492.0864	461.2666	443.2642	451.6020	470.9560	504.7825	542.3704	570.8148	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	8.2500	40.5720	0.6300	0.7000	0.7700	102.2945	(77)
Northwest	5.7600	12.9280	0.6300	0.7000	0.7700	22.7576	(81)

Solar gains	125.0521	202.1768	289.8500	400.9878	465.6157	507.7698	476.5742	422.2841	348.1056	239.7519	154.8847	105.0917	(83)
Total gains	711.2834	783.9792	849.9711	927.4959	957.7021	969.0364	919.8384	873.8861	819.0616	744.5344	697.2551	675.9065	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.3804	36.0320	35.7067	37.3155	37.3155	38.8604	38.5582	38.5582	37.9430	37.3155	37.6306	36.3558	
alpha	3.3587	3.4021	3.3804	3.4877	3.4877	3.5907	3.5705	3.5705	3.5295	3.4877	3.5087	3.4237	
util living area													
	0.9911	0.9870	0.9763	0.9479	0.8862	0.7194	0.5513	0.5743	0.8357	0.9548	0.9849	0.9924	(86)
MIT	19.0561	19.2418	19.5830	20.0838	20.5015	20.8605	20.9613	20.9559	20.7209	20.1911	19.6082	19.0769	(87)
Th 2	19.3583	19.3822	19.3703	19.4276	19.4276	19.4791	19.4693	19.4693	19.4489	19.4276	19.4384	19.3939	(88)
util rest of house													
	0.9879	0.9822	0.9666	0.9245	0.8275	0.5796	0.3420	0.3590	0.7298	0.9289	0.9783	0.9896	(89)
MIT 2	16.8938	17.1772	17.6637	18.4096	18.9702	19.4054	19.4620	19.4608	19.2576	18.5705	17.7448	16.9451	(90)
Living area fraction										fLA = Living area / (4) =		0.4626	(91)
MIT	17.8941	18.1323	18.5516	19.1841	19.6786	20.0786	20.1557	20.1525	19.9346	19.3202	18.6068	17.9314	(92)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment												0.0000	
adjusted MIT	17.8941	18.1323	18.5516	19.1841	19.6786	20.0786	20.1557	20.1525	19.9346	19.3202	18.6068	17.9314	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9836	0.9768	0.9598	0.9198	0.8388	0.6407	0.4415	0.4617	0.7690	0.9265	0.9732	0.9859	(94)
Useful gains	699.5869	765.7966	815.8129	853.1009	803.3572	620.8275	406.1030	403.4646	629.8991	689.8332	678.5983	666.3540	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	2149.2056	2069.0860	1852.5178	1503.7470	1137.7767	698.0990	420.4502	419.9861	798.1647	1250.6057	1690.6981	2097.3531	(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	1078.5164	875.8104	771.3085	468.4652	248.8081	0.0000	0.0000	0.0000	0.0000	417.2148	728.7119	1064.6634	(98)
Space heating												5653.4987	(98)
RHI space heating demand												5653	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.7500 (1b)	x	2.5000 (2b)	=	204.3750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	204.3750	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1957	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9457	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8748	(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	1.1154	1.0935	1.0716	0.9623	0.9404	0.8311	0.8311	0.8092	0.8748	0.9404	0.9841	1.0279	(22b)
Effective ac	1.1154	1.0935	1.0716	0.9630	0.9422	0.8453	0.8453	0.8274	0.8826	0.9422	0.9843	1.0279	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			14.0100	1.5038	21.0677			(27)
Heat Loss Floor 1			81.7500	0.2200	17.9850			(28a)
External Wall	66.2500	16.1100	50.1400	0.5500	27.5770			(29a)
Total net area of external elements Aum(A, m2)			148.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.4097			(33)
Party Wall 1			30.9800	0.0000	0.0000			(32)
Party Ceilings 1			81.7500					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	22.2000	(36)
Total fabric heat loss (33) + (36) =	92.6097	(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	75.2239	73.7489	72.2739	64.9470	63.5438	57.0117	57.0117	55.8021	59.5278	63.5438	66.3825	69.3239	(38)
Heat transfer coeff	167.8335	166.3585	164.8836	157.5567	156.1535	149.6214	149.6214	148.4117	152.1374	156.1535	158.9921	161.9336	(39)
Average = Sum(39)m / 12 =												157.4714	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0530	2.0350	2.0169	1.9273	1.9101	1.8302	1.8302	1.8154	1.8610	1.9101	1.9449	1.9808	(40)
HLP (average)												1.9263	(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	2.4952 (42)
Average daily hot water use (litres/day)	93.4616 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	102.8078	99.0693	95.3309	91.5924	87.8539	84.1155	84.1155	87.8539	91.5924	95.3309	99.0693	102.8078	(44)
Energy conte	152.4610	133.3434	137.5984	119.9616	115.1060	99.3278	92.0418	105.6193	106.8807	124.5592	135.9661	147.6504	(45)
Energy content (annual)										Total = Sum(45)m =		1470.5157	(45)
Distribution loss (46)m = 0.15 x (45)m	22.8692	20.0015	20.6398	17.9942	17.2659	14.8992	13.8063	15.8429	16.0321	18.6839	20.3949	22.1476	(46)

Water storage loss:	
Store volume	110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.6000 (49)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(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													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(64)
								Total per year (kWh/year) = Sum(64)m =				1816.5357	(64)
Heat gains from water heating, kWh/month													
	74.2037	65.5719	69.2619	62.6392	61.7832	55.7785	54.1143	58.6288	58.2898	64.9263	67.9607	72.6041	(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	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.2000	45.4754	36.9830	27.9985	20.9292	17.6693	19.0924	24.8170	33.3093	42.2938	49.3631	52.6230	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	332.9240	336.3787	327.6730	309.1394	285.7442	263.7560	249.0665	245.6118	254.3175	272.8510	296.2463	318.2345	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	(71)
Water heating gains (Table 5)													
	99.7361	97.5772	93.0939	86.9990	83.0419	77.4701	72.7343	78.8022	80.9581	87.2666	94.3899	97.5862	(72)
Total internal gains													
	586.2312	581.8024	560.1211	526.5081	492.0864	461.2666	443.2642	451.6020	470.9560	504.7825	542.3704	570.8148	(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	
Southeast	8.2500	36.7938	0.6300	0.7000	0.7700	92.7686	(77)
Northwest	5.7600	11.2829	0.6300	0.7000	0.7700	19.8617	(81)

Solar gains	112.6303	198.4483	289.0491	387.5179	460.8618	469.3216	447.5686	391.0479	322.8654	224.0524	136.1065	95.6106	(83)
Total gains	698.8615	780.2507	849.1701	914.0259	952.9482	930.5882	890.8328	842.6499	793.8215	728.8349	678.4769	666.4255	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.8257	34.1256	34.4309	36.0320	36.3558	37.9430	37.9430	38.2523	37.3155	36.3558	35.7067	35.0581	
alpha	3.2550	3.2750	3.2954	3.4021	3.4237	3.5295	3.5295	3.5502	3.4877	3.4237	3.3804	3.3372	
util living area													
	0.9918	0.9875	0.9785	0.9556	0.9038	0.7902	0.6501	0.6920	0.8713	0.9635	0.9871	0.9931	(86)
MIT	18.9187	19.1124	19.4523	19.9604	20.4037	20.7729	20.9190	20.8979	20.6358	20.0698	19.4543	18.9458	(87)
Th 2	19.2982	19.3101	19.3221	19.3822	19.3939	19.4489	19.4489	19.4592	19.4276	19.3939	19.3703	19.3461	(88)
util rest of house													
	0.9888	0.9828	0.9698	0.9356	0.8541	0.6741	0.4593	0.5094	0.7852	0.9429	0.9815	0.9906	(89)
MIT 2	16.6595	16.9476	17.4466	18.2084	18.8212	19.3019	19.4233	19.4220	19.1487	18.3800	17.4816	16.7264	(90)
Living area fraction										fLA = Living area / (4) =		0.4626	(91)
MIT	17.7047	17.9491	18.3745	19.0189	19.5533	19.9824	20.1153	20.1048	19.8367	19.1618	18.3943	17.7532	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7047	17.9491	18.3745	19.0189	19.5533	19.9824	20.1153	20.1048	19.8367	19.1618	18.3943	17.7532	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9846	0.9773	0.9629	0.9296	0.8602	0.7198	0.5490	0.5944	0.8125	0.9388	0.9765	0.9869	(94)
Useful gains	688.0690	762.5124	817.6457	849.7116	819.7098	669.8802	489.0239	500.8470	644.9563	684.2570	662.5296	657.6831	(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													
	2249.7515	2170.8260	1957.9077	1594.3039	1226.3178	805.3238	525.9618	549.8390	872.7605	1336.9514	1795.6986	2194.7154	(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													
	1161.8917	946.3867	848.3550	536.1064	302.5163	0.0000	0.0000	0.0000	0.0000	485.6046	815.8817	1143.5521	(98)
Space heating												6240.2946	(98)
Space heating per m2											(98) / (4) =	76.3339	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												6240.2946	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1161.8917	946.3867	848.3550	536.1064	302.5163	0.0000	0.0000	0.0000	0.0000	485.6046	815.8817	1143.5521	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	1161.8917	946.3867	848.3550	536.1064	302.5163	0.0000	0.0000	0.0000	0.0000	485.6046	815.8817	1143.5521	(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													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(219)
Water heating fuel used												1816.5357	(219)
Annual totals kWh/year													
Space heating fuel - main system												6240.2946	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												361.6830	(232)
Total delivered energy for all uses												8418.5132	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6240.2946	13.1900	823.0949	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1816.5357	13.1900	239.6011	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	361.6830	13.1900	47.7060	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1110.4019	(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] =	3.6794	(257)
SAP value		48.5404	
SAP rating (Section 12)		49	(258)
SAP band		E	

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	6240.2946	0.5190	3238.7129	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1816.5357	0.5190	942.7820	(264)
Space and water heating			4181.4949	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	361.6830	0.5190	187.7135	(268)
Total kg/year			4369.2084	(272)
CO2 emissions per m2			53.4500	(273)
EI value			53.9418	
EI rating			54	(274)
EI band			E	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.7500 (1b)	x	2.5000 (2b)	=	204.3750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	204.3750	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1957	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9457	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8748	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0060	0.9623	0.9841	0.8748	0.8748	0.7654	0.7873	0.7873	0.8311	0.8748	0.8529	0.9404	(22b)
Effective ac	1.0060	0.9630	0.9843	0.8826	0.8826	0.7929	0.8099	0.8099	0.8453	0.8826	0.8637	0.9422	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			14.0100	1.5038	21.0677			(27)
Heat Loss Floor 1			81.7500	0.2200	17.9850			(28a)
External Wall	66.2500	16.1100	50.1400	0.5500	27.5770			(29a)
Total net area of external elements Aum(A, m2)			148.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.4097			(33)
Party Wall 1			30.9800	0.0000	0.0000			(32)
Party Ceilings 1			81.7500					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	22.2000	(36)
Total fabric heat loss (33) + (36) =	92.6097	(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	67.8490	64.9470	66.3825	59.5278	59.5278	53.4795	54.6247	54.6247	57.0117	59.5278	58.2536	63.5438	(38)
Heat transfer coeff	160.4586	157.5567	158.9921	152.1374	152.1374	146.0892	147.2343	147.2343	149.6214	152.1374	150.8633	156.1535	(39)
Average = Sum(39)m / 12 =												152.5513	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9628	1.9273	1.9449	1.8610	1.8610	1.7870	1.8010	1.8010	1.8302	1.8610	1.8454	1.9101	(40)
HLP (average)												1.8661	(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	2.4952 (42)
Average daily hot water use (litres/day)	93.4616 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	102.8078	99.0693	95.3309	91.5924	87.8539	84.1155	84.1155	87.8539	91.5924	95.3309	99.0693	102.8078	(44)
Energy conte	152.4610	133.3434	137.5984	119.9616	115.1060	99.3278	92.0418	105.6193	106.8807	124.5592	135.9661	147.6504	(45)
Energy content (annual)										Total = Sum(45)m =		1470.5157	(45)
Distribution loss (46)m = 0.15 x (45)m	22.8692	20.0015	20.6398	17.9942	17.2659	14.8992	13.8063	15.8429	16.0321	18.6839	20.3949	22.1476	(46)

Water storage loss:	
Store volume	110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.6000 (49)

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

Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(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													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(64)
								Total per year (kWh/year) = Sum(64)m =				1816.5357	(64)
Heat gains from water heating, kWh/month													
	74.2037	65.5719	69.2619	62.6392	61.7832	55.7785	54.1143	58.6288	58.2898	64.9263	67.9607	72.6041	(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	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.2000	45.4754	36.9830	27.9985	20.9292	17.6693	19.0924	24.8170	33.3093	42.2938	49.3631	52.6230	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	332.9240	336.3787	327.6730	309.1394	285.7442	263.7560	249.0665	245.6118	254.3175	272.8510	296.2463	318.2345	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	(71)
Water heating gains (Table 5)													
	99.7361	97.5772	93.0939	86.9990	83.0419	77.4701	72.7343	78.8022	80.9581	87.2666	94.3899	97.5862	(72)
Total internal gains													
	586.2312	581.8024	560.1211	526.5081	492.0864	461.2666	443.2642	451.6020	470.9560	504.7825	542.3704	570.8148	(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	
Southeast	8.2500	40.5720	0.6300	0.7000	0.7700	102.2945	(77)
Northwest	5.7600	12.9280	0.6300	0.7000	0.7700	22.7576	(81)

Solar gains	125.0521	202.1768	289.8500	400.9878	465.6157	507.7698	476.5742	422.2841	348.1056	239.7519	154.8847	105.0917	(83)
Total gains	711.2834	783.9792	849.9711	927.4959	957.7021	969.0364	919.8384	873.8861	819.0616	744.5344	697.2551	675.9065	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.3804	36.0320	35.7067	37.3155	37.3155	38.8604	38.5582	38.5582	37.9430	37.3155	37.6306	36.3558	
alpha	3.3587	3.4021	3.3804	3.4877	3.4877	3.5907	3.5705	3.5705	3.5295	3.4877	3.5087	3.4237	
util living area													
	0.9911	0.9870	0.9763	0.9479	0.8862	0.7194	0.5513	0.5743	0.8357	0.9548	0.9849	0.9924	(86)
MIT	19.0561	19.2418	19.5830	20.0838	20.5015	20.8605	20.9613	20.9559	20.7209	20.1911	19.6082	19.0769	(87)
Th 2	19.3583	19.3822	19.3703	19.4276	19.4276	19.4791	19.4693	19.4693	19.4489	19.4276	19.4384	19.3939	(88)
util rest of house													
	0.9879	0.9822	0.9666	0.9245	0.8275	0.5796	0.3420	0.3590	0.7298	0.9289	0.9783	0.9896	(89)
MIT 2	16.8938	17.1772	17.6637	18.4096	18.9702	19.4054	19.4620	19.4608	19.2576	18.5705	17.7448	16.9451	(90)
Living area fraction										fLA = Living area / (4) =		0.4626	(91)
MIT	17.8941	18.1323	18.5516	19.1841	19.6786	20.0786	20.1557	20.1525	19.9346	19.3202	18.6068	17.9314	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.8941	18.1323	18.5516	19.1841	19.6786	20.0786	20.1557	20.1525	19.9346	19.3202	18.6068	17.9314	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9836	0.9768	0.9598	0.9198	0.8388	0.6407	0.4415	0.4617	0.7690	0.9265	0.9732	0.9859	(94)
Useful gains	699.5869	765.7966	815.8129	853.1009	803.3572	620.8275	406.1030	403.4646	629.8991	689.8332	678.5983	666.3540	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	2149.2056	2069.0860	1852.5178	1503.7470	1137.7767	698.0990	420.4502	419.9861	798.1647	1250.6057	1690.6981	2097.3531	(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													
	1078.5164	875.8104	771.3085	468.4652	248.8081	0.0000	0.0000	0.0000	0.0000	417.2148	728.7119	1064.6634	(98)
Space heating												5653.4987	(98)
Space heating per m2											(98) / (4) =	69.1559	(99)

8c. Space cooling requirement

Not applicable

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

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 %)	100.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	5653.4987	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1078.5164	875.8104	771.3085	468.4652	248.8081	0.0000	0.0000	0.0000	0.0000	417.2148	728.7119	1064.6634	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	1078.5164	875.8104	771.3085	468.4652	248.8081	0.0000	0.0000	0.0000	0.0000	417.2148	728.7119	1064.6634	(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													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(219)
Water heating fuel used												1816.5357	(219)
Annual totals kWh/year													
Space heating fuel - main system												5653.4987	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												361.6830	(232)
Total delivered energy for all uses												7831.7173	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5653.4987	18.2700	1032.8942	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1816.5357	18.2700	331.8811	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	361.6830	18.2700	66.0795	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1430.8548	(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	5653.4987	0.5190	2934.1658	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1816.5357	0.5190	942.7820	(264)
Space and water heating			3876.9478	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	361.6830	0.5190	187.7135	(268)
Total kg/year			4064.6613	(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	5653.4987	3.0700	17356.2410	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1816.5357	3.0700	5576.7645	(264)
Space and water heating			22933.0054	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	361.6830	3.0700	1110.3668	(268)
Primary energy kWh/year			24043.3722	(272)
Primary energy kWh/m2/year			294.1085	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	E 49
Current environmental impact rating:	E 54

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: E 49
Potential environmental impact rating: E 54

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£1431	£1431	£0
Space heating	£1033	£1033	£0
Water heating	£332	£332	£0
Lighting	£66	£66	£0
Total cost of fuels	£1431	£1431	£0
Total cost of uses	£1431	£1431	£0
Delivered energy	96 kWh/m²	96 kWh/m²	0 kWh/m²
Carbon dioxide emissions	4.1 tonnes	4.1 tonnes	0.0 tonnes
CO2 emissions per m²	50 kg/m²	50 kg/m²	0 kg/m²
Primary energy	294 kWh/m²	294 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-1	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit G.01, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	49 E	**DER**	N/A	**TER**	N/A
Environmental	54 E	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	4.06	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	26.50 m	81.75 m²	2.50 m

7.0 Living Area	37.82	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.55	66.25	50.14

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	30.98

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	81.75

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid	Slab on ground, screed over insulation	0.22	81.75

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.60

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[1] External Wall	North East							2.10	
windows	Window	[1] External Wall	South East	None	0.00					8.25	
windows	Window	[1] External Wall	North West	None	0.00					5.76	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate
Night Ventilation	No
Air change rate	2.00

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				4
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	8	
Total number of L.E.L. fittings	8	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit G.02, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

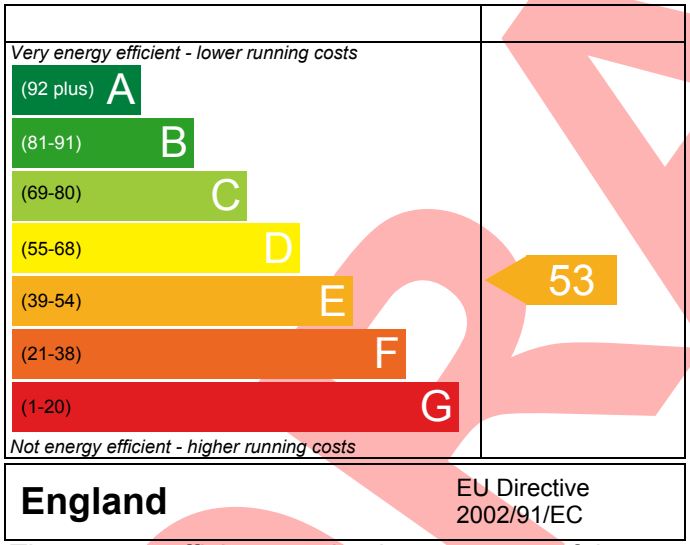
Unit G.02, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	81.41 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

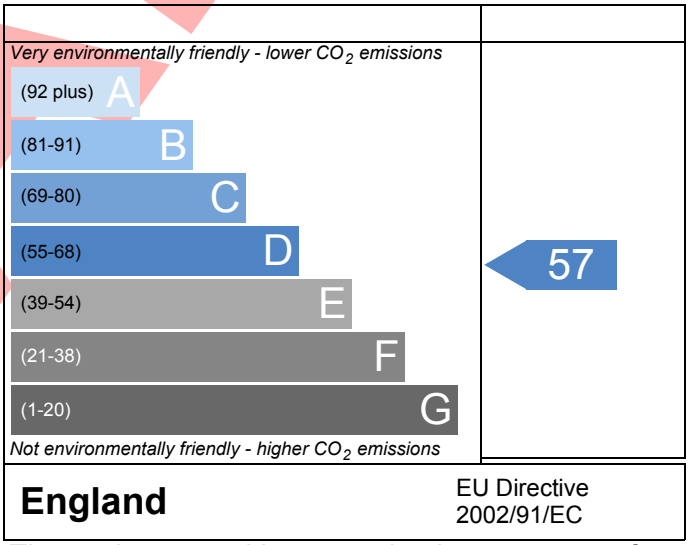
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-2	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit G.02, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	53 E	**DER**	N/A	**TER**	N/A
Environmental	57 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	3.74	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4100	(1b)	x 2.5000	(2b) =	203.5250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		203.5250	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1965	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9465	(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) =	0.8046	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.9252	0.8850	0.9051	0.8046	0.8046	0.7040	0.7241	0.7241	0.7643	0.8046	0.7844	0.8649	(22b)
Effective ac	0.9280	0.8916	0.9096	0.8237	0.8237	0.7478	0.7622	0.7622	0.7921	0.8237	0.8077	0.8740	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			14.0100	1.5038	21.0677			(27)
Heat Loss Floor 1			81.4100	0.2200	17.9102			(28a)
External Wall	38.0000	16.1100	21.8900	0.5500	12.0395			(29a)
External Wall - lobby/stairwel	19.4000		19.4000	0.4769	9.2528			(29a)
Total net area of external elements Aum(A, m2)			138.8100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.0502			(33)
Party Wall 1			38.7800	0.0000	0.0000			(32)
Party Ceilings 1			81.4100					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	20.8215	(36)
Total fabric heat loss (33) + (36) =	84.8717	(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	62.3298	59.8843	61.0934	55.3193	55.3193	50.2246	51.1892	51.1892	53.1999	55.3193	54.2460	58.7023	(38)
Heat transfer coeff	147.2014	144.7559	145.9651	140.1910	140.1910	135.0962	136.0608	136.0608	138.0716	140.1910	139.1177	143.5739	(39)

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Average = Sum(39)m / 12 = 140.5397 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8081	1.7781	1.7930	1.7220	1.7220	1.6595	1.6713	1.6713	1.6960	1.7220	1.7089	1.7636	(40)
HLP (average)												1.7263	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4891 (42)
Average daily hot water use (litres/day) 93.3154 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	102.6470	98.9143	95.1817	91.4491	87.7165	83.9839	83.9839	87.7165	91.4491	95.1817	98.9143	102.6470	(44)
Energy conte	152.2225	133.1347	137.3831	119.7739	114.9259	99.1724	91.8978	105.4540	106.7135	124.3643	135.7533	147.4193	(45)
Energy content (annual)										Total = Sum(45)m =		1468.2148	(45)
Distribution loss (46)m = 0.15 x (45)m													
	22.8334	19.9702	20.6075	17.9661	17.2389	14.8759	13.7847	15.8181	16.0070	18.6546	20.3630	22.1129	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	181.6105	159.6787	166.7711	148.2139	144.3139	127.6124	121.2858	134.8420	135.1535	153.7523	164.1933	176.8073	(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													
	181.6105	159.6787	166.7711	148.2139	144.3139	127.6124	121.2858	134.8420	135.1535	153.7523	164.1933	176.8073	(64)
								Total per year (kWh/year) = Sum(64)m =				1814.2348	(64)
RHI water heating demand												1814	(64)
Heat gains from water heating, kWh/month													
	74.1244	65.5025	69.1903	62.5768	61.7233	55.7268	54.0664	58.5739	58.2342	64.8615	67.8900	72.5273	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.0023	45.2998	36.8403	27.8904	20.8484	17.6011	19.0186	24.7211	33.1807	42.1305	49.1725	52.4198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	331.8838	335.3277	326.6492	308.1735	284.8514	262.9319	248.2883	244.8444	253.5229	271.9985	295.3207	317.2402	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	(71)
Water heating gains (Table 5)													
	99.6295	97.4740	92.9977	86.9123	82.9614	77.3983	72.6699	78.7283	80.8809	87.1795	94.2916	97.4830	(72)
Total internal gains													
	584.7205	580.3064	558.6920	525.1812	490.8661	460.1362	442.1817	450.4987	469.7894	503.5134	540.9897	569.3479	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	8.2500	40.5720	0.6300	0.7000	0.7700	102.2945	(77)
Northwest	5.7600	12.9280	0.6300	0.7000	0.7700	22.7576	(81)

Solar gains	125.0521	202.1768	289.8500	400.9878	465.6157	507.7698	476.5742	422.2841	348.1056	239.7519	154.8847	105.0917	(83)
Total gains	709.7727	782.4832	848.5420	926.1689	956.4818	967.9061	918.7559	872.7828	817.8949	743.2653	695.8744	674.4396	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.4064	39.0552	38.7317	40.3269	40.3269	41.8477	41.5511	41.5511	40.9460	40.3269	40.6381	39.3767	
alpha	3.5604	3.6037	3.5821	3.6885	3.6885	3.7898	3.7701	3.7701	3.7297	3.6885	3.7092	3.6251	
util living area													
	0.9911	0.9866	0.9750	0.9432	0.8739	0.6929	0.5208	0.5437	0.8179	0.9510	0.9844	0.9925	(86)
MIT	19.2226	19.4016	19.7290	20.1990	20.5843	20.8951	20.9737	20.9696	20.7748	20.2884	19.7362	19.2364	(87)
Th 2	19.4643	19.4854	19.4749	19.5251	19.5251	19.5700	19.5615	19.5615	19.5437	19.5251	19.5345	19.4956	(88)
util rest of house													
	0.9879	0.9818	0.9651	0.9189	0.8137	0.5590	0.3313	0.3480	0.7122	0.9242	0.9777	0.9897	(89)
MIT 2	17.1988	17.4710	17.9373	18.6338	19.1447	19.5147	19.5563	19.5554	19.3899	18.7689	17.9890	17.2380	(90)
Living area fraction									fLA = Living area / (4) =			0.4655	(91)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	18.1410	18.3698	18.7714	19.3625	19.8149	20.1573	20.2162	20.2138	20.0346	19.4763	18.8024	18.1683 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1410	18.3698	18.7714	19.3625	19.8149	20.1573	20.2162	20.2138	20.0346	19.4763	18.8024	18.1683 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9839	0.9769	0.9589	0.9155	0.8276	0.6187	0.4213	0.4413	0.7533	0.9231	0.9730	0.9862	(94)
Useful gains	698.3575	764.3702	813.6623	847.9016	791.6312	598.8461	387.0894	385.1437	616.1584	686.0720	677.1045	665.1569	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	2007.9702	1935.3560	1732.8125	1410.6727	1067.5414	656.2050	396.7770	396.4497	750.3666	1174.2810	1586.2803	1962.4175	(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	974.3518	786.9024	683.8478	405.1952	205.2772	0.0000	0.0000	0.0000	0.0000	363.2275	654.6066	965.1619	(98)
Space heating												5038.5705	(98)
RHI space heating demand												5039	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4100 (1b)	x	2.5000 (2b)	=	203.5250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	203.5250	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1965	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9465	(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) =	0.8046	(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	1.0258	1.0057	0.9856	0.8850	0.8649	0.7643	0.7643	0.7442	0.8046	0.8649	0.9051	0.9454	(22b)
Effective ac	1.0258	1.0057	0.9857	0.8916	0.8740	0.7921	0.7921	0.7769	0.8237	0.8740	0.9096	0.9468	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			14.0100	1.5038	21.0677			(27)
Heat Loss Floor 1			81.4100	0.2200	17.9102			(28a)
External Wall	38.0000	16.1100	21.8900	0.5500	12.0395			(29a)
External Wall - lobby/stairwel	19.4000		19.4000	0.4769	9.2528			(29a)
Total net area of external elements Aum(A, m2)			138.8100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	64.0502			(33)
Party Wall 1			38.7800	0.0000	0.0000			(32)
Party Ceilings 1			81.4100					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	20.8215	(36)
Total fabric heat loss (33) + (36) =	84.8717	(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	68.8966	67.5457	66.2018	59.8843	58.7023	53.1999	53.1999	52.1810	55.3193	58.7023	61.0934	63.5933	(38)
Heat transfer coeff	153.7683	152.4174	151.0734	144.7559	143.5739	138.0716	138.0716	137.0526	140.1910	143.5739	145.9651	148.4649	(39)
Average = Sum(39)m / 12 =												144.7483	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8888	1.8722	1.8557	1.7781	1.7636	1.6960	1.6960	1.6835	1.7220	1.7636	1.7930	1.8237	(40)
HLP (average)												1.7780	(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	2.4891 (42)
Average daily hot water use (litres/day)	93.3154 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	102.6470	98.9143	95.1817	91.4491	87.7165	83.9839	83.9839	87.7165	91.4491	95.1817	98.9143	102.6470	(44)
Energy conte	152.2225	133.1347	137.3831	119.7739	114.9259	99.1724	91.8978	105.4540	106.7135	124.3643	135.7533	147.4193	(45)
Energy content (annual)										Total = Sum(45)m =		1468.2148	(45)
Distribution loss (46)m = 0.15 x (45)m	22.8334	19.9702	20.6075	17.9661	17.2389	14.8759	13.7847	15.8181	16.0070	18.6546	20.3630	22.1129	(46)

Water storage loss:	
Store volume	110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	181.6105	159.6787	166.7711	148.2139	144.3139	127.6124	121.2858	134.8420	135.1535	153.7523	164.1933	176.8073	(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													
	181.6105	159.6787	166.7711	148.2139	144.3139	127.6124	121.2858	134.8420	135.1535	153.7523	164.1933	176.8073	(64)
								Total per year (kWh/year) = Sum(64)m =				1814.2348	(64)
Heat gains from water heating, kWh/month													
	74.1244	65.5025	69.1903	62.5768	61.7233	55.7268	54.0664	58.5739	58.2342	64.8615	67.8900	72.5273	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.0023	45.2998	36.8403	27.8904	20.8484	17.6011	19.0186	24.7211	33.1807	42.1305	49.1725	52.4198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	331.8838	335.3277	326.6492	308.1735	284.8514	262.9319	248.2883	244.8444	253.5229	271.9985	295.3207	317.2402	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	(71)
Water heating gains (Table 5)													
	99.6295	97.4740	92.9977	86.9123	82.9614	77.3983	72.6699	78.7283	80.8809	87.1795	94.2916	97.4830	(72)
Total internal gains													
	584.7205	580.3064	558.6920	525.1812	490.8661	460.1362	442.1817	450.4987	469.7894	503.5134	540.9897	569.3479	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	8.2500	36.7938	0.6300	0.7000	0.7700	92.7686	(77)
Northwest	5.7600	11.2829	0.6300	0.7000	0.7700	19.8617	(81)

Solar gains	112.6303	198.4483	289.0491	387.5179	460.8618	469.3216	447.5686	391.0479	322.8654	224.0524	136.1065	95.6106	(83)
Total gains	697.3508	778.7546	847.7411	912.6990	951.7279	929.4579	889.7503	841.5466	792.6548	727.5658	677.0962	664.9585	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.7662	37.0920	37.4220	39.0552	39.3767	40.9460	40.9460	41.2504	40.3269	39.3767	38.7317	38.0795	
alpha	3.4511	3.4728	3.4948	3.6037	3.6251	3.7297	3.7297	3.7500	3.6885	3.6251	3.5821	3.5386	
util living area													
	0.9919	0.9872	0.9775	0.9519	0.8936	0.7682	0.6203	0.6639	0.8573	0.9607	0.9868	0.9932	(86)
MIT	19.0922	19.2820	19.6078	20.0862	20.4970	20.8220	20.9417	20.9246	20.6993	20.1759	19.5948	19.1157	(87)
Th 2	19.4085	19.4199	19.4313	19.4854	19.4956	19.5437	19.5437	19.5527	19.5251	19.4956	19.4749	19.4535	(88)
util rest of house													
	0.9889	0.9826	0.9687	0.9312	0.8424	0.6541	0.4431	0.4920	0.7702	0.9396	0.9812	0.9907	(89)
MIT 2	16.9757	17.2579	17.7358	18.4507	19.0130	19.4290	19.5250	19.5249	19.2954	18.5935	17.7477	17.0368	(90)
Living area fraction									fLA = Living area / (4) =			0.4655	(91)
MIT	17.9611	18.2002	18.6073	19.2121	19.7039	20.0775	20.1845	20.1765	19.9490	19.3302	18.6076	18.0046	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9611	18.2002	18.6073	19.2121	19.7039	20.0775	20.1845	20.1765	19.9490	19.3302	18.6076	18.0046	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9850	0.9775	0.9623	0.9264	0.8509	0.7009	0.5267	0.5726	0.7998	0.9365	0.9766	0.9873	(94)
Useful gains	686.9097	761.2155	815.7815	845.4828	809.8275	651.4378	468.6433	481.8373	633.9919	681.3397	661.2504	656.5404	(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													
	2100.6380	2027.1842	1829.0958	1492.7345	1149.1476	756.2844	494.9202	517.5837	819.9769	1253.4261	1679.7105	2049.4990	(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													
	1051.8138	850.7309	753.9058	466.0212	252.4542	0.0000	0.0000	0.0000	0.0000	425.6323	733.2913	1036.3612	(98)
Space heating												5570.2107	(98)
Space heating per m2											(98) / (4) =	68.4217	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)	100.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	5570.2107	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1051.8138	850.7309	753.9058	466.0212	252.4542	0.0000	0.0000	0.0000	0.0000	425.6323	733.2913	1036.3612	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	1051.8138	850.7309	753.9058	466.0212	252.4542	0.0000	0.0000	0.0000	0.0000	425.6323	733.2913	1036.3612	(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													
	181.6105	159.6787	166.7711	148.2139	144.3139	127.6124	121.2858	134.8420	135.1535	153.7523	164.1933	176.8073	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	181.6105	159.6787	166.7711	148.2139	144.3139	127.6124	121.2858	134.8420	135.1535	153.7523	164.1933	176.8073	(219)
Water heating fuel used												1814.2348	(219)
Annual totals kWh/year													
Space heating fuel - main system												5570.2107	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												360.2865	(232)
Total delivered energy for all uses												7744.7321	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5570.2107	13.1900	734.7108	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1814.2348	13.1900	239.2976	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	360.2865	13.1900	47.5218	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1021.5302	(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] =	3.3941	(257)
SAP value		52.6529	
SAP rating (Section 12)		53	(258)
SAP band		E	

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	5570.2107	0.5190	2890.9394	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1814.2348	0.5190	941.5879	(264)
Space and water heating			3832.5272	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	360.2865	0.5190	186.9887	(268)
Total kg/year			4019.5159	(272)
CO2 emissions per m2			49.3700	(273)
EI value			57.2727	
EI rating			57	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.4100 (1b)	x	2.5000 (2b)	=	203.5250	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.4100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	203.5250	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1965	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9465	(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) =	0.8046	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.9252	0.8850	0.9051	0.8046	0.8046	0.7040	0.7241	0.7241	0.7643	0.8046	0.7844	0.8649	(22b)
Effective ac	0.9280	0.8916	0.9096	0.8237	0.8237	0.7478	0.7622	0.7622	0.7921	0.8237	0.8077	0.8740	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			14.0100	1.5038	21.0677			(27)
Heat Loss Floor 1			81.4100	0.2200	17.9102			(28a)
External Wall	38.0000	16.1100	21.8900	0.5500	12.0395			(29a)
External Wall - lobby/stairwel	19.4000		19.4000	0.4769	9.2528			(29a)
Total net area of external elements Aum(A, m2)			138.8100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	64.0502			(33)
Party Wall 1			38.7800	0.0000	0.0000			(32)
Party Ceilings 1			81.4100					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	20.8215	(36)
Total fabric heat loss (33) + (36) =	84.8717	(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	62.3298	59.8843	61.0934	55.3193	55.3193	50.2246	51.1892	51.1892	53.1999	55.3193	54.2460	58.7023	(38)
Heat transfer coeff	147.2014	144.7559	145.9651	140.1910	140.1910	135.0962	136.0608	136.0608	138.0716	140.1910	139.1177	143.5739	(39)
Average = Sum(39)m / 12 =												140.5397	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8081	1.7781	1.7930	1.7220	1.7220	1.6595	1.6713	1.6713	1.6960	1.7220	1.7089	1.7636	(40)
HLP (average)												1.7263	(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	2.4891 (42)
Average daily hot water use (litres/day)	93.3154 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	102.6470	98.9143	95.1817	91.4491	87.7165	83.9839	83.9839	87.7165	91.4491	95.1817	98.9143	102.6470	(44)
Energy conte	152.2225	133.1347	137.3831	119.7739	114.9259	99.1724	91.8978	105.4540	106.7135	124.3643	135.7533	147.4193	(45)
Energy content (annual)										Total = Sum(45)m =		1468.2148	(45)
Distribution loss (46)m = 0.15 x (45)m	22.8334	19.9702	20.6075	17.9661	17.2389	14.8759	13.7847	15.8181	16.0070	18.6546	20.3630	22.1129	(46)

Water storage loss:	
Store volume	110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)

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

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month	181.6105	159.6787	166.7711	148.2139	144.3139	127.6124	121.2858	134.8420	135.1535	153.7523	164.1933	176.8073	(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	181.6105	159.6787	166.7711	148.2139	144.3139	127.6124	121.2858	134.8420	135.1535	153.7523	164.1933	176.8073	(64)
Total per year (kWh/year) = Sum(64)m =												1814.2348	(64)
Heat gains from water heating, kWh/month	74.1244	65.5025	69.1903	62.5768	61.7233	55.7268	54.0664	58.5739	58.2342	64.8615	67.8900	72.5273	(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	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	149.3442	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.0023	45.2998	36.8403	27.8904	20.8484	17.6011	19.0186	24.7211	33.1807	42.1305	49.1725	52.4198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	331.8838	335.3277	326.6492	308.1735	284.8514	262.9319	248.2883	244.8444	253.5229	271.9985	295.3207	317.2402	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	52.4235	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	-99.5628	(71)
Water heating gains (Table 5)	99.6295	97.4740	92.9977	86.9123	82.9614	77.3983	72.6699	78.7283	80.8809	87.1795	94.2916	97.4830	(72)
Total internal gains	584.7205	580.3064	558.6920	525.1812	490.8661	460.1362	442.1817	450.4987	469.7894	503.5134	540.9897	569.3479	(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	
Southeast	8.2500	40.5720	0.6300	0.7000	0.7700	102.2945	(77)
Northwest	5.7600	12.9280	0.6300	0.7000	0.7700	22.7576	(81)

Solar gains	125.0521	202.1768	289.8500	400.9878	465.6157	507.7698	476.5742	422.2841	348.1056	239.7519	154.8847	105.0917	(83)
Total gains	709.7727	782.4832	848.5420	926.1689	956.4818	967.9061	918.7559	872.7828	817.8949	743.2653	695.8744	674.4396	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.4064	39.0552	38.7317	40.3269	40.3269	41.8477	41.5511	41.5511	40.9460	40.3269	40.6381	39.3767	
alpha	3.5604	3.6037	3.5821	3.6885	3.6885	3.7898	3.7701	3.7701	3.7297	3.6885	3.7092	3.6251	
util living area	0.9911	0.9866	0.9750	0.9432	0.8739	0.6929	0.5208	0.5437	0.8179	0.9510	0.9844	0.9925	(86)
MIT	19.2226	19.4016	19.7290	20.1990	20.5843	20.8951	20.9737	20.9696	20.7748	20.2884	19.7362	19.2364	(87)
Th 2	19.4643	19.4854	19.4749	19.5251	19.5251	19.5700	19.5615	19.5615	19.5437	19.5251	19.5345	19.4956	(88)
util rest of house	0.9879	0.9818	0.9651	0.9189	0.8137	0.5590	0.3313	0.3480	0.7122	0.9242	0.9777	0.9897	(89)
MIT 2	17.1988	17.4710	17.9373	18.6338	19.1447	19.5147	19.5563	19.5554	19.3899	18.7689	17.9890	17.2380	(90)
Living area fraction									fLA = Living area / (4) =			0.4655	(91)
MIT	18.1410	18.3698	18.7714	19.3625	19.8149	20.1573	20.2162	20.2138	20.0346	19.4763	18.8024	18.1683	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1410	18.3698	18.7714	19.3625	19.8149	20.1573	20.2162	20.2138	20.0346	19.4763	18.8024	18.1683	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9839	0.9769	0.9589	0.9155	0.8276	0.6187	0.4213	0.4413	0.7533	0.9231	0.9730	0.9862	(94)
Useful gains	698.3575	764.3702	813.6623	847.9016	791.6312	598.8461	387.0894	385.1437	616.1584	686.0720	677.1045	665.1569	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	2007.9702	1935.3560	1732.8125	1410.6727	1067.5414	656.2050	396.7770	396.4497	750.3666	1174.2810	1586.2803	1962.4175	(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	974.3518	786.9024	683.8478	405.1952	205.2772	0.0000	0.0000	0.0000	0.0000	363.2275	654.6066	965.1619	(98)
Space heating												5038.5705	(98)
Space heating per m2											(98) / (4) =	61.8913	(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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												5038.5705	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	974.3518	786.9024	683.8478	405.1952	205.2772	0.0000	0.0000	0.0000	0.0000	363.2275	654.6066	965.1619	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	974.3518	786.9024	683.8478	405.1952	205.2772	0.0000	0.0000	0.0000	0.0000	363.2275	654.6066	965.1619	(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													
	181.6105	159.6787	166.7711	148.2139	144.3139	127.6124	121.2858	134.8420	135.1535	153.7523	164.1933	176.8073	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	181.6105	159.6787	166.7711	148.2139	144.3139	127.6124	121.2858	134.8420	135.1535	153.7523	164.1933	176.8073	(219)
Water heating fuel used												1814.2348	(219)
Annual totals kWh/year													
Space heating fuel - main system												5038.5705	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												360.2865	(232)
Total delivered energy for all uses												7213.0918	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5038.5705	18.2700	920.5468	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1814.2348	18.2700	331.4607	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	360.2865	18.2700	65.8243	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1317.8319	(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	5038.5705	0.5190	2615.0181	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1814.2348	0.5190	941.5879	(264)
Space and water heating			3556.6060	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	360.2865	0.5190	186.9887	(268)
Total kg/year			3743.5947	(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	5038.5705	3.0700	15468.4114	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1814.2348	3.0700	5569.7009	(264)
Space and water heating			21038.1123	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	360.2865	3.0700	1106.0796	(268)
Primary energy kWh/year			22144.1920	(272)
Primary energy kWh/m2/year			272.0083	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	E 53
Current environmental impact rating:	D 57

(For testing purposes):

A	Not considered
B	Not considered

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

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:	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: E 53
Potential environmental impact rating: D 57

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£1318	£1318	£0
Space heating	£921	£921	£0
Water heating	£331	£331	£0
Lighting	£66	£66	£0
Total cost of fuels	£1318	£1318	£0
Total cost of uses	£1318	£1318	£0
Delivered energy	89 kWh/m²	89 kWh/m²	0 kWh/m²
Carbon dioxide emissions	3.7 tonnes	3.7 tonnes	0.0 tonnes
CO2 emissions per m²	46 kg/m²	46 kg/m²	0 kg/m²
Primary energy	272 kWh/m²	272 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
```

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-2	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit G.02, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	53 E	**DER**	N/A	**TER**	N/A
Environmental	57 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	3.74	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	22.96 m	81.41 m²	2.50 m

7.0 Living Area	37.90	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.55	38.00	21.89
External Wall - lobby/stairwel	Solid Wall	Other	0.60	19.40	19.40

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	38.78

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	81.41

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid	Slab on ground, screed over insulation	0.22	81.41

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.60

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[1] External Wall	South West							2.10	
windows	Window	[1] External Wall	South East	None	0.00					8.25	
windows	Window	[1] External Wall	North West	None	0.00					5.76	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating		
Windows open in hot weather	Calculated rate	
Night Ventilation	No	
Air change rate	2.00	
Mechanical Ventilation		
Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				4
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal		
Total number of light fittings	8	
Total number of L.E.L. fittings	8	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit G.03, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

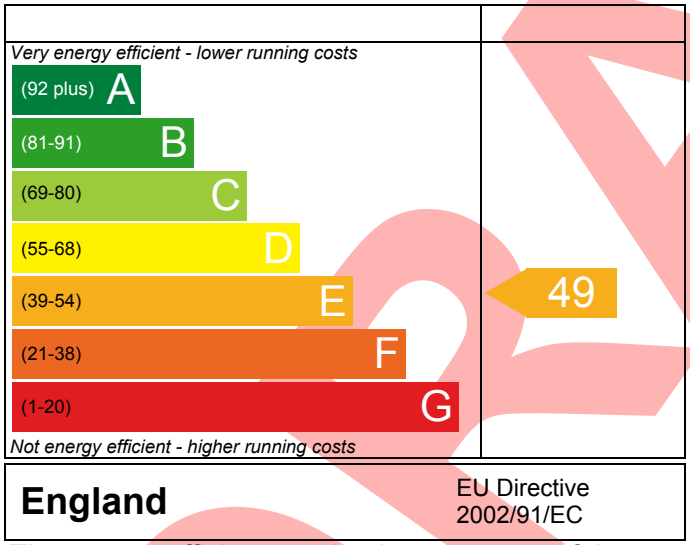
Unit G.03, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	47.4 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

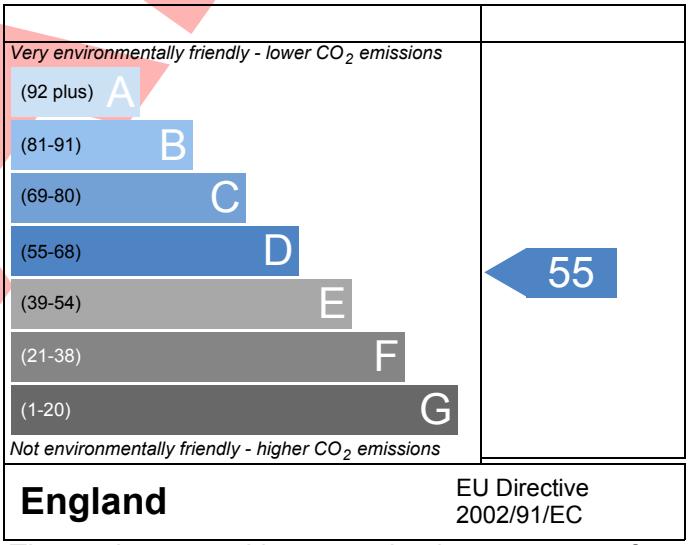
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-3	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit G.03, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	49 E	**DER**	N/A	**TER**	N/A
Environmental	55 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.96	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.4000 (1b)	x	2.5000 (2b)	=	118.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	118.5000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2532	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0032	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7775	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8941	0.8552	0.8746	0.7775	0.7775	0.6803	0.6997	0.6997	0.7386	0.7775	0.7580	0.8358	(22b)
Effective ac	0.8997	0.8657	0.8825	0.8022	0.8022	0.7314	0.7448	0.7448	0.7728	0.8022	0.7873	0.8492	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			8.2500	2.5180	20.7734			(27)
Heat Loss Floor 1			47.4000	0.6000	28.4400			(28a)
External Wall	21.3000	10.3500	10.9500	0.6000	6.5700			(29a)
External Wall - lobby/stairwel	14.4500		14.4500	0.4769	6.8919			(29a)
Total net area of external elements Aum(A, m2)			83.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		66.4553			(33)
Party Wall 1			35.6500	0.0000	0.0000			(32)
Party Ceilings 1			47.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	12.4725	(36)
Total fabric heat loss	(33) + (36) = 78.9278	(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	35.1820	33.8525	34.5099	31.3707	31.3707	28.6008	29.1252	29.1252	30.2184	31.3707	30.7871	33.2099	(38)
Heat transfer coeff	114.1098	112.7803	113.4376	110.2984	110.2984	107.5286	108.0530	108.0530	109.1462	110.2984	109.7149	112.1376	(39)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 = 110.4880 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.4074	2.3793	2.3932	2.3270	2.3270	2.2685	2.2796	2.2796	2.3027	2.3270	2.3147	2.3658	(40)
HLP (average)												2.3310	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6139 (42)
Average daily hot water use (litres/day) 72.5304 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	79.7835	76.8822	73.9810	71.0798	68.1786	65.2774	65.2774	68.1786	71.0798	73.9810	76.8822	79.7835	(44)
Energy conte	118.3166	103.4804	106.7825	93.0956	89.3274	77.0828	71.4285	81.9653	82.9442	96.6635	105.5158	114.5833	(45)
Energy content (annual)										Total = Sum(45)m =		1141.1860	(45)
Distribution loss (46)m = 0.15 x (45)m													
	17.7475	15.5221	16.0174	13.9643	13.3991	11.5624	10.7143	12.2948	12.4416	14.4995	15.8274	17.1875	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	147.7046	130.0244	136.1705	121.5356	118.7154	105.5228	100.8165	111.3533	111.3842	126.0515	133.9558	143.9713	(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													
	147.7046	130.0244	136.1705	121.5356	118.7154	105.5228	100.8165	111.3533	111.3842	126.0515	133.9558	143.9713	(64)
								Total per year (kWh/year) = Sum(64)m =				1487.2060	(64)
RHI water heating demand												1487	(64)
Heat gains from water heating, kWh/month													
	62.8507	55.6424	59.0156	53.7063	53.2118	48.3820	47.2604	50.7639	50.3310	55.6510	57.8360	61.6093	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	32.1590	28.5633	23.2292	17.5860	13.1458	11.0982	11.9920	15.5877	20.9217	26.5649	31.0052	33.0528	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	209.6801	211.8559	206.3729	194.7003	179.9656	166.1171	156.8655	154.6897	160.1727	171.8453	186.5800	200.4285	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	(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)													
	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	(71)
Water heating gains (Table 5)													
	84.4767	82.8013	79.3220	74.5921	71.5212	67.1973	63.5220	68.2310	69.9041	74.7997	80.3278	82.8083	(72)
Total internal gains													
	404.8914	401.7961	387.4998	365.4540	343.2082	322.9882	310.9552	317.0840	329.5741	351.7857	376.4886	394.8651	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	8.2500	40.5720	0.7600	0.7000	0.7700	123.4029	(77)

Solar gains	123.4029	192.4595	258.5081	330.2742	361.7192	385.0164	365.1202	338.7801	300.7641	223.1701	151.3990	104.6115	(83)
Total gains	528.2943	594.2556	646.0080	695.7282	704.9275	708.0046	676.0753	655.8640	630.3382	574.9557	527.8875	499.4767	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.8465	29.1866	29.0174	29.8433	29.8433	30.6120	30.4634	30.4634	30.1583	29.8433	30.0020	29.3538	
alpha	2.9231	2.9458	2.9345	2.9896	2.9896	3.0408	3.0309	3.0309	3.0106	2.9896	3.0001	2.9569	
util living area													
	0.9824	0.9742	0.9571	0.9206	0.8540	0.6959	0.5355	0.5481	0.7878	0.9246	0.9709	0.9847	(86)
MIT	18.8013	19.0160	19.4149	19.9394	20.3986	20.8021	20.9379	20.9338	20.6693	20.0857	19.3988	18.7964	(87)
Th 2	19.0756	19.0924	19.0841	19.1243	19.1243	19.1603	19.1534	19.1534	19.1392	19.1243	19.1318	19.1006	(88)
util rest of house													
	0.9758	0.9648	0.9398	0.8852	0.7785	0.5322	0.2910	0.2995	0.6544	0.8825	0.9581	0.9790	(89)
MIT 2	16.3657	16.6833	17.2503	18.0065	18.6106	19.0680	19.1449	19.1442	18.9403	18.2217	17.2611	16.3725	(90)
Living area fraction									fLA = Living area / (4) =			0.6042	(91)
MIT	17.8373	18.0928	18.5582	19.1744	19.6910	20.1158	20.2283	20.2255	19.9850	19.3480	18.5527	17.8371	(92)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment											0.0000	
adjusted MIT	17.8373	18.0928	18.5582	19.1744	19.6910	20.1158	20.2283	20.2255	19.9850	19.3480	18.5527	17.8371 (93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9699	0.9579	0.9335	0.8864	0.8054	0.6256	0.4419	0.4531	0.7238	0.8888	0.9527	0.9736	(94)
Useful gains	512.3945	569.2494	603.0790	616.6943	567.7276	442.9460	298.7245	297.1846	456.2518	511.0421	502.9255	486.3141	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1521.9189	1476.6077	1322.4763	1089.1338	826.2426	517.8361	316.4079	316.1081	587.7511	909.7414	1223.6216	1495.5898	(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													
	751.0861	609.7448	535.2316	340.1564	192.3352	0.0000	0.0000	0.0000	0.0000	296.6323	518.9012	750.9011	(98)
Space heating												3994.9888	(98)
RHI space heating demand												3995	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.4000 (1b)	x	2.5000 (2b)	=	118.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	118.5000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2532	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0032	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7775	(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	0.9913	0.9718	0.9524	0.8552	0.8358	0.7386	0.7386	0.7191	0.7775	0.8358	0.8746	0.9135	(22b)
Effective ac	0.9913	0.9722	0.9535	0.8657	0.8492	0.7728	0.7728	0.7586	0.8022	0.8492	0.8825	0.9172	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			8.2500	2.5180	20.7734			(27)
Heat Loss Floor 1			47.4000	0.6000	28.4400			(28a)
External Wall	21.3000	10.3500	10.9500	0.6000	6.5700			(29a)
External Wall - lobby/stairwel	14.4500		14.4500	0.4769	6.8919			(29a)
Total net area of external elements Aum(A, m2)			83.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		66.4553			(33)
Party Wall 1			35.6500	0.0000	0.0000			(32)
Party Ceilings 1			47.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	12.4725	(36)
Total fabric heat loss (33) + (36) =	78.9278	(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	38.7644	38.0184	37.2871	33.8525	33.2099	30.2184	30.2184	29.6644	31.3707	33.2099	34.5099	35.8690	(38)
Heat transfer coeff	117.6922	116.9462	116.2149	112.7803	112.1376	109.1462	109.1462	108.5922	110.2984	112.1376	113.4376	114.7967	(39)
Average = Sum(39)m / 12 =												112.7772	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.4830	2.4672	2.4518	2.3793	2.3658	2.3027	2.3027	2.2910	2.3270	2.3658	2.3932	2.4219	(40)
HLP (average)												2.3793	(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	1.6139	(42)
Average daily hot water use (litres/day)	72.5304	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	79.7835	76.8822	73.9810	71.0798	68.1786	65.2774	65.2774	68.1786	71.0798	73.9810	76.8822	79.7835	(44)
Energy conte	118.3166	103.4804	106.7825	93.0956	89.3274	77.0828	71.4285	81.9653	82.9442	96.6635	105.5158	114.5833	(45)
Energy content (annual)										Total = Sum(45)m =		1141.1860	(45)
Distribution loss (46)m = 0.15 x (45)m	17.7475	15.5221	16.0174	13.9643	13.3991	11.5624	10.7143	12.2948	12.4416	14.4995	15.8274	17.1875	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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  Temperature factor from Table 2b                                                                                                0.6000 (49)
Enter (49) or (54) in (55)                                                                                                        0.9480 (55)
Total storage loss
                29.3880     26.5440     29.3880     28.4400     29.3880     28.4400     29.3880     29.3880     28.4400     29.3880     28.4400     29.3880 (56)
If cylinder contains dedicated solar storage
                29.3880     26.5440     29.3880     28.4400     29.3880     28.4400     29.3880     29.3880     28.4400     29.3880     28.4400     29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
               147.7046    130.0244    136.1705    121.5356    118.7154    105.5228    100.8165    111.3533    111.3842    126.0515    133.9558    143.9713 (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
               147.7046    130.0244    136.1705    121.5356    118.7154    105.5228    100.8165    111.3533    111.3842    126.0515    133.9558    143.9713 (64)
                                                                                                     Total per year (kWh/year) = Sum(64)m =    1487.2060 (64)
Heat gains from water heating, kWh/month
                62.8507     55.6424     59.0156     53.7063     53.2118     48.3820     47.2604     50.7639     50.3310     55.6510     57.8360     61.6093 (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           96.8348     96.8348     96.8348     96.8348     96.8348     96.8348     96.8348     96.8348     96.8348     96.8348     96.8348     96.8348 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
                32.1590     28.5633     23.2292     17.5860     13.1458     11.0982     11.9920     15.5877     20.9217     26.5649     31.0052     33.0528 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
               209.6801    211.8559    206.3729    194.7003    179.9656    166.1171    156.8655    154.6897    160.1727    171.8453    186.5800    200.4285 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
                46.2974     46.2974     46.2974     46.2974     46.2974     46.2974     46.2974     46.2974     46.2974     46.2974     46.2974     46.2974 (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)
               -64.5565    -64.5565    -64.5565    -64.5565    -64.5565    -64.5565    -64.5565    -64.5565    -64.5565    -64.5565    -64.5565    -64.5565 (71)
Water heating gains (Table 5)
                84.4767     82.8013     79.3220     74.5921     71.5212     67.1973     63.5220     68.2310     69.9041     74.7997     80.3278     82.8083 (72)
Total internal gains
               404.8914    401.7961    387.4998    365.4540    343.2082    322.9882    310.9552    317.0840    329.5741    351.7857    376.4886    394.8651 (73)

----------------------------------------------------------------------------------------------------
6. Solar gains
----------------------------------------------------------------------------------------------------
[Jan]                                        Area         Solar flux               g               FF             Access             Gains
                                               m2           Table 6a   Specific data   Specific data             factor                 W
                                                                W/m2     or Table 6b     or Table 6c           Table 6d
----------------------------------------------------------------------------------------------------
Southeast                                  8.2500            36.7938          0.7600          0.7000             0.7700          111.9113 (77)
----------------------------------------------------------------------------------------------------

Solar gains    111.9113    190.6263    260.8232    323.1726    361.9803    359.3626    346.4639    317.5117    282.4164    210.6827    134.0439     95.7727 (83)
Total gains    516.8027    592.4224    648.3231    688.6266    705.1885    682.3508    657.4191    634.5956    611.9905    562.4683    510.5325    490.6379 (84)

----------------------------------------------------------------------------------------------------
7. Mean internal temperature (heating season)
----------------------------------------------------------------------------------------------------
Temperature during heating periods in the living area from Table 9, Th1 (C)                                                      21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
                    Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec
tau             27.9684     28.1469     28.3240     29.1866     29.3538     30.1583     30.1583     30.3122     29.8433     29.3538     29.0174     28.6739
alpha            2.8646      2.8765      2.8883      2.9458      2.9569      3.0106      3.0106      3.0208      2.9896      2.9569      2.9345      2.9116
util living area
                 0.9839      0.9751      0.9600      0.9292      0.8707      0.7594      0.6237      0.6556      0.8243      0.9365      0.9750      0.9861 (86)

MIT             18.6771     18.9144     19.2980     19.8267     20.3043     20.7046     20.8850     20.8630     20.5813     19.9627     19.2568     18.6758 (87)
Th 2            19.0308     19.0400     19.0491     19.0924     19.1006     19.1392     19.1392     19.1464     19.1243     19.1006     19.0841     19.0669 (88)
util rest of house
                 0.9779      0.9659      0.9442      0.8978      0.8045      0.6211      0.4029      0.4432      0.7110      0.9016      0.9640      0.9810 (89)
MIT 2           16.1626     16.5090     17.0640     17.8329     18.4769     18.9675     19.1097     19.1056     18.8398     18.0408     17.0319     16.1797 (90)
Living area fraction                                                                                  fLA = Living area / (4) =       0.6042 (91)
MIT             17.6819     17.9624     18.4138     19.0376     19.5810     20.0171     20.1824     20.1675     19.8921     19.2020     18.3762     17.6879 (92)
Temperature adjustment                                                                                                            0.0000
adjusted MIT    17.6819     17.9624     18.4138     19.0376     19.5810     20.0171     20.1824     20.1675     19.8921     19.2020     18.3762     17.6879 (93)

----------------------------------------------------------------------------------------------------
8. Space heating requirement
----------------------------------------------------------------------------------------------------

                    Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec
Utilisation      0.9720      0.9588      0.9373      0.8967      0.8245      0.6946      0.5372      0.5713      0.7652      0.9040      0.9583      0.9757 (94)
Useful gains   502.3410    568.0223    607.6698    617.4977    581.4239    473.9535    353.1386    362.5523    468.2988    508.4992    489.2455    478.7001 (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
              1574.9475   1527.5958   1384.5638   1143.3163    883.7603    591.2550    391.0047    409.1200    638.8569    964.6122   1279.1480   1548.3679 (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
               798.0192    644.8334    578.0091    378.5894    224.9383      0.0000      0.0000      0.0000      0.0000    339.3481    568.7298    795.8329 (98)
Space heating                                                                                                                  4328.3001 (98)
Space heating per m2                                                                                          (98) / (4) =       91.3143 (99)

----------------------------------------------------------------------------------------------------
8c. Space cooling requirement
----------------------------------------------------------------------------------------------------
Not applicable
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CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												4328.3001	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	798.0192	644.8334	578.0091	378.5894	224.9383	0.0000	0.0000	0.0000	0.0000	339.3481	568.7298	795.8329	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	798.0192	644.8334	578.0091	378.5894	224.9383	0.0000	0.0000	0.0000	0.0000	339.3481	568.7298	795.8329	(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													
	147.7046	130.0244	136.1705	121.5356	118.7154	105.5228	100.8165	111.3533	111.3842	126.0515	133.9558	143.9713	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	147.7046	130.0244	136.1705	121.5356	118.7154	105.5228	100.8165	111.3533	111.3842	126.0515	133.9558	143.9713	(219)
Water heating fuel used												1487.2060	(219)
Annual totals kWh/year													
Space heating fuel - main system												4328.3001	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												227.1750	(232)
Total delivered energy for all uses												6042.6811	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4328.3001	13.1900	570.9028	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1487.2060	13.1900	196.1625	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	227.1750	13.1900	29.9644	(250)
Additional standing charges			0.0000	(251)
Total energy cost			797.0296	(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] =	3.6229	(257)
SAP value		49.3547	
SAP rating (Section 12)		49	(258)
SAP band		E	

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	4328.3001	0.5190	2246.3878	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1487.2060	0.5190	771.8599	(264)
Space and water heating			3018.2477	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	227.1750	0.5190	117.9038	(268)
Total kg/year			3136.1515	(272)
CO2 emissions per m2			66.1600	(273)
EI value			54.5811	
EI rating			55	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.4000 (1b)	x	2.5000 (2b)	=	118.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	118.5000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2532	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0032	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7775	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8941	0.8552	0.8746	0.7775	0.7775	0.6803	0.6997	0.6997	0.7386	0.7775	0.7580	0.8358	(22b)
Effective ac	0.8997	0.8657	0.8825	0.8022	0.8022	0.7314	0.7448	0.7448	0.7728	0.8022	0.7873	0.8492	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			8.2500	2.5180	20.7734			(27)
Heat Loss Floor 1			47.4000	0.6000	28.4400			(28a)
External Wall	21.3000	10.3500	10.9500	0.6000	6.5700			(29a)
External Wall - lobby/stairwel	14.4500		14.4500	0.4769	6.8919			(29a)
Total net area of external elements Aum(A, m2)			83.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		66.4553			(33)
Party Wall 1			35.6500	0.0000	0.0000			(32)
Party Ceilings 1			47.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	12.4725	(36)
Total fabric heat loss (33) + (36) =	78.9278	(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	35.1820	33.8525	34.5099	31.3707	31.3707	28.6008	29.1252	29.1252	30.2184	31.3707	30.7871	33.2099	(38)
Heat transfer coeff	114.1098	112.7803	113.4376	110.2984	110.2984	107.5286	108.0530	108.0530	109.1462	110.2984	109.7149	112.1376	(39)
Average = Sum(39)m / 12 =												110.4880	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.4074	2.3793	2.3932	2.3270	2.3270	2.2685	2.2796	2.2796	2.3027	2.3270	2.3147	2.3658	(40)
HLP (average)												2.3310	(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	1.6139 (42)
Average daily hot water use (litres/day)	72.5304 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	79.7835	76.8822	73.9810	71.0798	68.1786	65.2774	65.2774	68.1786	71.0798	73.9810	76.8822	79.7835	(44)
Energy conte	118.3166	103.4804	106.7825	93.0956	89.3274	77.0828	71.4285	81.9653	82.9442	96.6635	105.5158	114.5833	(45)
Energy content (annual)										Total = Sum(45)m =		1141.1860	(45)
Distribution loss (46)m = 0.15 x (45)m	17.7475	15.5221	16.0174	13.9643	13.3991	11.5624	10.7143	12.2948	12.4416	14.4995	15.8274	17.1875	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)

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

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	147.7046	130.0244	136.1705	121.5356	118.7154	105.5228	100.8165	111.3533	111.3842	126.0515	133.9558	143.9713	(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													
	147.7046	130.0244	136.1705	121.5356	118.7154	105.5228	100.8165	111.3533	111.3842	126.0515	133.9558	143.9713	(64)
								Total per year (kWh/year) = Sum(64)m =				1487.2060	(64)
Heat gains from water heating, kWh/month													
	62.8507	55.6424	59.0156	53.7063	53.2118	48.3820	47.2604	50.7639	50.3310	55.6510	57.8360	61.6093	(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	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	96.8348	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	32.1590	28.5633	23.2292	17.5860	13.1458	11.0982	11.9920	15.5877	20.9217	26.5649	31.0052	33.0528	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	209.6801	211.8559	206.3729	194.7003	179.9656	166.1171	156.8655	154.6897	160.1727	171.8453	186.5800	200.4285	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	46.2974	(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)													
	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	-64.5565	(71)
Water heating gains (Table 5)													
	84.4767	82.8013	79.3220	74.5921	71.5212	67.1973	63.5220	68.2310	69.9041	74.7997	80.3278	82.8083	(72)
Total internal gains													
	404.8914	401.7961	387.4998	365.4540	343.2082	322.9882	310.9552	317.0840	329.5741	351.7857	376.4886	394.8651	(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	
Southeast	8.2500	40.5720	0.7600	0.7000	0.7700	123.4029	(77)

Solar gains	123.4029	192.4595	258.5081	330.2742	361.7192	385.0164	365.1202	338.7801	300.7641	223.1701	151.3990	104.6115	(83)
Total gains	528.2943	594.2556	646.0080	695.7282	704.9275	708.0046	676.0753	655.8640	630.3382	574.9557	527.8875	499.4767	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.8465	29.1866	29.0174	29.8433	29.8433	30.6120	30.4634	30.4634	30.1583	29.8433	30.0020	29.3538	
alpha	2.9231	2.9458	2.9345	2.9896	2.9896	3.0408	3.0309	3.0309	3.0106	2.9896	3.0001	2.9569	
util living area													
	0.9824	0.9742	0.9571	0.9206	0.8540	0.6959	0.5355	0.5481	0.7878	0.9246	0.9709	0.9847	(86)
MIT	18.8013	19.0160	19.4149	19.9394	20.3986	20.8021	20.9379	20.9338	20.6693	20.0857	19.3988	18.7964	(87)
Th 2	19.0756	19.0924	19.0841	19.1243	19.1243	19.1603	19.1534	19.1534	19.1392	19.1243	19.1318	19.1006	(88)
util rest of house													
	0.9758	0.9648	0.9398	0.8852	0.7785	0.5322	0.2910	0.2995	0.6544	0.8825	0.9581	0.9790	(89)
MIT 2	16.3657	16.6833	17.2503	18.0065	18.6106	19.0680	19.1449	19.1442	18.9403	18.2217	17.2611	16.3725	(90)
Living area fraction										fLA = Living area / (4) =		0.6042	(91)
MIT	17.8373	18.0928	18.5582	19.1744	19.6910	20.1158	20.2283	20.2255	19.9850	19.3480	18.5527	17.8371	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.8373	18.0928	18.5582	19.1744	19.6910	20.1158	20.2283	20.2255	19.9850	19.3480	18.5527	17.8371	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9699	0.9579	0.9335	0.8864	0.8054	0.6256	0.4419	0.4531	0.7238	0.8888	0.9527	0.9736	(94)
Useful gains	512.3945	569.2494	603.0790	616.6943	567.7276	442.9460	298.7245	297.1846	456.2518	511.0421	502.9255	486.3141	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1521.9189	1476.6077	1322.4763	1089.1338	826.2426	517.8361	316.4079	316.1081	587.7511	909.7414	1223.6216	1495.5898	(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													
	751.0861	609.7448	535.2316	340.1564	192.3352	0.0000	0.0000	0.0000	0.0000	296.6323	518.9012	750.9011	(98)
Space heating												3994.9888	(98)
Space heating per m2											(98) / (4) =	84.2825	(99)

8c. Space cooling requirement

Not applicable

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

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3994.9888	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	751.0861	609.7448	535.2316	340.1564	192.3352	0.0000	0.0000	0.0000	0.0000	296.6323	518.9012	750.9011	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	751.0861	609.7448	535.2316	340.1564	192.3352	0.0000	0.0000	0.0000	0.0000	296.6323	518.9012	750.9011	(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													
	147.7046	130.0244	136.1705	121.5356	118.7154	105.5228	100.8165	111.3533	111.3842	126.0515	133.9558	143.9713	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	147.7046	130.0244	136.1705	121.5356	118.7154	105.5228	100.8165	111.3533	111.3842	126.0515	133.9558	143.9713	(219)
Water heating fuel used												1487.2060	(219)
Annual totals kWh/year													
Space heating fuel - main system												3994.9888	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												227.1750	(232)
Total delivered energy for all uses												5709.3698	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3994.9888	18.2700	729.8845	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1487.2060	18.2700	271.7125	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	227.1750	18.2700	41.5049	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1043.1019	(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	3994.9888	0.5190	2073.3992	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1487.2060	0.5190	771.8599	(264)
Space and water heating			2845.2591	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	227.1750	0.5190	117.9038	(268)
Total kg/year			2963.1629	(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	3994.9888	3.0700	12264.6156	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1487.2060	3.0700	4565.7224	(264)
Space and water heating			16830.3381	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	227.1750	3.0700	697.4272	(268)
Primary energy kWh/year			17527.7653	(272)
Primary energy kWh/m2/year			369.7841	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	E 49
Current environmental impact rating:	D 55

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered

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

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:	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: E 49
Potential environmental impact rating: D 55

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£1043	£1043	£0
Space heating	£730	£730	£0
Water heating	£272	£272	£0
Lighting	£42	£42	£0
Total cost of fuels	£1043	£1043	£0
Total cost of uses	£1044	£1044	£0
Delivered energy	120 kWh/m²	120 kWh/m²	0 kWh/m²
Carbon dioxide emissions	3.0 tonnes	3.0 tonnes	0.0 tonnes
CO2 emissions per m²	63 kg/m²	63 kg/m²	0 kg/m²
Primary energy	370 kWh/m²	370 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-3	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit G.03, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	49 E	**DER**	N/A	**TER**	N/A
Environmental	55 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.96	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	14.30 m	47.40 m²	2.50 m

7.0 Living Area	28.64	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	21.30	10.95
External Wall - lobby/stairwel	Solid Wall	Other	0.60	14.45	14.45

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	35.65

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	47.40

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid	Slab on ground, screed over insulation	0.60	47.40

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[1] External Wall	North East							2.10	
windows	Window	[1] External Wall	South East	None	0.00					8.25	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate	
Night Ventilation	No	
Air change rate	2.00	

Mechanical Ventilation

Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%

Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit G.04, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

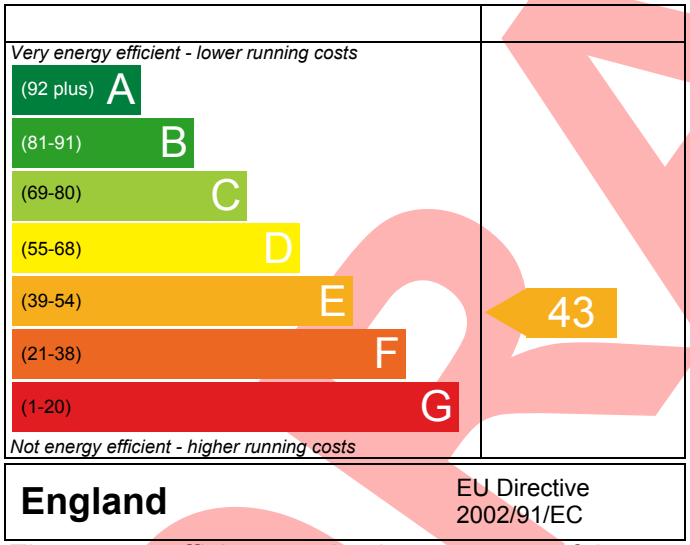
Unit G.04, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	54.08 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

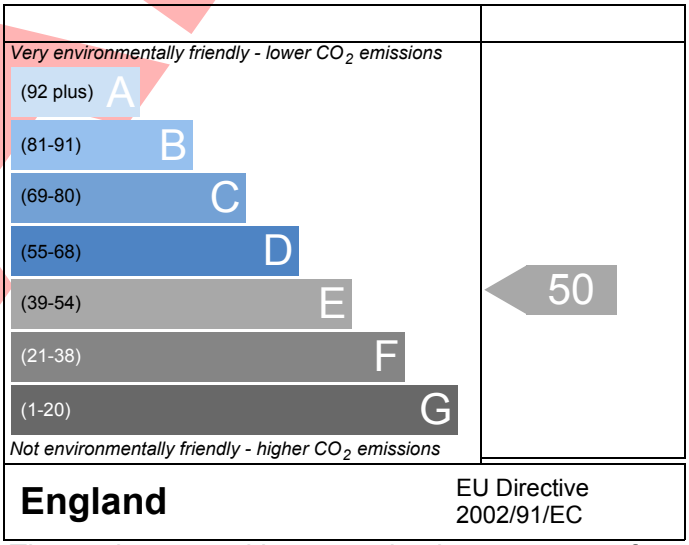
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-4	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit G.04, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	43 E	**DER**	N/A	**TER**	N/A
Environmental	50 E	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	3.59	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.0800 (1b)	x	2.5000 (2b)	=	135.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.0800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	135.2000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2219 (8)
Pressure test		No
Measured/design AP50		15.0000
Infiltration rate		0.9719 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7532 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8662	0.8285	0.8474	0.7532	0.7532	0.6591	0.6779	0.6779	0.7156	0.7532	0.7344	0.8097	(22b)
Effective ac	0.8752	0.8432	0.8590	0.7837	0.7837	0.7172	0.7298	0.7298	0.7560	0.7837	0.7697	0.8278	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			9.6000	2.5180	24.1727			(27)
Heat Loss Floor 1			54.0800	0.6000	32.4480			(28a)
External Wall	30.1700	9.6000	20.5700	0.6000	12.3420			(29a)
External Wall - lobby/stairwel	17.3800	2.1000	15.2800	0.4769	7.2878			(29a)
Total net area of external elements Aum(A, m2)			101.6300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	80.0304			(33)
Party Wall 1			38.3300	0.0000	0.0000			(32)
Party Ceilings 1			54.0800					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)		15.2445 (36)
Total fabric heat loss	(33) + (36) =	95.2749 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.0457	37.6219	38.3259	34.9641	34.9641	31.9979	32.5595	32.5595	33.7302	34.9641	34.3392	36.9338	(38)
Heat transfer coeff	134.3207	132.8969	133.6009	130.2391	130.2391	127.2728	127.8344	127.8344	129.0051	130.2391	129.6142	132.2087	(39)

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Average = Sum(39)m / 12 = 130.4421 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.4837	2.4574	2.4704	2.4083	2.4083	2.3534	2.3638	2.3638	2.3854	2.4083	2.3967	2.4447	(40)
HLP (average)												2.4120	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8104 (42)

Average daily hot water use (litres/day) 77.1959 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	84.9155	81.8277	78.7399	75.6520	72.5642	69.4763	69.4763	72.5642	75.6520	78.7399	81.8277	84.9155	(44)
Energy conte	125.9273	110.1368	113.6513	99.0840	95.0734	82.0411	76.0232	87.2377	88.2796	102.8814	112.3031	121.9538	(45)
Energy content (annual)										Total = Sum(45)m =		1214.5927	(45)
Distribution loss (46)m = 0.15 x (45)m													
	18.8891	16.5205	17.0477	14.8626	14.2610	12.3062	11.4035	13.0857	13.2419	15.4322	16.8455	18.2931	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	155.3153	136.6808	143.0393	127.5240	124.4614	110.4811	105.4112	116.6257	116.7196	132.2694	140.7431	151.3418	(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													
	155.3153	136.6808	143.0393	127.5240	124.4614	110.4811	105.4112	116.6257	116.7196	132.2694	140.7431	151.3418	(64)
								Total per year (kWh/year) = Sum(64)m =				1560.6127	(64)
RHI water heating demand												1561	(64)
Heat gains from water heating, kWh/month													
	65.3812	57.8557	61.2995	55.6974	55.1223	50.0307	48.7881	52.5169	52.1050	57.7185	60.0928	64.0601	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	36.0049	31.9793	26.0073	19.6892	14.7179	12.4255	13.4262	17.4518	23.4238	29.7419	34.7132	37.0056	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	235.5397	237.9838	231.8246	218.7124	202.1605	186.6041	176.2115	173.7673	179.9265	193.0388	209.5906	225.1470	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	(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)													
	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	(71)
Water heating gains (Table 5)													
	87.8780	86.0948	82.3918	77.3575	74.0891	69.4871	65.5754	70.5873	72.3680	77.5786	83.4622	86.1022	(72)
Total internal gains													
	443.3022	439.9374	424.1032	399.6387	374.8471	352.3962	339.0926	345.6860	359.5979	384.2388	411.6456	432.1345	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	9.6000	12.9280	0.7600	0.7000	0.7700	45.7561	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	45.7561	85.7272	151.9203	255.7619	333.2931	379.2190	349.6578	284.4034	198.6213	110.0907	59.0768	36.9429	(83)
Total gains	489.0582	525.6647	576.0236	655.4006	708.1402	731.6152	688.7504	630.0894	558.2192	494.3296	470.7224	469.0774	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.9596	28.2592	28.1103	28.8359	28.8359	29.5079	29.3783	29.3783	29.1117	28.8359	28.9749	28.4063	
alpha	2.8640	2.8839	2.8740	2.9224	2.9224	2.9672	2.9586	2.9586	2.9408	2.9224	2.9317	2.8938	
util living area													
	0.9897	0.9866	0.9767	0.9498	0.8898	0.7448	0.5953	0.6326	0.8697	0.9617	0.9846	0.9908	(86)
MIT	18.5797	18.7450	19.1505	19.7266	20.2709	20.7428	20.9105	20.8942	20.5178	19.8500	19.1612	18.5876	(87)
Th 2	19.0303	19.0458	19.0382	19.0750	19.0750	19.1081	19.1018	19.1018	19.0887	19.0750	19.0820	19.0534	(88)
util rest of house													
	0.9857	0.9813	0.9665	0.9247	0.8249	0.5806	0.3256	0.3535	0.7598	0.9367	0.9773	0.9872	(89)
MIT 2	16.0228	16.2708	16.8546	17.6948	18.4309	18.9832	19.0892	19.0860	18.7670	17.8839	16.8970	16.0464	(90)
Living area fraction									fLA = Living area / (4) =			0.5178	(91)
MIT	17.3466	17.5518	18.0433	18.7468	19.3836	19.8942	20.0321	20.0222	19.6735	18.9019	18.0693	17.3621	(92)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment											0.0000	
adjusted MIT	17.3466	17.5518	18.0433	18.7468	19.3836	19.8942	20.0321	20.0222	19.6735	18.9019	18.0693	17.3621 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9805	0.9752	0.9589	0.9190	0.8379	0.6591	0.4711	0.5051	0.8022	0.9335	0.9716	0.9825	(94)
Useful gains	479.5142	512.6357	552.3710	602.2940	593.3694	482.2116	324.4875	318.2573	447.8181	461.4747	457.3476	460.8472	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1725.5690	1668.0949	1488.7514	1230.3362	935.5857	584.7178	349.2613	347.9933	654.5039	1016.1070	1382.8946	1700.4834	(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	927.0648	776.4686	696.6670	452.1904	254.6089	0.0000	0.0000	0.0000	0.0000	412.6464	666.3938	922.2893	(98)
Space heating												5108.3292	(98)
RHI space heating demand												5108	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.0800 (1b)	x	2.5000 (2b)	=	135.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.0800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	135.2000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2219	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9719	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7532	(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	0.9604	0.9415	0.9227	0.8285	0.8097	0.7156	0.7156	0.6967	0.7532	0.8097	0.8474	0.8850	(22b)
Effective ac	0.9611	0.9432	0.9257	0.8432	0.8278	0.7560	0.7560	0.7427	0.7837	0.8278	0.8590	0.8916	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			9.6000	2.5180	24.1727			(27)
Heat Loss Floor 1			54.0800	0.6000	32.4480			(28a)
External Wall	30.1700	9.6000	20.5700	0.6000	12.3420			(29a)
External Wall - lobby/stairwel	17.3800	2.1000	15.2800	0.4769	7.2878			(29a)
Total net area of external elements Aum(A, m2)			101.6300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	80.0304			(33)
Party Wall 1			38.3300	0.0000	0.0000			(32)
Party Ceilings 1			54.0800					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	15.2445	(36)
Total fabric heat loss (33) + (36) =	95.2749	(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	42.8821	42.0832	41.3001	37.6219	36.9338	33.7302	33.7302	33.1369	34.9641	36.9338	38.3259	39.7814	(38)
Heat transfer coeff	138.1571	137.3581	136.5750	132.8969	132.2087	129.0051	129.0051	128.4118	130.2391	132.2087	133.6009	135.0563	(39)
Average = Sum(39)m / 12 =												132.8936	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.5547	2.5399	2.5254	2.4574	2.4447	2.3854	2.3854	2.3745	2.4083	2.4447	2.4704	2.4973	(40)
HLP (average)												2.4574	(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	1.8104 (42)
Average daily hot water use (litres/day)	77.1959 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	84.9155	81.8277	78.7399	75.6520	72.5642	69.4763	69.4763	72.5642	75.6520	78.7399	81.8277	84.9155	(44)
Energy conte	125.9273	110.1368	113.6513	99.0840	95.0734	82.0411	76.0232	87.2377	88.2796	102.8814	112.3031	121.9538	(45)
Energy content (annual)										Total = Sum(45)m =		1214.5927	(45)
Distribution loss (46)m = 0.15 x (45)m	18.8891	16.5205	17.0477	14.8626	14.2610	12.3062	11.4035	13.0857	13.2419	15.4322	16.8455	18.2931	(46)

Water storage loss:	
Store volume	110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	155.3153	136.6808	143.0393	127.5240	124.4614	110.4811	105.4112	116.6257	116.7196	132.2694	140.7431	151.3418	(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													
	155.3153	136.6808	143.0393	127.5240	124.4614	110.4811	105.4112	116.6257	116.7196	132.2694	140.7431	151.3418	(64)
								Total per year (kWh/year) = Sum(64)m =				1560.6127	(64)
Heat gains from water heating, kWh/month													
	65.3812	57.8557	61.2995	55.6974	55.1223	50.0307	48.7881	52.5169	52.1050	57.7185	60.0928	64.0601	(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	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	36.0049	31.9793	26.0073	19.6892	14.7179	12.4255	13.4262	17.4518	23.4238	29.7419	34.7132	37.0056	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	235.5397	237.9838	231.8246	218.7124	202.1605	186.6041	176.2115	173.7673	179.9265	193.0388	209.5906	225.1470	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	(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)													
	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	(71)
Water heating gains (Table 5)													
	87.8780	86.0948	82.3918	77.3575	74.0891	69.4871	65.5754	70.5873	72.3680	77.5786	83.4622	86.1022	(72)
Total internal gains													
	443.3022	439.9374	424.1032	399.6387	374.8471	352.3962	339.0926	345.6860	359.5979	384.2388	411.6456	432.1345	(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	
Northwest	9.6000	11.2829	0.7600	0.7000	0.7700	39.9336	(81)

Solar gains	39.9336	81.2860	146.4515	240.5154	323.2999	344.6720	322.4335	257.0478	178.4534	99.3379	50.2468	32.6118	(83)
Total gains	483.2358	521.2234	570.5547	640.1541	698.1471	697.0682	661.5262	602.7338	538.0514	483.5768	461.8924	464.7462	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.1832	27.3413	27.4981	28.2592	28.4063	29.1117	29.1117	29.2462	28.8359	28.4063	28.1103	27.8073	
alpha	2.8122	2.8228	2.8332	2.8839	2.8938	2.9408	2.9408	2.9497	2.9224	2.8938	2.8740	2.8538	
util living area													
	0.9902	0.9870	0.9789	0.9565	0.9056	0.8055	0.6866	0.7392	0.8965	0.9679	0.9862	0.9914	(86)
MIT	18.4712	18.6483	19.0255	19.6034	20.1606	20.6256	20.8393	20.7939	20.4119	19.7256	19.0379	18.4786	(87)
Th 2	18.9892	18.9977	19.0061	19.0458	19.0534	19.0887	19.0887	19.0954	19.0750	19.0534	19.0382	19.0224	(88)
util rest of house													
	0.9865	0.9819	0.9697	0.9351	0.8508	0.6735	0.4537	0.5206	0.8096	0.9478	0.9797	0.9881	(89)
MIT 2	15.8444	16.1061	16.6574	17.5056	18.2749	18.8612	19.0453	19.0282	18.6357	17.6964	16.6957	15.8718	(90)
Living area fraction									fLA = Living area / (4) =			0.5178	(91)
MIT	17.2044	17.4223	17.8835	18.5918	19.2512	19.7747	19.9741	19.9424	19.5553	18.7470	17.9084	17.2215	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2044	17.4223	17.8835	18.5918	19.2512	19.7747	19.9741	19.9424	19.5553	18.7470	17.9084	17.2215	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9813	0.9758	0.9622	0.9283	0.8579	0.7299	0.5766	0.6344	0.8378	0.9432	0.9740	0.9834	(94)
Useful gains	474.2103	508.6010	548.9927	594.2430	598.9266	508.7828	381.4641	382.3805	450.7664	456.1060	449.8783	457.0350	(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													
	1782.8405	1720.0438	1554.6971	1288.0038	998.3382	667.5666	435.2788	454.8856	710.4972	1077.1076	1444.0096	1758.6305	(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													
	973.6209	814.0896	748.2440	499.5077	297.1622	0.0000	0.0000	0.0000	0.0000	462.0252	715.7745	968.3871	(98)
Space heating												5478.8112	(98)
Space heating per m2											(98) / (4) =	101.3094	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												5478.8112	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	973.6209	814.0896	748.2440	499.5077	297.1622	0.0000	0.0000	0.0000	0.0000	462.0252	715.7745	968.3871	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	973.6209	814.0896	748.2440	499.5077	297.1622	0.0000	0.0000	0.0000	0.0000	462.0252	715.7745	968.3871	(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													
	155.3153	136.6808	143.0393	127.5240	124.4614	110.4811	105.4112	116.6257	116.7196	132.2694	140.7431	151.3418	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	155.3153	136.6808	143.0393	127.5240	124.4614	110.4811	105.4112	116.6257	116.7196	132.2694	140.7431	151.3418	(219)
Water heating fuel used												1560.6127	(219)
Annual totals kWh/year													
Space heating fuel - main system												5478.8112	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												254.3434	(232)
Total delivered energy for all uses												7293.7673	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5478.8112	13.1900	722.6552	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1560.6127	13.1900	205.8448	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	254.3434	13.1900	33.5479	(250)
Additional standing charges			0.0000	(251)
Total energy cost			962.0479	(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] =	4.0781	(257)
SAP value		43.1343	
SAP rating (Section 12)		43	(258)
SAP band		E	

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	5478.8112	0.5190	2843.5030	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1560.6127	0.5190	809.9580	(264)
Space and water heating			3653.4610	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	254.3434	0.5190	132.0042	(268)
Total kg/year			3785.4652	(272)
CO2 emissions per m2			70.0000	(273)
EI value			49.6973	
EI rating			50	(274)
EI band			E	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.0800 (1b)	x	2.5000 (2b)	=	135.2000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.0800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	135.2000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2219	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9719	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7532	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8662	0.8285	0.8474	0.7532	0.7532	0.6591	0.6779	0.6779	0.7156	0.7532	0.7344	0.8097	(22b)
Effective ac	0.8752	0.8432	0.8590	0.7837	0.7837	0.7172	0.7298	0.7298	0.7560	0.7837	0.7697	0.8278	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			9.6000	2.5180	24.1727			(27)
Heat Loss Floor 1			54.0800	0.6000	32.4480			(28a)
External Wall	30.1700	9.6000	20.5700	0.6000	12.3420			(29a)
External Wall - lobby/stairwel	17.3800	2.1000	15.2800	0.4769	7.2878			(29a)
Total net area of external elements Aum(A, m2)			101.6300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	80.0304			(33)
Party Wall 1			38.3300	0.0000	0.0000			(32)
Party Ceilings 1			54.0800					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	15.2445	(36)
Total fabric heat loss (33) + (36) =	95.2749	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	39.0457	37.6219	38.3259	34.9641	34.9641	31.9979	32.5595	32.5595	33.7302	34.9641	34.3392	36.9338	(38)
Heat transfer coeff	134.3207	132.8969	133.6009	130.2391	130.2391	127.2728	127.8344	127.8344	129.0051	130.2391	129.6142	132.2087	(39)
Average = Sum(39)m / 12 =												130.4421	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.4837	2.4574	2.4704	2.4083	2.4083	2.3534	2.3638	2.3638	2.3854	2.4083	2.3967	2.4447	(40)
HLP (average)												2.4120	(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	1.8104 (42)
Average daily hot water use (litres/day)	77.1959 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	84.9155	81.8277	78.7399	75.6520	72.5642	69.4763	69.4763	72.5642	75.6520	78.7399	81.8277	84.9155	(44)
Energy conte	125.9273	110.1368	113.6513	99.0840	95.0734	82.0411	76.0232	87.2377	88.2796	102.8814	112.3031	121.9538	(45)
Energy content (annual)										Total = Sum(45)m =		1214.5927	(45)
Distribution loss (46)m = 0.15 x (45)m	18.8891	16.5205	17.0477	14.8626	14.2610	12.3062	11.4035	13.0857	13.2419	15.4322	16.8455	18.2931	(46)

Water storage loss:	
Store volume	110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)

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

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month	155.3153	136.6808	143.0393	127.5240	124.4614	110.4811	105.4112	116.6257	116.7196	132.2694	140.7431	151.3418	(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	155.3153	136.6808	143.0393	127.5240	124.4614	110.4811	105.4112	116.6257	116.7196	132.2694	140.7431	151.3418	(64)
Total per year (kWh/year) = Sum(64)m =												1560.6127	(64)
Heat gains from water heating, kWh/month	65.3812	57.8557	61.2995	55.6974	55.1223	50.0307	48.7881	52.5169	52.1050	57.7185	60.0928	64.0601	(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	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	108.6213	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	36.0049	31.9793	26.0073	19.6892	14.7179	12.4255	13.4262	17.4518	23.4238	29.7419	34.7132	37.0056	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	235.5397	237.9838	231.8246	218.7124	202.1605	186.6041	176.2115	173.7673	179.9265	193.0388	209.5906	225.1470	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	47.6725	(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)	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	-72.4142	(71)
Water heating gains (Table 5)	87.8780	86.0948	82.3918	77.3575	74.0891	69.4871	65.5754	70.5873	72.3680	77.5786	83.4622	86.1022	(72)
Total internal gains	443.3022	439.9374	424.1032	399.6387	374.8471	352.3962	339.0926	345.6860	359.5979	384.2388	411.6456	432.1345	(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	
Northwest	9.6000	12.9280	0.7600	0.7000	0.7700	45.7561	(81)

Solar gains	45.7561	85.7272	151.9203	255.7619	333.2931	379.2190	349.6578	284.4034	198.6213	110.0907	59.0768	36.9429	(83)
Total gains	489.0582	525.6647	576.0236	655.4006	708.1402	731.6152	688.7504	630.0894	558.2192	494.3296	470.7224	469.0774	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.9596	28.2592	28.1103	28.8359	28.8359	29.5079	29.3783	29.3783	29.1117	28.8359	28.9749	28.4063	
alpha	2.8640	2.8839	2.8740	2.9224	2.9224	2.9672	2.9586	2.9586	2.9408	2.9224	2.9317	2.8938	
util living area	0.9897	0.9866	0.9767	0.9498	0.8898	0.7448	0.5953	0.6326	0.8697	0.9617	0.9846	0.9908	(86)
MIT	18.5797	18.7450	19.1505	19.7266	20.2709	20.7428	20.9105	20.8942	20.5178	19.8500	19.1612	18.5876	(87)
Th 2	19.0303	19.0458	19.0382	19.0750	19.0750	19.1081	19.1018	19.1018	19.0887	19.0750	19.0820	19.0534	(88)
util rest of house	0.9857	0.9813	0.9665	0.9247	0.8249	0.5806	0.3256	0.3535	0.7598	0.9367	0.9773	0.9872	(89)
MIT 2	16.0228	16.2708	16.8546	17.6948	18.4309	18.9832	19.0892	19.0860	18.7670	17.8839	16.8970	16.0464	(90)
Living area fraction									fLA = Living area / (4) =			0.5178	(91)
MIT	17.3466	17.5518	18.0433	18.7468	19.3836	19.8942	20.0321	20.0222	19.6735	18.9019	18.0693	17.3621	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3466	17.5518	18.0433	18.7468	19.3836	19.8942	20.0321	20.0222	19.6735	18.9019	18.0693	17.3621	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9805	0.9752	0.9589	0.9190	0.8379	0.6591	0.4711	0.5051	0.8022	0.9335	0.9716	0.9825	(94)
Useful gains	479.5142	512.6357	552.3710	602.2940	593.3694	482.2116	324.4875	318.2573	447.8181	461.4747	457.3476	460.8472	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1725.5690	1668.0949	1488.7514	1230.3362	935.5857	584.7178	349.2613	347.9933	654.5039	1016.1070	1382.8946	1700.4834	(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	927.0648	776.4686	696.6670	452.1904	254.6089	0.0000	0.0000	0.0000	0.0000	412.6464	666.3938	922.2893	(98)
Space heating												5108.3292	(98)
Space heating per m2											(98) / (4) =	94.4588	(99)

8c. Space cooling requirement

Not applicable

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

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												5108.3292	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	927.0648	776.4686	696.6670	452.1904	254.6089	0.0000	0.0000	0.0000	0.0000	412.6464	666.3938	922.2893	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	927.0648	776.4686	696.6670	452.1904	254.6089	0.0000	0.0000	0.0000	0.0000	412.6464	666.3938	922.2893	(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													
	155.3153	136.6808	143.0393	127.5240	124.4614	110.4811	105.4112	116.6257	116.7196	132.2694	140.7431	151.3418	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	155.3153	136.6808	143.0393	127.5240	124.4614	110.4811	105.4112	116.6257	116.7196	132.2694	140.7431	151.3418	(219)
Water heating fuel used												1560.6127	(219)
Annual totals kWh/year													
Space heating fuel - main system												5108.3292	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												254.3434	(232)
Total delivered energy for all uses												6923.2853	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5108.3292	18.2700	933.2918	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1560.6127	18.2700	285.1239	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	254.3434	18.2700	46.4685	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1264.8842	(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	5108.3292	0.5190	2651.2229	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1560.6127	0.5190	809.9580	(264)
Space and water heating			3461.1809	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	254.3434	0.5190	132.0042	(268)
Total kg/year			3593.1851	(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	5108.3292	3.0700	15682.5707	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1560.6127	3.0700	4791.0810	(264)
Space and water heating			20473.6518	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	254.3434	3.0700	780.8341	(268)
Primary energy kWh/year			21254.4859	(272)
Primary energy kWh/m2/year			393.0193	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	E 43
Current environmental impact rating:	E 50

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered

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

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:	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: E 43
Potential environmental impact rating: E 50

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£1265	£1265	£0
Space heating	£933	£933	£0
Water heating	£285	£285	£0
Lighting	£46	£46	£0
Total cost of fuels	£1265	£1265	£0
Total cost of uses	£1264	£1264	£0
Delivered energy	128 kWh/m²	128 kWh/m²	0 kWh/m²
Carbon dioxide emissions	3.6 tonnes	3.6 tonnes	0.0 tonnes
CO2 emissions per m²	66 kg/m²	66 kg/m²	0 kg/m²
Primary energy	393 kWh/m²	393 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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-------------------------------------------------------------------------------------------------
SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
```

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-4	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit G.04, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	43 E	**DER**	N/A	**TER**	N/A
Environmental	50 E	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	3.59	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	19.02 m	54.08 m²	2.50 m

7.0 Living Area	28.00	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	30.17	20.57
External Wall - lobby/stairwel	Solid Wall	Other	0.60	17.38	15.28

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	38.33

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	54.08

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid	Slab on ground, screed over insulation	0.60	54.08

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby/stairwel	South East							2.10	
windows	Window	[1] External Wall	North West	None	0.00					9.60	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate	
Night Ventilation	No	
Air change rate	2.00	

Mechanical Ventilation

Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%

Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit G.05, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

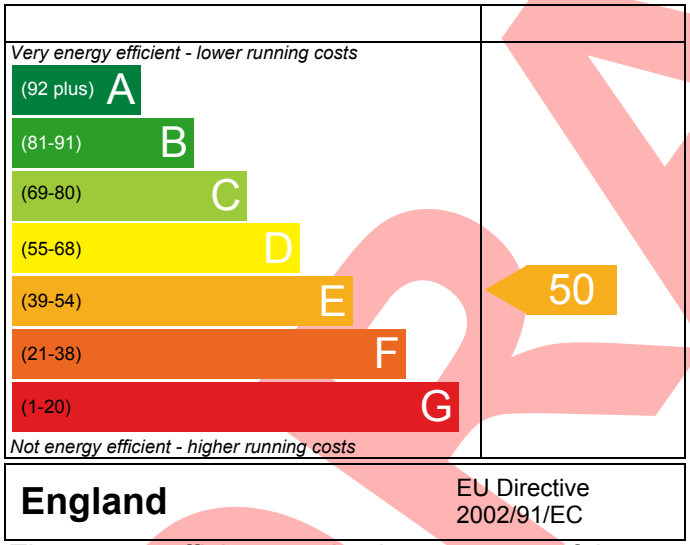
Unit G.05, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	81.75 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

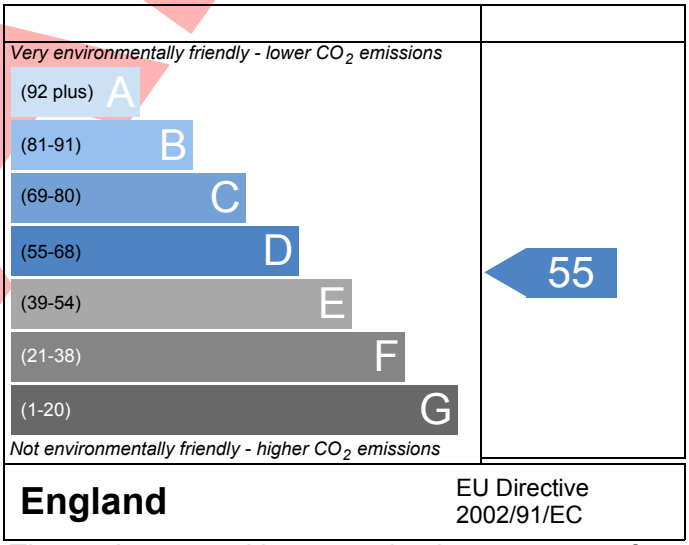
The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



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.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-5	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit G.05, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	50 E	**DER**	N/A	**TER**	N/A
Environmental	55 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	3.96	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.7500 (1b)	x	2.5000 (2b)	=	204.3750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	204.3750	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1957	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9457	(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) =	0.8039	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.9244	0.8842	0.9043	0.8039	0.8039	0.7034	0.7235	0.7235	0.7637	0.8039	0.7838	0.8642	(22b)
Effective ac	0.9273	0.8909	0.9089	0.8231	0.8231	0.7474	0.7617	0.7617	0.7916	0.8231	0.8071	0.8734	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			14.0100	2.5180	35.2770			(27)
Heat Loss Floor 1			81.7500	0.2200	17.9850			(28a)
External Wall	49.5000	16.1100	33.3900	0.6000	20.0340			(29a)
Total net area of external elements Aum(A, m2)			131.2500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.0760			(33)
Party Wall 1			47.7300	0.0000	0.0000			(32)
Party Ceilings 1			81.7500					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	19.6875	(36)
Total fabric heat loss	(33) + (36) = 96.7635	(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	62.5402	60.0888	61.3009	55.5127	55.5127	50.4055	51.3724	51.3724	53.3881	55.5127	54.4368	58.9039	(38)
Heat transfer coeff	159.3037	156.8522	158.0644	152.2762	152.2762	147.1689	148.1359	148.1359	150.1516	152.2762	151.2002	155.6674	(39)
Average = Sum(39)m / 12 =												152.6257	(39)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9487	1.9187	1.9335	1.8627	1.8627	1.8002	1.8121	1.8121	1.8367	1.8627	1.8495	1.9042	(40)
HLP (average)												1.8670	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4952 (42)

Average daily hot water use (litres/day) 93.4616 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	102.8078	99.0693	95.3309	91.5924	87.8539	84.1155	84.1155	87.8539	91.5924	95.3309	99.0693	102.8078	(44)
Energy conte	152.4610	133.3434	137.5984	119.9616	115.1060	99.3278	92.0418	105.6193	106.8807	124.5592	135.9661	147.6504	(45)
Energy content (annual)										Total = Sum(45)m =		1470.5157	(45)
Distribution loss (46)m = 0.15 x (45)m													
	22.8692	20.0015	20.6398	17.9942	17.2659	14.8992	13.8063	15.8429	16.0321	18.6839	20.3949	22.1476	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(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													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(64)
								Total per year (kWh/year) = Sum(64)m =				1816.5357	(64)
RHI water heating demand												1817	(64)
Heat gains from water heating, kWh/month													
	74.2037	65.5719	69.2619	62.6392	61.7832	55.7785	54.1143	58.6288	58.2898	64.9263	67.9607	72.6041	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.2000	45.4754	36.9830	27.9985	20.9292	17.6693	19.0924	24.8170	33.3093	42.2938	49.3631	52.6230	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	332.9240	336.3787	327.6730	309.1394	285.7442	263.7560	249.0665	245.6118	254.3175	272.8510	296.2463	318.2345	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	(71)
Water heating gains (Table 5)													
	99.7361	97.5772	93.0939	86.9990	83.0419	77.4701	72.7343	78.8022	80.9581	87.2666	94.3899	97.5862	(72)
Total internal gains													
	586.2312	581.8024	560.1211	526.5081	492.0864	461.2666	443.2642	451.6020	470.9560	504.7825	542.3704	570.8148	(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	
Southeast	8.2500	40.5720	0.7600	0.7000	0.7700	123.4029	(77)
Northwest	5.7600	12.9280	0.7600	0.7000	0.7700	27.4536	(81)

Solar gains	150.8565	243.8958	349.6603	483.7313	561.6951	612.5477	574.9149	509.4221	419.9369	289.2245	186.8451	126.7773	(83)
Total gains	737.0878	825.6982	909.7814	1010.2394	1053.7815	1073.8143	1018.1791	961.0241	890.8929	794.0070	729.2155	697.5921	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.6369	36.1938	35.9163	37.2815	37.2815	38.5753	38.3235	38.3235	37.8090	37.2815	37.5468	36.4693	
alpha	3.3758	3.4129	3.3944	3.4854	3.4854	3.5717	3.5549	3.5549	3.5206	3.4854	3.5031	3.4313	
util living area													
	0.9901	0.9848	0.9712	0.9350	0.8599	0.6766	0.5091	0.5342	0.8073	0.9463	0.9828	0.9917	(86)
MIT	19.0957	19.2904	19.6476	20.1488	20.5588	20.8846	20.9695	20.9644	20.7531	20.2311	19.6349	19.1044	(87)
Th 2	19.3678	19.3881	19.3780	19.4264	19.4264	19.4698	19.4616	19.4616	19.4444	19.4264	19.4355	19.3980	(88)
util rest of house													
	0.9865	0.9793	0.9597	0.9071	0.7936	0.5355	0.3109	0.3287	0.6942	0.9167	0.9753	0.9886	(89)
MIT 2	16.9568	17.2505	17.7594	18.4947	19.0330	19.4117	19.4561	19.4551	19.2815	18.6221	17.7810	16.9873	(90)
Living area fraction									fLA = Living area / (4) =			0.4626	(91)
MIT	17.9463	18.1942	18.6330	19.2599	19.7389	20.0931	20.1563	20.1534	19.9623	19.3665	18.6387	17.9667	(92)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment												0.0000	
adjusted MIT	17.9463	18.1942	18.6330	19.2599	19.7389	20.0931	20.1563	20.1534	19.9623	19.3665	18.6387	17.9667	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9819	0.9734	0.9525	0.9034	0.8091	0.5980	0.4047	0.4262	0.7378	0.9152	0.9699	0.9846	(94)
Useful gains	723.7706	803.7515	866.5762	912.6167	852.5926	642.1876	412.0101	409.6030	657.3379	726.6535	707.2349	686.8390	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	2142.0492	2069.5453	1854.5663	1516.6602	1147.9919	705.4005	423.1149	422.6850	805.1592	1258.7871	1699.2873	2096.3307	(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	1055.1993	850.6135	735.0646	434.9113	219.7771	0.0000	0.0000	0.0000	0.0000	395.9074	714.2777	1048.6618	(98)
Space heating												5454.4128	(98)
RHI space heating demand												5454	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.7500 (1b)	x	2.5000 (2b)	=	204.3750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	204.3750	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1957	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9457	(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) =	0.8039	(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	1.0249	1.0048	0.9847	0.8842	0.8642	0.7637	0.7637	0.7436	0.8039	0.8642	0.9043	0.9445	(22b)
Effective ac	1.0249	1.0048	0.9848	0.8909	0.8734	0.7916	0.7916	0.7764	0.8231	0.8734	0.9089	0.9461	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			14.0100	2.5180	35.2770			(27)
Heat Loss Floor 1			81.7500	0.2200	17.9850			(28a)
External Wall	49.5000	16.1100	33.3900	0.6000	20.0340			(29a)
Total net area of external elements Aum(A, m2)			131.2500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.0760			(33)
Party Wall 1			47.7300	0.0000	0.0000			(32)
Party Ceilings 1			81.7500					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	19.6875	(36)
Total fabric heat loss (33) + (36) =	96.7635	(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	69.1246	67.7692	66.4217	60.0888	58.9039	53.3881	53.3881	52.3666	55.5127	58.9039	61.3009	63.8068	(38)
Heat transfer coeff	165.8881	164.5327	163.1852	156.8522	155.6674	150.1516	150.1516	149.1301	152.2762	155.6674	158.0644	160.5703	(39)
Average = Sum(39)m / 12 =												156.8448	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0292	2.0126	1.9961	1.9187	1.9042	1.8367	1.8367	1.8242	1.8627	1.9042	1.9335	1.9642	(40)
HLP (average)												1.9186	(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	2.4952 (42)
Average daily hot water use (litres/day)	93.4616 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	102.8078	99.0693	95.3309	91.5924	87.8539	84.1155	84.1155	87.8539	91.5924	95.3309	99.0693	102.8078	(44)
Energy conte	152.4610	133.3434	137.5984	119.9616	115.1060	99.3278	92.0418	105.6193	106.8807	124.5592	135.9661	147.6504	(45)
Energy content (annual)										Total = Sum(45)m =		1470.5157	(45)
Distribution loss (46)m = 0.15 x (45)m	22.8692	20.0015	20.6398	17.9942	17.2659	14.8992	13.8063	15.8429	16.0321	18.6839	20.3949	22.1476	(46)

Water storage loss:	
Store volume	110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.6000 (49)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(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													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(64)
								Total per year (kWh/year) = Sum(64)m =				1816.5357	(64)
Heat gains from water heating, kWh/month													
	74.2037	65.5719	69.2619	62.6392	61.7832	55.7785	54.1143	58.6288	58.2898	64.9263	67.9607	72.6041	(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	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.2000	45.4754	36.9830	27.9985	20.9292	17.6693	19.0924	24.8170	33.3093	42.2938	49.3631	52.6230	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	332.9240	336.3787	327.6730	309.1394	285.7442	263.7560	249.0665	245.6118	254.3175	272.8510	296.2463	318.2345	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	(71)
Water heating gains (Table 5)													
	99.7361	97.5772	93.0939	86.9990	83.0419	77.4701	72.7343	78.8022	80.9581	87.2666	94.3899	97.5862	(72)
Total internal gains													
	586.2312	581.8024	560.1211	526.5081	492.0864	461.2666	443.2642	451.6020	470.9560	504.7825	542.3704	570.8148	(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	
Southeast	8.2500	36.7938	0.7600	0.7000	0.7700	111.9113	(77)
Northwest	5.7600	11.2829	0.7600	0.7000	0.7700	23.9602	(81)

Solar gains	135.8714	239.3979	348.6941	467.4819	555.9602	566.1658	539.9240	471.7403	389.4885	270.2854	164.1920	115.3398	(83)
Total gains	722.1027	821.2003	908.8152	993.9899	1048.0467	1027.4323	983.1883	923.3423	860.4445	775.0679	706.5624	686.1546	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.2224	34.5043	34.7892	36.1938	36.4693	37.8090	37.8090	38.0680	37.2815	36.4693	35.9163	35.3558	
alpha	3.2815	3.3003	3.3193	3.4129	3.4313	3.5206	3.5206	3.5379	3.4854	3.4313	3.3944	3.3571	
util living area													
	0.9910	0.9854	0.9739	0.9444	0.8803	0.7521	0.6068	0.6528	0.8475	0.9567	0.9855	0.9925	(86)
MIT	18.9653	19.1735	19.5257	20.0334	20.4696	20.8077	20.9346	20.9148	20.6731	20.1137	19.4912	18.9825	(87)
Th 2	19.3139	19.3249	19.3359	19.3881	19.3980	19.4444	19.4444	19.4531	19.4264	19.3980	19.3780	19.3573	(88)
util rest of house													
	0.9877	0.9801	0.9636	0.9205	0.8232	0.6304	0.4210	0.4718	0.7536	0.9331	0.9792	0.9897	(89)
MIT 2	16.7361	17.0441	17.5588	18.3105	18.9015	19.3252	19.4248	19.4235	19.1841	18.4418	17.5391	16.7861	(90)
Living area fraction										fLA = Living area / (4) =		0.4626	(91)
MIT	17.7674	18.0292	18.4688	19.1075	19.6269	20.0111	20.1232	20.1135	19.8730	19.2153	18.4422	17.8022	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7674	18.0292	18.4688	19.1075	19.6269	20.0111	20.1232	20.1135	19.8730	19.2153	18.4422	17.8022	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9741	0.9562	0.9151	0.8330	0.6801	0.5082	0.5561	0.7853	0.9295	0.9739	0.9858	(94)
Useful gains	709.9984	799.9525	869.0066	909.6267	872.9723	698.7231	499.6693	513.5053	675.7152	720.4066	688.1026	676.4417	(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													
	2234.0806	2160.1826	1953.1242	1601.0763	1233.9624	812.4812	529.0208	553.7880	879.0880	1341.1164	1792.7935	2184.1112	(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													
	1133.9171	914.0747	806.5835	497.8437	268.5766	0.0000	0.0000	0.0000	0.0000	461.8081	795.3775	1121.7061	(98)
Space heating												5999.8873	(98)
Space heating per m2											(98) / (4) =	73.3931	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												5999.8873	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1133.9171	914.0747	806.5835	497.8437	268.5766	0.0000	0.0000	0.0000	0.0000	461.8081	795.3775	1121.7061	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	1133.9171	914.0747	806.5835	497.8437	268.5766	0.0000	0.0000	0.0000	0.0000	461.8081	795.3775	1121.7061	(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													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(219)
Water heating fuel used												1816.5357	(219)
Annual totals kWh/year													
Space heating fuel - main system												5999.8873	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												361.6830	(232)
Total delivered energy for all uses												8178.1059	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5999.8873	13.1900	791.3851	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1816.5357	13.1900	239.6011	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	361.6830	13.1900	47.7060	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1078.6922	(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] =	3.5744	(257)
SAP value		50.0629	
SAP rating (Section 12)		50	(258)
SAP band		E	

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	5999.8873	0.5190	3113.9415	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1816.5357	0.5190	942.7820	(264)
Space and water heating			4056.7235	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	361.6830	0.5190	187.7135	(268)
Total kg/year			4244.4370	(272)
CO2 emissions per m2			51.9200	(273)
EI value			55.1371	
EI rating			55	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	81.7500 (1b)	x	2.5000 (2b)	=	204.3750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.7500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	204.3750	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.1957	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9457	(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) =	0.8039	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.9244	0.8842	0.9043	0.8039	0.8039	0.7034	0.7235	0.7235	0.7637	0.8039	0.7838	0.8642	(22b)
Effective ac	0.9273	0.8909	0.9089	0.8231	0.8231	0.7474	0.7617	0.7617	0.7916	0.8231	0.8071	0.8734	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			14.0100	2.5180	35.2770			(27)
Heat Loss Floor 1			81.7500	0.2200	17.9850			(28a)
External Wall	49.5000	16.1100	33.3900	0.6000	20.0340			(29a)
Total net area of external elements Aum(A, m2)			131.2500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.0760			(33)
Party Wall 1			47.7300	0.0000	0.0000			(32)
Party Ceilings 1			81.7500					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	19.6875	(36)
Total fabric heat loss (33) + (36) =	96.7635	(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	62.5402	60.0888	61.3009	55.5127	55.5127	50.4055	51.3724	51.3724	53.3881	55.5127	54.4368	58.9039	(38)
Heat transfer coeff	159.3037	156.8522	158.0644	152.2762	152.2762	147.1689	148.1359	148.1359	150.1516	152.2762	151.2002	155.6674	(39)
Average = Sum(39)m / 12 =												152.6257	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9487	1.9187	1.9335	1.8627	1.8627	1.8002	1.8121	1.8121	1.8367	1.8627	1.8495	1.9042	(40)
HLP (average)												1.8670	(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	2.4952 (42)
Average daily hot water use (litres/day)	93.4616 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	102.8078	99.0693	95.3309	91.5924	87.8539	84.1155	84.1155	87.8539	91.5924	95.3309	99.0693	102.8078	(44)
Energy conte	152.4610	133.3434	137.5984	119.9616	115.1060	99.3278	92.0418	105.6193	106.8807	124.5592	135.9661	147.6504	(45)
Energy content (annual)										Total = Sum(45)m =		1470.5157	(45)
Distribution loss (46)m = 0.15 x (45)m	22.8692	20.0015	20.6398	17.9942	17.2659	14.8992	13.8063	15.8429	16.0321	18.6839	20.3949	22.1476	(46)

Water storage loss:	
Store volume	110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)
Temperature factor from Table 2b	0.6000 (49)

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

Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(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													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(64)
								Total per year (kWh/year) = Sum(64)m =				1816.5357	(64)
Heat gains from water heating, kWh/month													
	74.2037	65.5719	69.2619	62.6392	61.7832	55.7785	54.1143	58.6288	58.2898	64.9263	67.9607	72.6041	(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	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	149.7136	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	51.2000	45.4754	36.9830	27.9985	20.9292	17.6693	19.0924	24.8170	33.3093	42.2938	49.3631	52.6230	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	332.9240	336.3787	327.6730	309.1394	285.7442	263.7560	249.0665	245.6118	254.3175	272.8510	296.2463	318.2345	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	52.4666	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	-99.8091	(71)
Water heating gains (Table 5)													
	99.7361	97.5772	93.0939	86.9990	83.0419	77.4701	72.7343	78.8022	80.9581	87.2666	94.3899	97.5862	(72)
Total internal gains													
	586.2312	581.8024	560.1211	526.5081	492.0864	461.2666	443.2642	451.6020	470.9560	504.7825	542.3704	570.8148	(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	
Southeast	8.2500	40.5720	0.7600	0.7000	0.7700	123.4029	(77)
Northwest	5.7600	12.9280	0.7600	0.7000	0.7700	27.4536	(81)

Solar gains	150.8565	243.8958	349.6603	483.7313	561.6951	612.5477	574.9149	509.4221	419.9369	289.2245	186.8451	126.7773	(83)
Total gains	737.0878	825.6982	909.7814	1010.2394	1053.7815	1073.8143	1018.1791	961.0241	890.8929	794.0070	729.2155	697.5921	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.6369	36.1938	35.9163	37.2815	37.2815	38.5753	38.3235	38.3235	37.8090	37.2815	37.5468	36.4693	
alpha	3.3758	3.4129	3.3944	3.4854	3.4854	3.5717	3.5549	3.5549	3.5206	3.4854	3.5031	3.4313	
util living area													
	0.9901	0.9848	0.9712	0.9350	0.8599	0.6766	0.5091	0.5342	0.8073	0.9463	0.9828	0.9917	(86)
MIT	19.0957	19.2904	19.6476	20.1488	20.5588	20.8846	20.9695	20.9644	20.7531	20.2311	19.6349	19.1044	(87)
Th 2	19.3678	19.3881	19.3780	19.4264	19.4264	19.4698	19.4616	19.4616	19.4444	19.4264	19.4355	19.3980	(88)
util rest of house													
	0.9865	0.9793	0.9597	0.9071	0.7936	0.5355	0.3109	0.3287	0.6942	0.9167	0.9753	0.9886	(89)
MIT 2	16.9568	17.2505	17.7594	18.4947	19.0330	19.4117	19.4561	19.4551	19.2815	18.6221	17.7810	16.9873	(90)
Living area fraction									fLA = Living area / (4) =			0.4626	(91)
MIT	17.9463	18.1942	18.6330	19.2599	19.7389	20.0931	20.1563	20.1534	19.9623	19.3665	18.6387	17.9667	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9463	18.1942	18.6330	19.2599	19.7389	20.0931	20.1563	20.1534	19.9623	19.3665	18.6387	17.9667	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9819	0.9734	0.9525	0.9034	0.8091	0.5980	0.4047	0.4262	0.7378	0.9152	0.9699	0.9846	(94)
Useful gains	723.7706	803.7515	866.5762	912.6167	852.5926	642.1876	412.0101	409.6030	657.3379	726.6535	707.2349	686.8390	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	2142.0492	2069.5453	1854.5663	1516.6602	1147.9919	705.4005	423.1149	422.6850	805.1592	1258.7871	1699.2873	2096.3307	(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													
	1055.1993	850.6135	735.0646	434.9113	219.7771	0.0000	0.0000	0.0000	0.0000	395.9074	714.2777	1048.6618	(98)
Space heating												5454.4128	(98)
Space heating per m2											(98) / (4) =	66.7206	(99)

8c. Space cooling requirement

Not applicable

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

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												5454.4128	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1055.1993	850.6135	735.0646	434.9113	219.7771	0.0000	0.0000	0.0000	0.0000	395.9074	714.2777	1048.6618	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	1055.1993	850.6135	735.0646	434.9113	219.7771	0.0000	0.0000	0.0000	0.0000	395.9074	714.2777	1048.6618	(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													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	181.8490	159.8874	166.9864	148.4016	144.4940	127.7678	121.4298	135.0073	135.3207	153.9472	164.4061	177.0384	(219)
Water heating fuel used												1816.5357	(219)
Annual totals kWh/year													
Space heating fuel - main system												5454.4128	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												361.6830	(232)
Total delivered energy for all uses												7632.6315	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5454.4128	18.2700	996.5212	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1816.5357	18.2700	331.8811	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	361.6830	18.2700	66.0795	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1394.4818	(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	5454.4128	0.5190	2830.8403	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1816.5357	0.5190	942.7820	(264)
Space and water heating			3773.6223	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	361.6830	0.5190	187.7135	(268)
Total kg/year			3961.3357	(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	5454.4128	3.0700	16745.0474	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1816.5357	3.0700	5576.7645	(264)
Space and water heating			22321.8119	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	361.6830	3.0700	1110.3668	(268)
Primary energy kWh/year			23432.1787	(272)
Primary energy kWh/m2/year			286.6322	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	E 50
Current environmental impact rating:	D 55

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: E 50
Potential environmental impact rating: D 55

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£1394	£1394	£0
Space heating	£997	£997	£0
Water heating	£332	£332	£0
Lighting	£66	£66	£0
Total cost of fuels	£1394	£1394	£0
Total cost of uses	£1395	£1395	£0
Delivered energy	93 kWh/m²	93 kWh/m²	0 kWh/m²
Carbon dioxide emissions	4.0 tonnes	4.0 tonnes	0.0 tonnes
CO2 emissions per m²	48 kg/m²	48 kg/m²	0 kg/m²
Primary energy	287 kWh/m²	287 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
```

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-5	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit G.05, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	50 E	**DER**	N/A	**TER**	N/A
Environmental	55 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	3.96	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	19.80 m	81.75 m²	2.50 m

7.0 Living Area	37.82	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	49.50	33.39

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	47.73

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	81.75

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid	Slab on ground, screed over insulation	0.22	81.75

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[1] External Wall	South West							2.10	
windows	Window	[1] External Wall	South East	None	0.00					8.25	
windows	Window	[1] External Wall	North West	None	0.00					5.76	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating		
Windows open in hot weather	Calculated rate	
Night Ventilation	No	
Air change rate	2.00	
Mechanical Ventilation		
Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				4
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal		
Total number of light fittings	8	
Total number of L.E.L. fittings	8	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 1.01, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

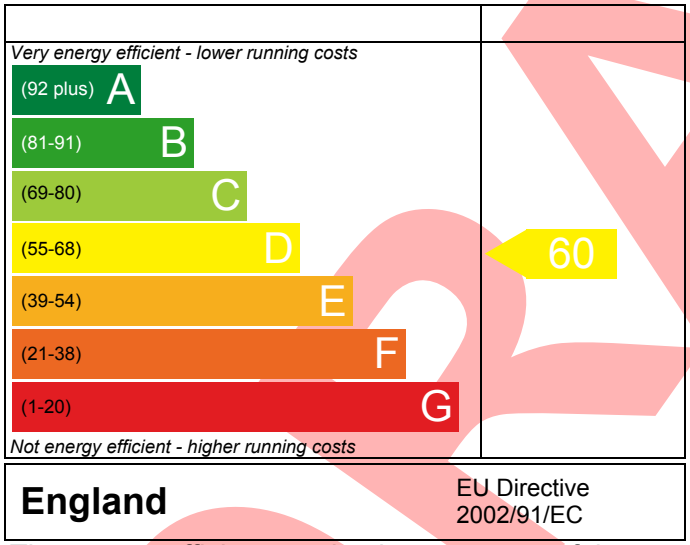
Unit 1.01, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	41.04 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

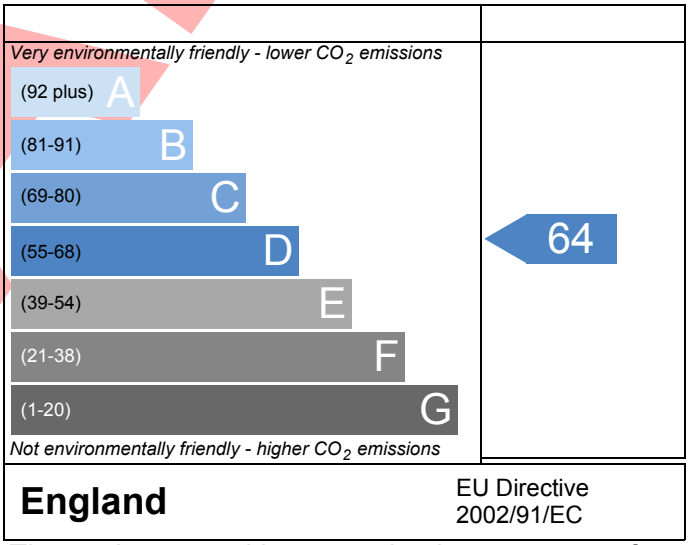
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-6	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.01, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	60 D	**DER**	N/A	**TER**	N/A
Environmental	64 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.13	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400	(1b)	x 2.5000	(2b) =	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	33.6700	7.8800	25.7900	0.6000	15.4740			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
Total net area of external elements Aum(A, m2)			38.9500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.6124			(33)
Party Wall 1			26.6800	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			41.0400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	5.8425	(36)
Total fabric heat loss	(33) + (36) = 46.4549	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff	80.9543	79.4652	80.2045	76.6743	76.6743	73.5593	74.1491	74.1491	75.3784	76.6743	76.0180	78.7426	(39)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 = 76.8870 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9726	1.9363	1.9543	1.8683	1.8683	1.7924	1.8068	1.8068	1.8367	1.8683	1.8523	1.9187	(40)
HLP (average)												1.8735	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4342 (42)

Average daily hot water use (litres/day) 68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m													
	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
								Total per year (kWh/year) = Sum(64)m =				1420.0675	(64)
RHI water heating demand												1420	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.9998	24.8692	20.2250	15.3116	11.4456	9.6629	10.4411	13.5717	18.2159	23.1292	26.9952	28.7780	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	368.4002	365.6156	352.8511	333.1701	313.3918	295.3005	284.4434	290.0830	301.1476	320.9846	343.0755	359.4317	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.9700	12.9280	0.7600	0.7000	0.7700	9.3895	(75)
Southeast	5.9100	40.5720	0.7600	0.7000	0.7700	88.4014	(77)

Solar gains	97.7909	155.4629	216.3611	289.0809	327.5170	353.6306	333.3115	301.0517	256.2152	182.4625	120.5798	82.5209	(83)
Total gains	466.1910	521.0785	569.2123	622.2509	640.9088	648.9311	617.7549	591.1346	557.3628	503.4470	463.6552	441.9526	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, n1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.2050	35.8647	35.5342	37.1702	37.1702	38.7442	38.4361	38.4361	37.8092	37.1702	37.4911	36.1939	
alpha	3.3470	3.3910	3.3689	3.4780	3.4780	3.5829	3.5624	3.5624	3.5206	3.4780	3.4994	3.4129	
util living area													
	0.9806	0.9708	0.9483	0.8935	0.7962	0.5908	0.4301	0.4475	0.7195	0.9040	0.9657	0.9832	(86)
MIT	19.2514	19.4675	19.8201	20.3097	20.6673	20.9265	20.9823	20.9799	20.8345	20.3849	19.8109	19.2642	(87)
Th 2	19.3517	19.3761	19.3640	19.4226	19.4226	19.4753	19.4653	19.4653	19.4444	19.4226	19.4336	19.3881	(88)
util rest of house													
	0.9739	0.9608	0.9294	0.8537	0.7169	0.4556	0.2583	0.2697	0.5953	0.8585	0.9520	0.9774	(89)
MIT 2	17.1704	17.4946	17.9881	18.6966	19.1430	19.4409	19.4623	19.4619	19.3451	18.8123	18.0270	17.2114	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	18.3909	18.6517	19.0626	19.6427	20.0370	20.3122	20.3538	20.3522	20.2186	19.7346	19.0733	18.4154	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3909	18.6517	19.0626	19.6427	20.0370	20.3122	20.3538	20.3522	20.2186	19.7346	19.0733	18.4154	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9686	0.9550	0.9250	0.8601	0.7510	0.5332	0.3600	0.3750	0.6623	0.8692	0.9479	0.9726	(94)
Useful gains	451.5464	497.6120	526.5464	535.2217	481.3334	345.9922	222.3763	221.6922	369.1260	437.6046	439.5174	429.8393	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1124.5295	1084.8352	975.4930	793.0158	600.8959	368.6962	226.4350	226.3178	423.5220	662.0532	887.3785	1095.7308	(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	500.6995	394.6139	334.0162	185.6117	88.9545	0.0000	0.0000	0.0000	0.0000	166.9897	322.4600	495.4232	(98)
Space heating												2488.7688	(98)
RHI space heating demand												2489	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(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	1.1297	1.1075	1.0854	0.9746	0.9525	0.8417	0.8417	0.8196	0.8860	0.9525	0.9968	1.0411	(22b)
Effective ac	1.1297	1.1075	1.0854	0.9750	0.9536	0.8543	0.8543	0.8359	0.8925	0.9536	0.9968	1.0411	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	33.6700	7.8800	25.7900	0.6000	15.4740			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
Total net area of external elements Aum(A, m2)			38.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.6124			(33)
Party Wall 1			26.6800	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			41.0400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	5.8425	(36)
Total fabric heat loss (33) + (36) =	46.4549	(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	38.2493	37.4993	36.7494	33.0103	32.2876	28.9235	28.9235	28.3005	30.2193	32.2876	33.7496	35.2494	(38)
Heat transfer coeff	84.7043	83.9543	83.2043	79.4652	78.7426	75.3784	75.3784	74.7555	76.6743	78.7426	80.2045	81.7043	(39)
Average = Sum(39)m / 12 =												79.4090	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0639	2.0457	2.0274	1.9363	1.9187	1.8367	1.8367	1.8215	1.8683	1.9187	1.9543	1.9908	(40)
HLP (average)												1.9349	(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	1.4342 (42)
Average daily hot water use (litres/day)	68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
								Total per year (kWh/year) = Sum(64)m =				1420.0675	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.9998	24.8692	20.2250	15.3116	11.4456	9.6629	10.4411	13.5717	18.2159	23.1292	26.9952	28.7780	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	368.4002	365.6156	352.8511	333.1701	313.3918	295.3005	284.4434	290.0830	301.1476	320.9846	343.0755	359.4317	(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	1.9700	11.2829	0.7600	0.7000	0.7700	8.1947	(75)
Southeast	5.9100	36.7938	0.7600	0.7000	0.7700	80.1692	(77)

Solar gains	88.3639	153.2383	216.8973	280.8649	325.6533	328.1639	314.3602	280.2022	238.9330	171.3104	106.3352	75.3003	(83)
Total gains	456.7640	518.8539	569.7485	614.0350	639.0451	623.4644	598.8036	570.2851	540.0805	492.2950	449.4107	434.7320	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.6465	33.9471	34.2530	35.8647	36.1939	37.8092	37.8092	38.1243	37.1702	36.1939	35.5342	34.8819	
alpha	3.2431	3.2631	3.2835	3.3910	3.4129	3.5206	3.5206	3.5416	3.4780	3.4129	3.3689	3.3255	
util living area													
	0.9825	0.9724	0.9532	0.9082	0.8229	0.6704	0.5207	0.5586	0.7686	0.9215	0.9715	0.9850	(86)
MIT	19.1053	19.3334	19.6911	20.1916	20.5857	20.8689	20.9596	20.9484	20.7694	20.2667	19.6462	19.1258	(87)
Th 2	19.2910	19.3031	19.3151	19.3761	19.3881	19.4444	19.4444	19.4550	19.4226	19.3881	19.3640	19.3394	(88)
util rest of house													
	0.9764	0.9629	0.9362	0.8732	0.7520	0.5452	0.3518	0.3909	0.6582	0.8839	0.9599	0.9797	(89)
MIT 2	16.9240	17.2583	17.7751	18.5074	19.0212	19.3692	19.4333	19.4387	19.2666	18.6329	17.7495	16.9821	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.2033	18.4753	18.8988	19.4952	19.9387	20.2488	20.3285	20.3242	20.1480	19.5911	18.8620	18.2394	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2033	18.4753	18.8988	19.4952	19.9387	20.2488	20.3285	20.3242	20.1480	19.5911	18.8620	18.2394	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9711	0.9567	0.9308	0.8762	0.7792	0.6141	0.4514	0.4895	0.7142	0.8896	0.9552	0.9750	(94)
Useful gains	443.5683	496.3889	530.3378	538.0428	497.9310	382.8804	270.2943	279.1305	385.7278	437.9646	429.2693	423.8515	(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													
	1177.6712	1139.7062	1031.6366	841.9481	648.7399	425.7946	281.0465	293.3519	463.7248	707.9853	943.3614	1147.0787	(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													
	546.1726	432.3093	372.9664	218.8118	112.2018	0.0000	0.0000	0.0000	0.0000	200.8954	370.1463	538.0810	(98)
Space heating												2791.5845	(98)
Space heating per m2											(98) / (4) =	68.0211	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2791.5845	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	546.1726	432.3093	372.9664	218.8118	112.2018	0.0000	0.0000	0.0000	0.0000	200.8954	370.1463	538.0810	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	546.1726	432.3093	372.9664	218.8118	112.2018	0.0000	0.0000	0.0000	0.0000	200.8954	370.1463	538.0810	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												2791.5845	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												197.7939	(232)
Total delivered energy for all uses												4409.4459	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2791.5845	13.1900	368.2100	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	13.1900	187.3069	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	197.7939	13.1900	26.0890	(250)
Additional standing charges			0.0000	(251)
Total energy cost			581.6059	(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] =	2.8391	(257)
SAP value		60.3948	
SAP rating (Section 12)		60	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2791.5845	0.5190	1448.8324	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			2185.8474	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	197.7939	0.5190	102.6551	(268)
Total kg/year			2288.5024	(272)
CO2 emissions per m2			55.7600	(273)
EI value			64.3585	
EI rating			64	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	33.6700	7.8800	25.7900	0.6000	15.4740			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
Total net area of external elements Aum(A, m2)			38.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.6124			(33)
Party Wall 1			26.6800	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			41.0400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	5.8425	(36)
Total fabric heat loss (33) + (36) =	46.4549	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff	80.9543	79.4652	80.2045	76.6743	76.6743	73.5593	74.1491	74.1491	75.3784	76.6743	76.0180	78.7426	(39)
Average = Sum(39)m / 12 =												76.8870	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9726	1.9363	1.9543	1.8683	1.8683	1.7924	1.8068	1.8068	1.8367	1.8683	1.8523	1.9187	(40)
HLP (average)												1.8735	(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	1.4342	(42)
Average daily hot water use (litres/day)	68.2633	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)

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

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
								Total per year (kWh/year) = Sum(64)m =				1420.0675	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.9998	24.8692	20.2250	15.3116	11.4456	9.6629	10.4411	13.5717	18.2159	23.1292	26.9952	28.7780	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	368.4002	365.6156	352.8511	333.1701	313.3918	295.3005	284.4434	290.0830	301.1476	320.9846	343.0755	359.4317	(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	1.9700	12.9280	0.7600	0.7000	0.7700	9.3895	(75)
Southeast	5.9100	40.5720	0.7600	0.7000	0.7700	88.4014	(77)

Solar gains	97.7909	155.4629	216.3611	289.0809	327.5170	353.6306	333.3115	301.0517	256.2152	182.4625	120.5798	82.5209	(83)
Total gains	466.1910	521.0785	569.2123	622.2509	640.9088	648.9311	617.7549	591.1346	557.3628	503.4470	463.6552	441.9526	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.2050	35.8647	35.5342	37.1702	37.1702	38.7442	38.4361	38.4361	37.8092	37.1702	37.4911	36.1939	
alpha	3.3470	3.3910	3.3689	3.4780	3.4780	3.5829	3.5624	3.5624	3.5206	3.4780	3.4994	3.4129	
util living area													
	0.9806	0.9708	0.9483	0.8935	0.7962	0.5908	0.4301	0.4475	0.7195	0.9040	0.9657	0.9832	(86)
MIT	19.2514	19.4675	19.8201	20.3097	20.6673	20.9265	20.9823	20.9799	20.8345	20.3849	19.8109	19.2642	(87)
Th 2	19.3517	19.3761	19.3640	19.4226	19.4226	19.4753	19.4653	19.4653	19.4444	19.4226	19.4336	19.3881	(88)
util rest of house													
	0.9739	0.9608	0.9294	0.8537	0.7169	0.4556	0.2583	0.2697	0.5953	0.8585	0.9520	0.9774	(89)
MIT 2	17.1704	17.4946	17.9881	18.6966	19.1430	19.4409	19.4623	19.4619	19.3451	18.8123	18.0270	17.2114	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.3909	18.6517	19.0626	19.6427	20.0370	20.3122	20.3538	20.3522	20.2186	19.7346	19.0733	18.4154	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3909	18.6517	19.0626	19.6427	20.0370	20.3122	20.3538	20.3522	20.2186	19.7346	19.0733	18.4154	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9686	0.9550	0.9250	0.8601	0.7510	0.5332	0.3600	0.3750	0.6623	0.8692	0.9479	0.9726	(94)
Useful gains	451.5464	497.6120	526.5464	535.2217	481.3334	345.9922	222.3763	221.6922	369.1260	437.6046	439.5174	429.8393	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1124.5295	1084.8352	975.4930	793.0158	600.8959	368.6962	226.4350	226.3178	423.5220	662.0532	887.3785	1095.7308	(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													
	500.6995	394.6139	334.0162	185.6117	88.9545	0.0000	0.0000	0.0000	0.0000	166.9897	322.4600	495.4232	(98)
Space heating												2488.7688	(98)
Space heating per m2											(98) / (4) =	60.6425	(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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2488.7688	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	500.6995	394.6139	334.0162	185.6117	88.9545	0.0000	0.0000	0.0000	0.0000	166.9897	322.4600	495.4232	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	500.6995	394.6139	334.0162	185.6117	88.9545	0.0000	0.0000	0.0000	0.0000	166.9897	322.4600	495.4232	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												2488.7688	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												197.7939	(232)
Total delivered energy for all uses												4106.6303	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2488.7688	18.2700	454.6981	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	18.2700	259.4463	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	197.7939	18.2700	36.1370	(250)
Additional standing charges			0.0000	(251)
Total energy cost			750.2814	(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	2488.7688	0.5190	1291.6710	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			2028.6861	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	197.7939	0.5190	102.6551	(268)
Total kg/year			2131.3411	(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	2488.7688	3.0700	7640.5203	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	3.0700	4359.6072	(264)
Space and water heating			12000.1275	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	197.7939	3.0700	607.2274	(268)
Primary energy kWh/year			12607.3549	(272)
Primary energy kWh/m2/year			307.1968	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 60
Current environmental impact rating:	D 64

(For testing purposes):

A	Not considered
B	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 60
Potential environmental impact rating: D 64

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£750	£750	£0
Space heating	£455	£455	£0
Water heating	£259	£259	£0
Lighting	£36	£36	£0
Total cost of fuels	£750	£750	£0
Total cost of uses	£750	£750	£0
Delivered energy	100 kWh/m²	100 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.1 tonnes	2.1 tonnes	0.0 tonnes
CO2 emissions per m²	52 kg/m²	52 kg/m²	0 kg/m²
Primary energy	307 kWh/m²	307 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
```

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-6	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.01, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	60 D	**DER**	N/A	**TER**	N/A
Environmental	64 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.13	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	15.58 m	41.04 m²	2.50 m

7.0 Living Area	24.07	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	33.67	25.79
External Wall - lobby	Solid Wall	Other	0.60	5.28	3.18

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	26.68

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	41.04

11.1 Party Floors

Description	Construction	Area (m²)
Party Floor 1	Other	41.04

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	North West							2.10	
windows	Window	[1] External Wall	South East	None	0.00					5.91	
window	Window	[1] External Wall	North East	None	0.00					1.97	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate	
Night Ventilation	No	
Air change rate	2.00	

Mechanical Ventilation

Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	

Efficiency (SAP Table)	100.0	%
Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 1.02, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

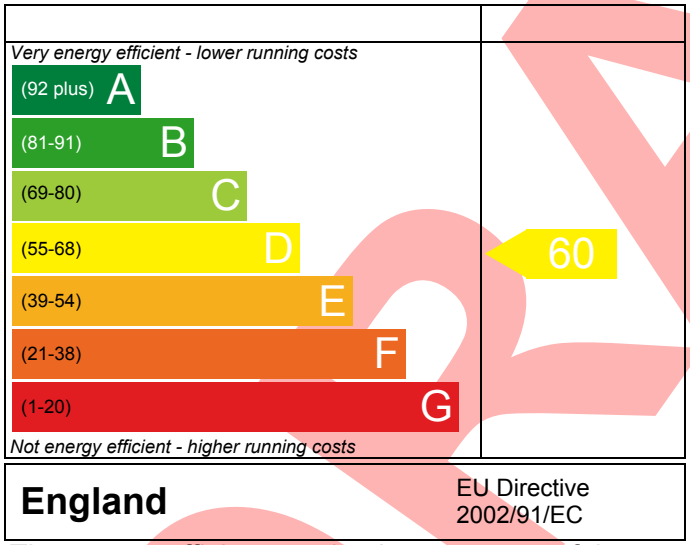
Unit 1.02, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	42.63 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

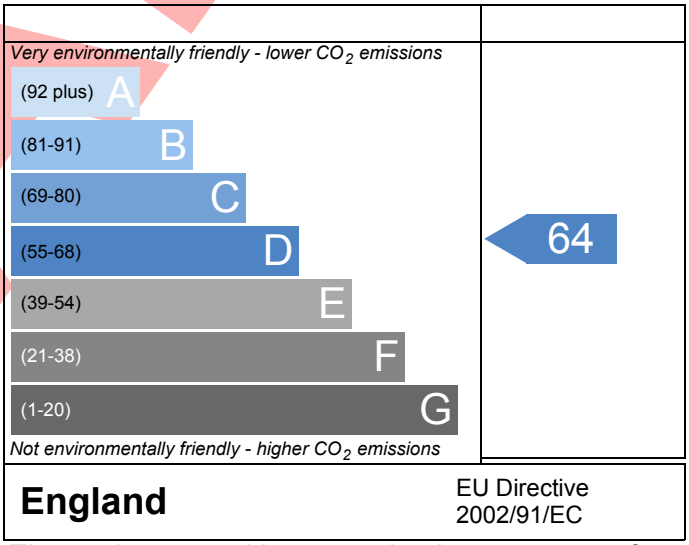
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-7	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.02, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	60 D	**DER**	N/A	**TER**	N/A
Environmental	64 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.24	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.6300	(1b)	x 2.5000	(2b) =	106.5750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.5750	(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) =	0.1877	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9377	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7267	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8357	0.7994	0.8175	0.7267	0.7267	0.6359	0.6540	0.6540	0.6904	0.7267	0.7085	0.7812	(22b)
Effective ac	0.8492	0.8195	0.8342	0.7640	0.7640	0.7022	0.7139	0.7139	0.7383	0.7640	0.7510	0.8051	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	23.9800	7.8800	16.1000	0.6000	9.6600			(29a)
External Wall - lobby	30.5000	2.1000	28.4000	0.4769	13.5453			(29a)
Total net area of external elements Aum(A, m2)			54.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.8270			(33)
Party Wall 1			19.8000	0.0000	0.0000			(32)
Party Floor 1			42.6300					(32d)
Party Ceilings 1			42.6300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.1720	(36)
Total fabric heat loss (33) + (36) =	54.9990	(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	29.8658	28.8211	29.3376	26.8710	26.8710	24.6946	25.1066	25.1066	25.9656	26.8710	26.4125	28.3162	(38)
Heat transfer coeff	84.8648	83.8201	84.3367	81.8700	81.8700	79.6936	80.1057	80.1057	80.9646	81.8700	81.4115	83.3152	(39)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 = 82.0190 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9907	1.9662	1.9783	1.9205	1.9205	1.8694	1.8791	1.8791	1.8992	1.9205	1.9097	1.9544	(40)
HLP (average)												1.9240	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4779 (42)

Average daily hot water use (litres/day) 69.2992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	76.2291	73.4571	70.6852	67.9132	65.1412	62.3693	62.3693	65.1412	67.9132	70.6852	73.4571	76.2291	(44)
Energy conte	113.0455	98.8703	102.0253	88.9482	85.3479	73.6487	68.2464	78.3137	79.2490	92.3571	100.8150	109.4786	(45)
Energy content (annual)										Total = Sum(45)m =		1090.3458	(45)
Distribution loss (46)m = 0.15 x (45)m													
	16.9568	14.8306	15.3038	13.3422	12.8022	11.0473	10.2370	11.7471	11.8874	13.8536	15.1223	16.4218	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
								Total per year (kWh/year) = Sum(64)m =				1436.3658	(64)
RHI water heating demand												1436	(64)
Heat gains from water heating, kWh/month													
	61.0980	54.1096	57.4338	52.3273	51.8886	47.2402	46.2023	49.5497	49.1023	54.2191	56.2730	59.9120	(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	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.0640	25.8144	20.9937	15.8935	11.8806	10.0301	10.8379	14.0875	18.9082	24.0083	28.0213	29.8718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	191.3434	193.3290	188.3255	177.6736	164.2275	151.5901	143.1475	141.1619	146.1655	156.8173	170.2634	182.9009	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	(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)													
	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	(71)
Water heating gains (Table 5)													
	82.1210	80.5202	77.1960	72.6768	69.7427	65.6114	62.0999	66.5991	68.1976	72.8752	78.1569	80.5269	(72)
Total internal gains													
	377.4307	374.5658	361.4173	341.1461	320.7530	302.1338	290.9875	296.7507	308.1735	328.6031	351.3438	368.2017	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.8800	40.5720	0.7600	0.7000	0.7700	117.8685	(77)

Solar gains	117.8685	183.8280	246.9144	315.4619	345.4967	367.7490	348.7451	323.5863	287.2753	213.1612	144.6089	99.9199	(83)
Total gains	495.2991	558.3938	608.3318	656.6080	666.2497	669.8828	639.7326	620.3370	595.4488	541.7643	495.9528	468.1216	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.8839	35.3187	35.1024	36.1600	36.1600	37.1475	36.9564	36.9564	36.5643	36.1600	36.3636	35.5327	
alpha	3.3256	3.3546	3.3402	3.4107	3.4107	3.4765	3.4638	3.4638	3.4376	3.4107	3.4242	3.3688	
util living area													
	0.9794	0.9684	0.9449	0.8930	0.8025	0.6095	0.4454	0.4577	0.7181	0.8990	0.9637	0.9823	(86)
MIT	19.2515	19.4650	19.8241	20.2823	20.6411	20.9105	20.9777	20.9758	20.8244	20.3751	19.7822	19.2421	(87)
Th 2	19.3395	19.3559	19.3478	19.3869	19.3869	19.4218	19.4152	19.4152	19.4014	19.3869	19.3942	19.3639	(88)
util rest of house													
	0.9723	0.9577	0.9250	0.8527	0.7231	0.4685	0.2629	0.2709	0.5912	0.8514	0.9491	0.9762	(89)
MIT 2	17.1631	17.4780	17.9822	18.6344	19.0851	19.3800	19.4116	19.4112	19.2972	18.7723	17.9606	17.1647	(90)
Living area fraction									fLA = Living area / (4) =			0.6587	(91)
MIT	18.5387	18.7868	19.1954	19.7198	20.1100	20.3881	20.4432	20.4418	20.3031	19.8280	19.1605	18.5331	(92)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment												0.0000	
adjusted MIT	18.5387	18.7868	19.1954	19.7198	20.1100	20.3881	20.4432	20.4418	20.3031	19.8280	19.1605	18.5331	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9677	0.9530	0.9228	0.8623	0.7622	0.5587	0.3840	0.3949	0.6681	0.8666	0.9464	0.9720	(94)
Useful gains	479.3160	532.1312	561.3436	566.1757	507.7973	374.2426	245.6519	244.9829	397.8077	469.4860	469.3697	455.0272	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1191.3956	1155.6112	1036.9533	853.0709	647.5930	405.4889	251.7885	251.6756	461.7535	714.5631	957.4396	1169.1686	(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													
	529.7872	418.9785	353.8537	206.5646	104.0080	0.0000	0.0000	0.0000	0.0000	182.3373	351.4103	531.3212	(98)
Space heating												2678.2609	(98)
RHI space heating demand												2678	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.6300 (1b)	x	2.5000 (2b)	=	106.5750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.5750	(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) =	0.1877	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9377	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7267	(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	0.9265	0.9084	0.8902	0.7994	0.7812	0.6904	0.6904	0.6722	0.7267	0.7812	0.8175	0.8539	(22b)
Effective ac	0.9292	0.9126	0.8962	0.8195	0.8051	0.7383	0.7383	0.7259	0.7640	0.8051	0.8342	0.8645	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	23.9800	7.8800	16.1000	0.6000	9.6600			(29a)
External Wall - lobby	30.5000	2.1000	28.4000	0.4769	13.5453			(29a)
Total net area of external elements Aum(A, m2)			54.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.8270			(33)
Party Wall 1			19.8000	0.0000	0.0000			(32)
Party Floor 1			42.6300					(32d)
Party Ceilings 1			42.6300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.1720	(36)
Total fabric heat loss (33) + (36) =	54.9990	(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	32.6806	32.0944	31.5199	28.8211	28.3162	25.9656	25.9656	25.5303	26.8710	28.3162	29.3376	30.4055	(38)
Heat transfer coeff	87.6797	87.0935	86.5189	83.8201	83.3152	80.9646	80.9646	80.5294	81.8700	83.3152	84.3367	85.4046	(39)
Average = Sum(39)m / 12 =												83.8177	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0568	2.0430	2.0295	1.9662	1.9544	1.8992	1.8992	1.8890	1.9205	1.9544	1.9783	2.0034	(40)
HLP (average)												1.9662	(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	1.4779 (42)
Average daily hot water use (litres/day)	69.2992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.2291	73.4571	70.6852	67.9132	65.1412	62.3693	62.3693	65.1412	67.9132	70.6852	73.4571	76.2291	(44)
Energy conte	113.0455	98.8703	102.0253	88.9482	85.3479	73.6487	68.2464	78.3137	79.2490	92.3571	100.8150	109.4786	(45)
Energy content (annual)										Total = Sum(45)m =		1090.3458	(45)
Distribution loss (46)m = 0.15 x (45)m	16.9568	14.8306	15.3038	13.3422	12.8022	11.0473	10.2370	11.7471	11.8874	13.8536	15.1223	16.4218	(46)

Water storage loss:	
Store volume	110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
								Total per year (kWh/year) = Sum(64)m =				1436.3658	(64)
Heat gains from water heating, kWh/month													
	61.0980	54.1096	57.4338	52.3273	51.8886	47.2402	46.2023	49.5497	49.1023	54.2191	56.2730	59.9120	(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	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.0640	25.8144	20.9937	15.8935	11.8806	10.0301	10.8379	14.0875	18.9082	24.0083	28.0213	29.8718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	191.3434	193.3290	188.3255	177.6736	164.2275	151.5901	143.1475	141.1619	146.1655	156.8173	170.2634	182.9009	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	(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)													
	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	(71)
Water heating gains (Table 5)													
	82.1210	80.5202	77.1960	72.6768	69.7427	65.6114	62.0999	66.5991	68.1976	72.8752	78.1569	80.5269	(72)
Total internal gains													
	377.4307	374.5658	361.4173	341.1461	320.7530	302.1338	290.9875	296.7507	308.1735	328.6031	351.3438	368.2017	(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	
Southeast	7.8800	36.7938	0.7600	0.7000	0.7700	106.8922	(77)

Solar gains	106.8922	182.0770	249.1257	308.6788	345.7460	343.2457	330.9255	303.2717	269.7504	201.2339	128.0322	91.4775	(83)
Total gains	484.3229	556.6428	610.5430	649.8249	666.4990	645.3795	621.9130	600.0225	577.9240	529.8369	479.3761	459.6792	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.7640	33.9913	34.2170	35.3187	35.5327	36.5643	36.5643	36.7620	36.1600	35.5327	35.1024	34.6634	
alpha	3.2509	3.2661	3.2811	3.3546	3.3688	3.4376	3.4376	3.4508	3.4107	3.3688	3.3402	3.3109	
util living area													
	0.9815	0.9699	0.9494	0.9057	0.8254	0.6834	0.5335	0.5667	0.7644	0.9161	0.9696	0.9842	(86)
MIT	19.1302	19.3661	19.7185	20.1836	20.5682	20.8505	20.9525	20.9410	20.7621	20.2677	19.6457	19.1269	(87)
Th 2	19.2958	19.3048	19.3137	19.3559	19.3639	19.4014	19.4014	19.4083	19.3869	19.3639	19.3478	19.3311	(88)
util rest of house													
	0.9751	0.9596	0.9312	0.8698	0.7543	0.5555	0.3574	0.3930	0.6516	0.8764	0.9572	0.9787	(89)
MIT 2	16.9624	17.3055	17.8116	18.4818	18.9818	19.3155	19.3884	19.3901	19.2277	18.6159	17.7383	16.9787	(90)
Living area fraction										fLA = Living area / (4) =		0.6587	(91)
MIT	18.3903	18.6628	19.0676	19.6028	20.0268	20.3266	20.4187	20.4116	20.2384	19.7039	18.9947	18.3937	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3903	18.6628	19.0676	19.6028	20.0268	20.3266	20.4187	20.4116	20.2384	19.7039	18.9947	18.3937	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9705	0.9545	0.9279	0.8761	0.7863	0.6341	0.4735	0.5071	0.7165	0.8863	0.9538	0.9746	(94)
Useful gains	470.0306	531.3362	566.5259	569.3401	524.0703	409.2166	294.4479	304.2546	414.1042	469.5714	457.2310	447.9895	(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													
	1235.4353	1198.6464	1087.3383	897.1091	693.7452	463.6482	309.1800	323.0553	502.5496	758.4964	1003.1568	1212.2067	(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													
	569.4611	448.4324	387.4845	235.9936	126.2381	0.0000	0.0000	0.0000	0.0000	214.9602	393.0666	568.5776	(98)
Space heating												2944.2141	(98)
Space heating per m2											(98) / (4) =	69.0644	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2944.2141	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	569.4611	448.4324	387.4845	235.9936	126.2381	0.0000	0.0000	0.0000	0.0000	214.9602	393.0666	568.5776	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	569.4611	448.4324	387.4845	235.9936	126.2381	0.0000	0.0000	0.0000	0.0000	214.9602	393.0666	568.5776	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(219)
Water heating fuel used												1436.3658	(219)
Annual totals kWh/year													
Space heating fuel - main system												2944.2141	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												205.3115	(232)
Total delivered energy for all uses												4585.8914	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2944.2141	13.1900	388.3418	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1436.3658	13.1900	189.4566	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	205.3115	13.1900	27.0806	(250)
Additional standing charges			0.0000	(251)
Total energy cost			604.8791	(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] =	2.8991	(257)
SAP value		59.5574	
SAP rating (Section 12)		60	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2944.2141	0.5190	1528.0471	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1436.3658	0.5190	745.4738	(264)
Space and water heating			2273.5210	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3115	0.5190	106.5567	(268)
Total kg/year			2380.0777	(272)
CO2 emissions per m2			55.8300	(273)
EI value			63.6049	
EI rating			64	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.6300 (1b)	x	2.5000 (2b)	=	106.5750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.5750	(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) =	0.1877	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9377	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7267	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8357	0.7994	0.8175	0.7267	0.7267	0.6359	0.6540	0.6540	0.6904	0.7267	0.7085	0.7812	(22b)
Effective ac	0.8492	0.8195	0.8342	0.7640	0.7640	0.7022	0.7139	0.7139	0.7383	0.7640	0.7510	0.8051	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	23.9800	7.8800	16.1000	0.6000	9.6600			(29a)
External Wall - lobby	30.5000	2.1000	28.4000	0.4769	13.5453			(29a)
Total net area of external elements Aum(A, m2)			54.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.8270			(33)
Party Wall 1			19.8000	0.0000	0.0000			(32)
Party Floor 1			42.6300					(32d)
Party Ceilings 1			42.6300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.1720	(36)
Total fabric heat loss (33) + (36) =	54.9990	(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	29.8658	28.8211	29.3376	26.8710	26.8710	24.6946	25.1066	25.1066	25.9656	26.8710	26.4125	28.3162	(38)
Heat transfer coeff	84.8648	83.8201	84.3367	81.8700	81.8700	79.6936	80.1057	80.1057	80.9646	81.8700	81.4115	83.3152	(39)
Average = Sum(39)m / 12 =												82.0190	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9907	1.9662	1.9783	1.9205	1.9205	1.8694	1.8791	1.8791	1.8992	1.9205	1.9097	1.9544	(40)
HLP (average)												1.9240	(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	1.4779 (42)
Average daily hot water use (litres/day)	69.2992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.2291	73.4571	70.6852	67.9132	65.1412	62.3693	62.3693	65.1412	67.9132	70.6852	73.4571	76.2291	(44)
Energy conte	113.0455	98.8703	102.0253	88.9482	85.3479	73.6487	68.2464	78.3137	79.2490	92.3571	100.8150	109.4786	(45)
Energy content (annual)										Total = Sum(45)m =		1090.3458	(45)
Distribution loss (46)m = 0.15 x (45)m	16.9568	14.8306	15.3038	13.3422	12.8022	11.0473	10.2370	11.7471	11.8874	13.8536	15.1223	16.4218	(46)

Water storage loss:	
Store volume	110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)

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

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(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	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
Total per year (kWh/year) = Sum(64)m =												1436.3658	(64)
Heat gains from water heating, kWh/month	61.0980	54.1096	57.4338	52.3273	51.8886	47.2402	46.2023	49.5497	49.1023	54.2191	56.2730	59.9120	(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	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.0640	25.8144	20.9937	15.8935	11.8806	10.0301	10.8379	14.0875	18.9082	24.0083	28.0213	29.8718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.3434	193.3290	188.3255	177.6736	164.2275	151.5901	143.1475	141.1619	146.1655	156.8173	170.2634	182.9009	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	(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)	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	(71)
Water heating gains (Table 5)	82.1210	80.5202	77.1960	72.6768	69.7427	65.6114	62.0999	66.5991	68.1976	72.8752	78.1569	80.5269	(72)
Total internal gains	377.4307	374.5658	361.4173	341.1461	320.7530	302.1338	290.9875	296.7507	308.1735	328.6031	351.3438	368.2017	(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	
Southeast	7.8800	40.5720	0.7600	0.7000	0.7700	117.8685	(77)

Solar gains	117.8685	183.8280	246.9144	315.4619	345.4967	367.7490	348.7451	323.5863	287.2753	213.1612	144.6089	99.9199	(83)
Total gains	495.2991	558.3938	608.3318	656.6080	666.2497	669.8828	639.7326	620.3370	595.4488	541.7643	495.9528	468.1216	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.8839	35.3187	35.1024	36.1600	36.1600	37.1475	36.9564	36.9564	36.5643	36.1600	36.3636	35.5327	
alpha	3.3256	3.3546	3.3402	3.4107	3.4107	3.4765	3.4638	3.4638	3.4376	3.4107	3.4242	3.3688	
util living area	0.9794	0.9684	0.9449	0.8930	0.8025	0.6095	0.4454	0.4577	0.7181	0.8990	0.9637	0.9823	(86)
MIT	19.2515	19.4650	19.8241	20.2823	20.6411	20.9105	20.9777	20.9758	20.8244	20.3751	19.7822	19.2421	(87)
Th 2	19.3395	19.3559	19.3478	19.3869	19.3869	19.4218	19.4152	19.4152	19.4014	19.3869	19.3942	19.3639	(88)
util rest of house	0.9723	0.9577	0.9250	0.8527	0.7231	0.4685	0.2629	0.2709	0.5912	0.8514	0.9491	0.9762	(89)
MIT 2	17.1631	17.4780	17.9822	18.6344	19.0851	19.3800	19.4116	19.4112	19.2972	18.7723	17.9606	17.1647	(90)
Living area fraction									fLA = Living area / (4) =			0.6587	(91)
MIT	18.5387	18.7868	19.1954	19.7198	20.1100	20.3881	20.4432	20.4418	20.3031	19.8280	19.1605	18.5331	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5387	18.7868	19.1954	19.7198	20.1100	20.3881	20.4432	20.4418	20.3031	19.8280	19.1605	18.5331	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9677	0.9530	0.9228	0.8623	0.7622	0.5587	0.3840	0.3949	0.6681	0.8666	0.9464	0.9720	(94)
Useful gains	479.3160	532.1312	561.3436	566.1757	507.7973	374.2426	245.6519	244.9829	397.8077	469.4860	469.3697	455.0272	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1191.3956	1155.6112	1036.9533	853.0709	647.5930	405.4889	251.7885	251.6756	461.7535	714.5631	957.4396	1169.1686	(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	529.7872	418.9785	353.8537	206.5646	104.0080	0.0000	0.0000	0.0000	0.0000	182.3373	351.4103	531.3212	(98)
Space heating												2678.2609	(98)
Space heating per m2											(98) / (4) =	62.8257	(99)

8c. Space cooling requirement

Not applicable

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

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2678.2609	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	529.7872	418.9785	353.8537	206.5646	104.0080	0.0000	0.0000	0.0000	0.0000	182.3373	351.4103	531.3212	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	529.7872	418.9785	353.8537	206.5646	104.0080	0.0000	0.0000	0.0000	0.0000	182.3373	351.4103	531.3212	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(219)
Water heating fuel used												1436.3658	(219)
Annual totals kWh/year													
Space heating fuel - main system												2678.2609	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												205.3115	(232)
Total delivered energy for all uses												4319.9382	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2678.2609	18.2700	489.3183	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1436.3658	18.2700	262.4240	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	205.3115	18.2700	37.5104	(250)
Additional standing charges			0.0000	(251)
Total energy cost			789.2527	(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	2678.2609	0.5190	1390.0174	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1436.3658	0.5190	745.4738	(264)
Space and water heating			2135.4912	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3115	0.5190	106.5567	(268)
Total kg/year			2242.0479	(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	2678.2609	3.0700	8222.2609	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1436.3658	3.0700	4409.6430	(264)
Space and water heating			12631.9038	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3115	3.0700	630.3064	(268)
Primary energy kWh/year			13262.2103	(272)
Primary energy kWh/m2/year			311.1004	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 60
Current environmental impact rating:	D 64

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 60
Potential environmental impact rating: D 64

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£789	£789	£0
Space heating	£489	£489	£0
Water heating	£262	£262	£0
Lighting	£38	£38	£0
Total cost of fuels	£789	£789	£0
Total cost of uses	£789	£789	£0
Delivered energy	101 kWh/m²	101 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.2 tonnes	2.2 tonnes	0.0 tonnes
CO2 emissions per m²	53 kg/m²	53 kg/m²	0 kg/m²
Primary energy	311 kWh/m²	311 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-7	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.02, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	60 D	**DER**	N/A	**TER**	N/A
Environmental	64 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.24	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	21.79 m	42.63 m²	2.50 m

7.0 Living Area	28.08	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	23.98	16.10
External Wall - lobby	Solid Wall	Other	0.60	30.50	28.40

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	19.80

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	42.63

11.1 Party Floors

Description	Construction	Area (m²)
Party Floor 1	Other	42.63

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	North West							2.10	
windows	Window	[1] External Wall	South East	None	0.00					7.88	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate	
Night Ventilation	No	
Air change rate	2.00	

Mechanical Ventilation

Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%

Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 1.03, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
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Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

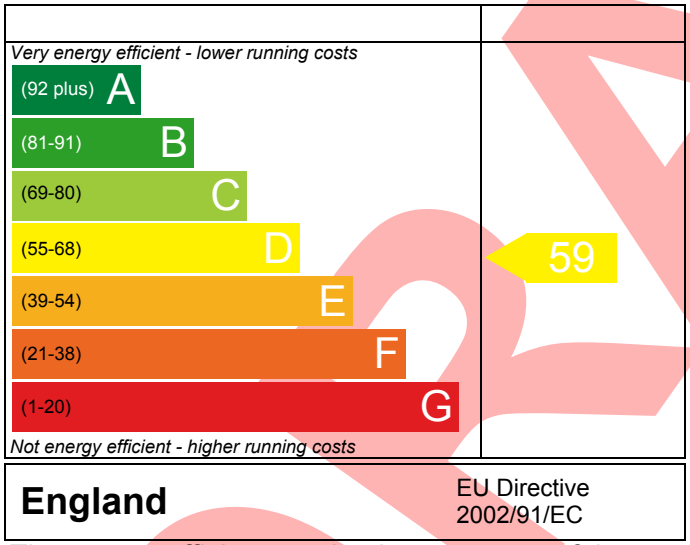
Unit 1.03, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	43.36 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

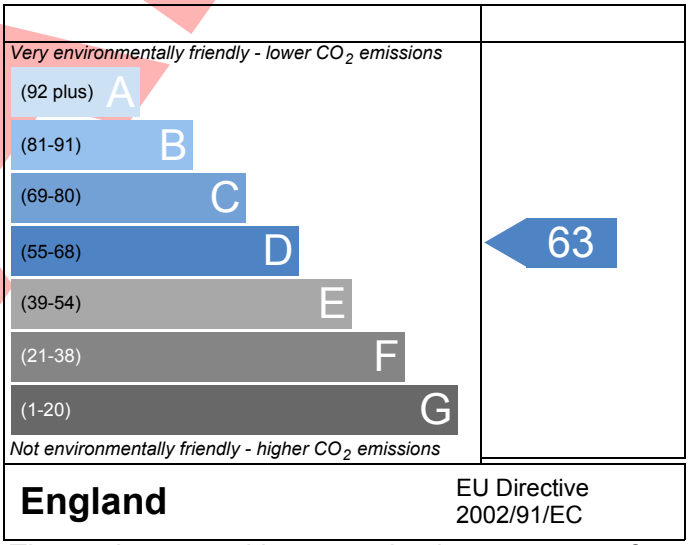
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-8	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.03, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	59 D	**DER**	N/A	**TER**	N/A
Environmental	63 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.29	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	43.3600	(1b)	x 2.5000	(2b) =	108.4000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		108.4000	(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) =	0.1845	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9345	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7242	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8329	0.7967	0.8148	0.7242	0.7242	0.6337	0.6518	0.6518	0.6880	0.7242	0.7061	0.7786	(22b)
Effective ac	0.8468	0.8173	0.8319	0.7623	0.7623	0.7008	0.7124	0.7124	0.7367	0.7623	0.7493	0.8031	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	32.0000	7.8800	24.1200	0.6000	14.4720			(29a)
External Wall - lobby	22.9800	2.1000	20.8800	0.4769	9.9587			(29a)
Total net area of external elements Aum(A, m2)			54.9800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.0524			(33)
Party Wall 1			19.3800	0.0000	0.0000			(32)
Party Floor 1			43.3600					(32d)
Party Ceilings 1			43.3600					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.2470	(36)
Total fabric heat loss	(33) + (36) = 56.2994	(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	30.2932	29.2377	29.7596	27.2676	27.2676	25.0688	25.4851	25.4851	26.3529	27.2676	26.8044	28.7276	(38)
Heat transfer coeff	86.5926	85.5371	86.0590	83.5670	83.5670	81.3682	81.7845	81.7845	82.6523	83.5670	83.1038	85.0270	(39)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 = 83.7175 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9971	1.9727	1.9848	1.9273	1.9273	1.8766	1.8862	1.8862	1.9062	1.9273	1.9166	1.9610	(40)
HLP (average)												1.9308	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4982 (42)

Average daily hot water use (litres/day) 69.7829 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	76.7612	73.9698	71.1785	68.3872	65.5959	62.8046	62.8046	65.5959	68.3872	71.1785	73.9698	76.7612	(44)
Energy conte	113.8346	99.5604	102.7375	89.5690	85.9436	74.1628	68.7227	78.8603	79.8022	93.0017	101.5187	110.2427	(45)
Energy content (annual)										Total = Sum(45)m =		1097.9562	(45)
Distribution loss (46)m = 0.15 x (45)m													
	17.0752	14.9341	15.4106	13.4354	12.8915	11.1244	10.3084	11.8290	11.9703	13.9503	15.2278	16.5364	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(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													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(64)
								Total per year (kWh/year) = Sum(64)m =				1443.9762	(64)
RHI water heating demand												1444	(64)
Heat gains from water heating, kWh/month													
	61.3604	54.3390	57.6706	52.5337	52.0866	47.4111	46.3607	49.7315	49.2862	54.4335	56.5070	60.1661	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5632	26.2578	21.3543	16.1666	12.0847	10.2024	11.0241	14.3295	19.2330	24.4207	28.5026	30.3849	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(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)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	82.4737	80.8617	77.5143	72.9635	70.0089	65.8488	62.3128	66.8434	68.4531	73.1633	78.4819	80.8684	(72)
Total internal gains													
	381.6186	378.7156	365.3883	344.8428	324.1645	305.3007	294.0208	299.8424	311.4320	332.1369	355.1792	372.2695	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.8800	40.5720	0.7600	0.7000	0.7700	117.8685	(77)

Solar gains	117.8685	183.8280	246.9144	315.4619	345.4967	367.7490	348.7451	323.5863	287.2753	213.1612	144.6089	99.9199	(83)
Total gains	499.4870	562.5436	612.3027	660.3047	669.6612	673.0496	642.7659	623.4287	598.7073	545.2981	499.7882	472.1894	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.7733	35.2024	34.9889	36.0323	36.0323	37.0060	36.8176	36.8176	36.4311	36.0323	36.2331	35.4136	
alpha	3.3182	3.3468	3.3326	3.4022	3.4022	3.4671	3.4545	3.4545	3.4287	3.4022	3.4155	3.3609	
util living area													
	0.9799	0.9693	0.9465	0.8962	0.8076	0.6164	0.4517	0.4640	0.7241	0.9018	0.9647	0.9828	(86)
MIT	19.2374	19.4491	19.8083	20.2676	20.6308	20.9064	20.9765	20.9745	20.8183	20.3633	19.7683	19.2281	(87)
Th 2	19.3353	19.3516	19.3435	19.3823	19.3823	19.4169	19.4103	19.4103	19.3966	19.3823	19.3895	19.3595	(88)
util rest of house													
	0.9729	0.9588	0.9271	0.8565	0.7288	0.4744	0.2664	0.2745	0.5973	0.8550	0.9504	0.9768	(89)
MIT 2	17.1403	17.4529	17.9578	18.6126	19.0706	19.3730	19.4065	19.4062	19.2883	18.7545	17.9382	17.1420	(90)
Living area fraction									fLA = Living area / (4) =			0.6621	(91)
MIT	18.5289	18.7747	19.1830	19.7084	20.1037	20.3883	20.4461	20.4446	20.3013	19.8197	19.1499	18.5233	(92)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment												0.0000	
adjusted MIT	18.5289	18.7747	19.1830	19.7084	20.1037	20.3883	20.4461	20.4446	20.3013	19.8197	19.1499	18.5233	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9685	0.9541	0.9247	0.8658	0.7675	0.5656	0.3900	0.4009	0.6743	0.8698	0.9477	0.9727	(94)
Useful gains	483.7396	536.7497	566.2208	571.6780	513.9504	380.6593	250.6586	249.9470	403.6883	474.3019	473.6639	459.2832	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1214.7944	1178.2447	1057.0661	869.8022	660.4859	414.0274	257.2996	257.1794	471.2289	728.6810	976.4650	1192.3589	(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													
	543.9047	431.0846	365.1889	214.6495	109.0224	0.0000	0.0000	0.0000	0.0000	189.2580	362.0168	545.4083	(98)
Space heating												2760.5332	(98)
RHI space heating demand												2761	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	43.3600 (1b)	x	2.5000 (2b)	=	108.4000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	108.4000	(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) =	0.1845	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9345	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7242	(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	0.9234	0.9053	0.8872	0.7967	0.7786	0.6880	0.6880	0.6699	0.7242	0.7786	0.8148	0.8510	(22b)
Effective ac	0.9263	0.9098	0.8936	0.8173	0.8031	0.7367	0.7367	0.7244	0.7623	0.8031	0.8319	0.8621	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	32.0000	7.8800	24.1200	0.6000	14.4720			(29a)
External Wall - lobby	22.9800	2.1000	20.8800	0.4769	9.9587			(29a)
Total net area of external elements Aum(A, m2)			54.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.0524			(33)
Party Wall 1			19.3800	0.0000	0.0000			(32)
Party Floor 1			43.3600					(32d)
Party Ceilings 1			43.3600					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.2470	(36)
Total fabric heat loss (33) + (36) =	56.2994	(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	33.1370	32.5448	31.9643	29.2377	28.7276	26.3529	26.3529	25.9131	27.2676	28.7276	29.7596	30.8385	(38)
Heat transfer coeff	89.4364	88.8441	88.2637	85.5371	85.0270	82.6523	82.6523	82.2125	83.5670	85.0270	86.0590	87.1379	(39)
Average = Sum(39)m / 12 =												85.5347	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0626	2.0490	2.0356	1.9727	1.9610	1.9062	1.9062	1.8960	1.9273	1.9610	1.9848	2.0096	(40)
HLP (average)												1.9727	(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	1.4982	(42)
Average daily hot water use (litres/day)	69.7829	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.7612	73.9698	71.1785	68.3872	65.5959	62.8046	62.8046	65.5959	68.3872	71.1785	73.9698	76.7612	(44)
Energy conte	113.8346	99.5604	102.7375	89.5690	85.9436	74.1628	68.7227	78.8603	79.8022	93.0017	101.5187	110.2427	(45)
Energy content (annual)										Total = Sum(45)m =		1097.9562	(45)
Distribution loss (46)m = 0.15 x (45)m	17.0752	14.9341	15.4106	13.4354	12.8915	11.1244	10.3084	11.8290	11.9703	13.9503	15.2278	16.5364	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(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													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(64)
									Total per year (kWh/year) = Sum(64)m =			1443.9762	(64)
Heat gains from water heating, kWh/month													
	61.3604	54.3390	57.6706	52.5337	52.0866	47.4111	46.3607	49.7315	49.2862	54.4335	56.5070	60.1661	(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	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5632	26.2578	21.3543	16.1666	12.0847	10.2024	11.0241	14.3295	19.2330	24.4207	28.5026	30.3849	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(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)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	82.4737	80.8617	77.5143	72.9635	70.0089	65.8488	62.3128	66.8434	68.4531	73.1633	78.4819	80.8684	(72)
Total internal gains													
	381.6186	378.7156	365.3883	344.8428	324.1645	305.3007	294.0208	299.8424	311.4320	332.1369	355.1792	372.2695	(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	
Southeast	7.8800	36.7938	0.7600	0.7000	0.7700	106.8922	(77)

Solar gains	106.8922	182.0770	249.1257	308.6788	345.7460	343.2457	330.9255	303.2717	269.7504	201.2339	128.0322	91.4775	(83)
Total gains	488.5108	560.7926	614.5140	653.5216	669.9105	648.5464	624.9463	603.1141	581.1824	533.3707	483.2115	463.7470	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.6676	33.8921	34.1150	35.2024	35.4136	36.4311	36.4311	36.6259	36.0323	35.4136	34.9889	34.5557	
alpha	3.2445	3.2595	3.2743	3.3468	3.3609	3.4287	3.4287	3.4417	3.4022	3.3609	3.3326	3.3037	
util living area													
	0.9819	0.9707	0.9508	0.9085	0.8300	0.6899	0.5401	0.5734	0.7698	0.9184	0.9704	0.9846	(86)
MIT	19.1169	19.3509	19.7027	20.1688	20.5570	20.8447	20.9503	20.9383	20.7548	20.2557	19.6325	19.1135	(87)
Th 2	19.2919	19.3009	19.3097	19.3516	19.3595	19.3966	19.3966	19.4035	19.3823	19.3595	19.3435	19.3269	(88)
util rest of house													
	0.9756	0.9606	0.9331	0.8733	0.7597	0.5617	0.3621	0.3980	0.6575	0.8795	0.9583	0.9792	(89)
MIT 2	16.9411	17.2817	17.7874	18.4597	18.9661	19.3070	19.3830	19.3843	19.2174	18.5974	17.7172	16.9570	(90)
Living area fraction										fLA = Living area / (4) =		0.6621	(91)
MIT	18.3818	18.6518	19.0556	19.5913	20.0195	20.3252	20.4207	20.4133	20.2354	19.6954	18.9854	18.3849	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3818	18.6518	19.0556	19.5913	20.0195	20.3252	20.4207	20.4133	20.2354	19.6954	18.9854	18.3849	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9711	0.9556	0.9297	0.8793	0.7912	0.6407	0.4800	0.5137	0.7222	0.8890	0.9549	0.9751	(94)
Useful gains	474.4141	535.9193	571.3360	574.6361	530.0307	415.5007	299.9809	309.8147	419.7329	474.1730	461.4201	452.2150	(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													
	1259.4240	1221.7675	1108.2047	914.5035	707.3805	473.1979	315.7926	329.9395	512.7147	773.3547	1022.8445	1236.0433	(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													
	584.0474	460.8900	399.4303	244.7045	131.9483	0.0000	0.0000	0.0000	0.0000	222.5912	404.2256	583.1683	(98)
Space heating												3031.0055	(98)
Space heating per m2											(98) / (4) =	69.9033	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3031.0055	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	584.0474	460.8900	399.4303	244.7045	131.9483	0.0000	0.0000	0.0000	0.0000	222.5912	404.2256	583.1683	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	584.0474	460.8900	399.4303	244.7045	131.9483	0.0000	0.0000	0.0000	0.0000	222.5912	404.2256	583.1683	(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													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(219)
Water heating fuel used												1443.9762	(219)
Annual totals kWh/year													
Space heating fuel - main system												3031.0055	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.8385	(232)
Total delivered energy for all uses												4683.8202	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3031.0055	13.1900	399.7896	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1443.9762	13.1900	190.4605	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.8385	13.1900	27.5458	(250)
Additional standing charges			0.0000	(251)
Total energy cost			617.7959	(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] =	2.9366	(257)
SAP value		59.0350	
SAP rating (Section 12)		59	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3031.0055	0.5190	1573.0919	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1443.9762	0.5190	749.4237	(264)
Space and water heating			2322.5155	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.8385	0.5190	108.3872	(268)
Total kg/year			2430.9027	(272)
CO2 emissions per m2			56.0600	(273)
EI value			63.1348	
EI rating			63	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	43.3600 (1b)	x	2.5000 (2b)	=	108.4000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	108.4000	(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) =	0.1845	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9345	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7242	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8329	0.7967	0.8148	0.7242	0.7242	0.6337	0.6518	0.6518	0.6880	0.7242	0.7061	0.7786	(22b)
Effective ac	0.8468	0.8173	0.8319	0.7623	0.7623	0.7008	0.7124	0.7124	0.7367	0.7623	0.7493	0.8031	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	32.0000	7.8800	24.1200	0.6000	14.4720			(29a)
External Wall - lobby	22.9800	2.1000	20.8800	0.4769	9.9587			(29a)
Total net area of external elements Aum(A, m2)			54.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.0524			(33)
Party Wall 1			19.3800	0.0000	0.0000			(32)
Party Floor 1			43.3600					(32d)
Party Ceilings 1			43.3600					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.2470	(36)
Total fabric heat loss (33) + (36) =	56.2994	(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	30.2932	29.2377	29.7596	27.2676	27.2676	25.0688	25.4851	25.4851	26.3529	27.2676	26.8044	28.7276	(38)
Heat transfer coeff	86.5926	85.5371	86.0590	83.5670	83.5670	81.3682	81.7845	81.7845	82.6523	83.5670	83.1038	85.0270	(39)
Average = Sum(39)m / 12 =												83.7175	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9971	1.9727	1.9848	1.9273	1.9273	1.8766	1.8862	1.8862	1.9062	1.9273	1.9166	1.9610	(40)
HLP (average)												1.9308	(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	1.4982	(42)
Average daily hot water use (litres/day)	69.7829	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.7612	73.9698	71.1785	68.3872	65.5959	62.8046	62.8046	65.5959	68.3872	71.1785	73.9698	76.7612	(44)
Energy conte	113.8346	99.5604	102.7375	89.5690	85.9436	74.1628	68.7227	78.8603	79.8022	93.0017	101.5187	110.2427	(45)
Energy content (annual)										Total = Sum(45)m =		1097.9562	(45)
Distribution loss (46)m = 0.15 x (45)m	17.0752	14.9341	15.4106	13.4354	12.8915	11.1244	10.3084	11.8290	11.9703	13.9503	15.2278	16.5364	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)

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

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  Temperature factor from Table 2b                                                                                               0.6000 (49)
Enter (49) or (54) in (55)                                                                                                       0.9480 (55)
Total storage loss
                29.3880    26.5440    29.3880    28.4400    29.3880    28.4400    29.3880    29.3880    28.4400    29.3880    28.4400    29.3880 (56)
If cylinder contains dedicated solar storage
                29.3880    26.5440    29.3880    28.4400    29.3880    28.4400    29.3880    29.3880    28.4400    29.3880    28.4400    29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
               143.2226   126.1044   132.1255   118.0090   115.3316   102.6028    98.1107   108.2483   108.2422   122.3897   129.9587   139.6307 (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
               143.2226   126.1044   132.1255   118.0090   115.3316   102.6028    98.1107   108.2483   108.2422   122.3897   129.9587   139.6307 (64)
                                                                                  Total per year (kWh/year) = Sum(64)m =         1443.9762 (64)
Heat gains from water heating, kWh/month
                61.3604    54.3390    57.6706    52.5337    52.0866    47.4111    46.3607    49.7315    49.2862    54.4335    56.5070    60.1661 (65)


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5. Internal gains (see Table 5 and 5a)
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Metabolic gains (Table 5), Watts
                  Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
(66)m           89.8936    89.8936    89.8936    89.8936    89.8936    89.8936    89.8936    89.8936    89.8936    89.8936    89.8936    89.8936 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
                29.5632    26.2578    21.3543    16.1666    12.0847    10.2024    11.0241    14.3295    19.2330    24.4207    28.5026    30.3849 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
               194.1296   196.1440   191.0677   180.2607   166.6188   153.7974   145.2318   143.2174   148.2938   159.1007   172.7426   185.5641 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
                45.4876    45.4876    45.4876    45.4876    45.4876    45.4876    45.4876    45.4876    45.4876    45.4876    45.4876    45.4876 (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)
               -59.9290   -59.9290   -59.9290   -59.9290   -59.9290   -59.9290   -59.9290   -59.9290   -59.9290   -59.9290   -59.9290   -59.9290 (71)
Water heating gains (Table 5)
                82.4737    80.8617    77.5143    72.9635    70.0089    65.8488    62.3128    66.8434    68.4531    73.1633    78.4819    80.8684 (72)
Total internal gains
               381.6186   378.7156   365.3883   344.8428   324.1645   305.3007   294.0208   299.8424   311.4320   332.1369   355.1792   372.2695 (73)


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6. Solar gains
----------------------------------------------------------------------------------------------------
[Jan]                                        Area          Solar flux               g                 FF            Access                 Gains
                                               m2             Table 6a     Specific data      Specific data          factor                    W
                                                                  W/m2       or Table 6b        or Table 6c        Table 6d
----------------------------------------------------------------------------------------------------
Southeast                                  7.8800            40.5720            0.7600            0.7000            0.7700            117.8685 (77)
----------------------------------------------------------------------------------------------------

Solar gains    117.8685   183.8280   246.9144   315.4619   345.4967   367.7490   348.7451   323.5863   287.2753   213.1612   144.6089    99.9199 (83)
Total gains    499.4870   562.5436   612.3027   660.3047   669.6612   673.0496   642.7659   623.4287   598.7073   545.2981   499.7882   472.1894 (84)


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7. Mean internal temperature (heating season)
----------------------------------------------------------------------------------------------------
Temperature during heating periods in the living area from Table 9, Th1 (C)                                                     21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
                  Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
tau             34.7733    35.2024    34.9889    36.0323    36.0323    37.0060    36.8176    36.8176    36.4311    36.0323    36.2331    35.4136
alpha            3.3182     3.3468     3.3326     3.4022     3.4022     3.4671     3.4545     3.4545     3.4287     3.4022     3.4155     3.3609
util living area
                 0.9799     0.9693     0.9465     0.8962     0.8076     0.6164     0.4517     0.4640     0.7241     0.9018     0.9647     0.9828 (86)

MIT             19.2374    19.4491    19.8083    20.2676    20.6308    20.9064    20.9765    20.9745    20.8183    20.3633    19.7683    19.2281 (87)
Th 2            19.3353    19.3516    19.3435    19.3823    19.3823    19.4169    19.4103    19.4103    19.3966    19.3823    19.3895    19.3595 (88)
util rest of house
                 0.9729     0.9588     0.9271     0.8565     0.7288     0.4744     0.2664     0.2745     0.5973     0.8550     0.9504     0.9768 (89)
MIT 2           17.1403    17.4529    17.9578    18.6126    19.0706    19.3730    19.4065    19.4062    19.2883    18.7545    17.9382    17.1420 (90)
Living area fraction                                                                                 fLA = Living area / (4) =       0.6621 (91)
MIT             18.5289    18.7747    19.1830    19.7084    20.1037    20.3883    20.4461    20.4446    20.3013    19.8197    19.1499    18.5233 (92)
Temperature adjustment                                                                                                               0.0000
adjusted MIT    18.5289    18.7747    19.1830    19.7084    20.1037    20.3883    20.4461    20.4446    20.3013    19.8197    19.1499    18.5233 (93)


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8. Space heating requirement
----------------------------------------------------------------------------------------------------

                  Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
Utilisation      0.9685     0.9541     0.9247     0.8658     0.7675     0.5656     0.3900     0.4009     0.6743     0.8698     0.9477     0.9727 (94)
Useful gains   483.7396   536.7497   566.2208   571.6780   513.9504   380.6593   250.6586   249.9470   403.6883   474.3019   473.6639   459.2832 (95)
Ext temp.        4.5000     5.0000     6.9000     9.3000    12.2000    15.3000    17.3000    17.3000    14.6000    11.1000     7.4000     4.5000 (96)
Heat loss rate W
              1214.7944  1178.2447  1057.0661   869.8022   660.4859   414.0274   257.2996   257.1794   471.2289   728.6810   976.4650  1192.3589 (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
               543.9047   431.0846   365.1889   214.6495   109.0224     0.0000     0.0000     0.0000     0.0000   189.2580   362.0168   545.4083 (98)
Space heating                                                                                                                     2760.5332 (98)
Space heating per m2                                                                                             (98) / (4) =       63.6654 (99)


----------------------------------------------------------------------------------------------------
8c. Space cooling requirement
----------------------------------------------------------------------------------------------------
Not applicable
```

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

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 %)	100.0000 (206)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)
Space heating requirement	2760.5332 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	543.9047	431.0846	365.1889	214.6495	109.0224	0.0000	0.0000	0.0000	0.0000	189.2580	362.0168	545.4083	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	543.9047	431.0846	365.1889	214.6495	109.0224	0.0000	0.0000	0.0000	0.0000	189.2580	362.0168	545.4083	(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													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(219)
Water heating fuel used												1443.9762	(219)
Annual totals kWh/year													
Space heating fuel - main system												2760.5332	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.8385	(232)
Total delivered energy for all uses												4413.3480	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2760.5332	18.2700	504.3494	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1443.9762	18.2700	263.8145	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.8385	18.2700	38.1548	(250)
Additional standing charges			0.0000	(251)
Total energy cost			806.3187	(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	2760.5332	0.5190	1432.7168	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1443.9762	0.5190	749.4237	(264)
Space and water heating			2182.1404	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.8385	0.5190	108.3872	(268)
Total kg/year			2290.5276	(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	2760.5332	3.0700	8474.8370	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1443.9762	3.0700	4433.0070	(264)
Space and water heating			12907.8441	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.8385	3.0700	641.1341	(268)
Primary energy kWh/year			13548.9782	(272)
Primary energy kWh/m2/year			312.4764	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 59
Current environmental impact rating:	D 63

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 59
Potential environmental impact rating: D 63

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£806	£806	£0
Space heating	£504	£504	£0
Water heating	£264	£264	£0
Lighting	£38	£38	£0
Total cost of fuels	£806	£806	£0
Total cost of uses	£806	£806	£0
Delivered energy	102 kWh/m²	102 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.3 tonnes	2.3 tonnes	0.0 tonnes
CO2 emissions per m²	53 kg/m²	53 kg/m²	0 kg/m²
Primary energy	312 kWh/m²	312 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
```

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-8	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.03, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	59 D	**DER**	N/A	**TER**	N/A
Environmental	63 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.29	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	21.99 m	43.36 m²	2.50 m

7.0 Living Area	28.71	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	32.00	24.12
External Wall - lobby	Solid Wall	Other	0.60	22.98	20.88

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	19.38

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	43.36

11.1 Party Floors

Description	Construction	Area (m²)
Party Floor 1	Other	43.36

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	North West							2.10	
windows	Window	[1] External Wall	South East	None	0.00					7.88	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate	
Night Ventilation	No	
Air change rate	2.00	

Mechanical Ventilation

Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%

Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 1.04, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

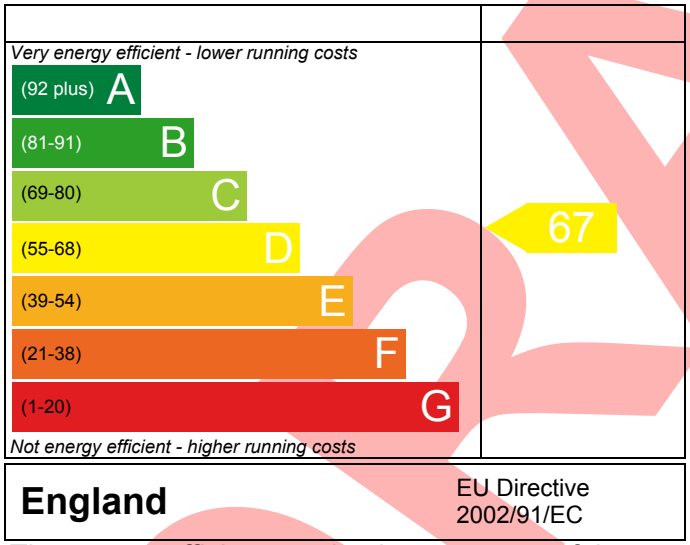
Unit 1.04, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	41.04 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

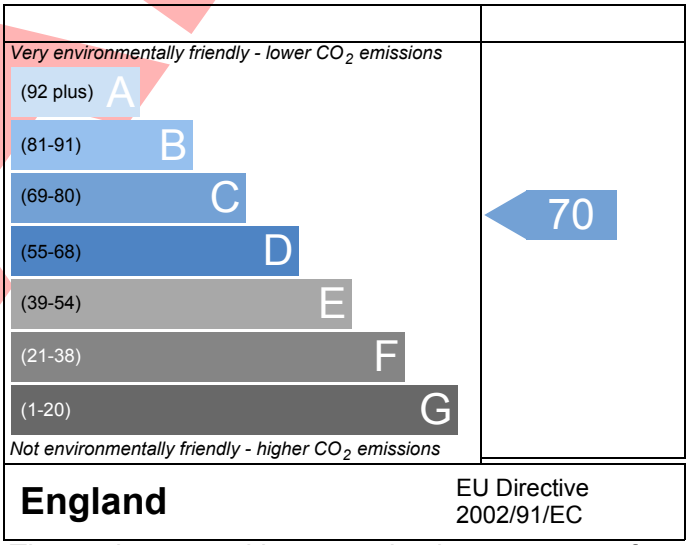
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-9	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.04, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	67 D	**DER**	N/A	**TER**	N/A
Environmental	70 C	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	1.77	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400	(1b)	x 2.5000	(2b) =	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	18.4200	5.9100	12.5100	0.6000	7.5060			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
Total net area of external elements Aum(A, m2)			23.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.6840			(33)
Party Wall 1			41.9300	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			41.0400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	3.5550	(36)
Total fabric heat loss (33) + (36) =	31.2390	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff	65.7384	64.2493	64.9886	61.4583	61.4583	58.3434	58.9332	58.9332	60.1625	61.4583	60.8021	63.5266	(39)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 = 61.6710 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6018	1.5655	1.5835	1.4975	1.4975	1.4216	1.4360	1.4360	1.4659	1.4975	1.4815	1.5479	(40)
HLP (average)												1.5027	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4342 (42)

Average daily hot water use (litres/day) 68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m													
	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
								Total per year (kWh/year) = Sum(64)m =				1420.0675	(64)
RHI water heating demand												1420	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.9100	40.5720	0.7600	0.7000	0.7700	88.4014	(77)

Solar gains	88.4014	137.8710	185.1858	236.5964	259.1225	275.8117	261.5588	242.6897	215.4565	159.8709	108.4567	74.9399	(83)
Total gains	458.3080	504.8246	539.1251	570.5903	573.1301	571.6321	546.5639	533.5029	517.5841	482.0999	452.9846	435.9200	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3537	44.3585	43.8539	46.3729	46.3729	48.8487	48.3599	48.3599	47.3717	46.3729	46.8734	44.8631	
alpha	3.8902	3.9572	3.9236	4.0915	4.0915	4.2566	4.2240	4.2240	4.1581	4.0915	4.1249	3.9909	
util living area													
	0.9795	0.9686	0.9446	0.8842	0.7796	0.5560	0.3940	0.4031	0.6728	0.8846	0.9604	0.9822	(86)
MIT	19.6557	19.8533	20.1366	20.5382	20.7977	20.9679	20.9941	20.9935	20.9203	20.6084	20.1543	19.6770	(87)
Th 2	19.6120	19.6387	19.6254	19.6894	19.6894	19.7468	19.7358	19.7358	19.7131	19.6894	19.7014	19.6518	(88)
util rest of house													
	0.9728	0.9586	0.9260	0.8460	0.7072	0.4451	0.2620	0.2683	0.5646	0.8383	0.9460	0.9764	(89)
MIT 2	17.9162	18.2160	18.6073	19.1983	19.5162	19.7309	19.7347	19.7345	19.6644	19.2992	18.6918	17.9738	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.9364	19.1763	19.5042	19.9841	20.2678	20.4564	20.4733	20.4729	20.4010	20.0670	19.5496	18.9727	(92)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment											0.0000	
adjusted MIT	18.9364	19.1763	19.5042	19.9841	20.2678	20.4564	20.4733	20.4729	20.4010	20.0670	19.5496	18.9727 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9686	0.9544	0.9241	0.8556	0.7415	0.5095	0.3397	0.3478	0.6252	0.8534	0.9440	0.9726	(94)
Useful gains	443.9379	481.8116	498.2017	488.2078	424.9807	291.2398	185.6819	185.5361	323.5947	411.4018	427.6096	423.9677	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	949.0267	910.8152	819.1301	656.6298	495.8320	300.8414	187.0129	186.9915	349.0013	551.0989	738.7197	919.4018	(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	375.7861	288.2904	238.7708	121.2639	52.7134	0.0000	0.0000	0.0000	0.0000	103.9347	223.9993	368.6030	(98)
Space heating												1773.3615	(98)
RHI space heating demand												1773	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(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	1.1297	1.1075	1.0854	0.9746	0.9525	0.8417	0.8417	0.8196	0.8860	0.9525	0.9968	1.0411	(22b)
Effective ac	1.1297	1.1075	1.0854	0.9750	0.9536	0.8543	0.8543	0.8359	0.8925	0.9536	0.9968	1.0411	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	18.4200	5.9100	12.5100	0.6000	7.5060			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
Total net area of external elements Aum(A, m2)			23.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6840			(33)
Party Wall 1			41.9300	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			41.0400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	3.5550	(36)
Total fabric heat loss (33) + (36) =	31.2390	(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	38.2493	37.4993	36.7494	33.0103	32.2876	28.9235	28.9235	28.3005	30.2193	32.2876	33.7496	35.2494	(38)
Heat transfer coeff	69.4883	68.7383	67.9883	64.2493	63.5266	60.1625	60.1625	59.5395	61.4583	63.5266	64.9886	66.4884	(39)
Average = Sum(39)m / 12 =												64.1931	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6932	1.6749	1.6566	1.5655	1.5479	1.4659	1.4659	1.4508	1.4975	1.5479	1.5835	1.6201	(40)
HLP (average)												1.5642	(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	1.4342 (42)
Average daily hot water use (litres/day)	68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

```
  Temperature factor from Table 2b                                                                                0.6000 (49)
Enter (49) or (54) in (55)                                                                                        0.9480 (55)
Total storage loss
              29.3880    26.5440    29.3880    28.4400    29.3880    28.4400    29.3880    29.3880    28.4400    29.3880    28.4400    29.3880 (56)
If cylinder contains dedicated solar storage
              29.3880    26.5440    29.3880    28.4400    29.3880    28.4400    29.3880    29.3880    28.4400    29.3880    28.4400    29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
             140.7437   123.9364   129.8883   116.0586   113.4601   100.9878    96.6142   106.5311   106.5044   120.3646   127.7480   137.2301 (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
             140.7437   123.9364   129.8883   116.0586   113.4601   100.9878    96.6142   106.5311   106.5044   120.3646   127.7480   137.2301 (64)
                                                                                    Total per year (kWh/year) = Sum(64)m =   1420.0675 (64)
Heat gains from water heating, kWh/month
              60.5362    53.6182    56.9267    51.8852    51.4644    46.8742    45.8631    49.1605    48.7084    53.7601    55.7719    59.3679 (65)
```

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

```
Metabolic gains (Table 5), Watts
                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
(66)m         86.0546    86.0546    86.0546    86.0546    86.0546    86.0546    86.0546    86.0546    86.0546    86.0546    86.0546    86.0546 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
              29.5062    26.2072    21.3131    16.1354    12.0614    10.1827    11.0028    14.3019    19.1959    24.3737    28.4477    30.3263 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
             185.3099   187.2329   182.3871   172.0711   159.0490   146.8101   138.6337   136.7108   141.5565   151.8725   164.8946   177.1336 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
              45.0397    45.0397    45.0397    45.0397    45.0397    45.0397    45.0397    45.0397    45.0397    45.0397    45.0397    45.0397 (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)
             -57.3698   -57.3698   -57.3698   -57.3698   -57.3698   -57.3698   -57.3698   -57.3698   -57.3698   -57.3698   -57.3698   -57.3698 (71)
Water heating gains (Table 5)
              81.3658    79.7890    76.5144    72.0627    69.1726    65.1030    61.6440    66.0759    67.6506    72.2582    77.4610    79.7956 (72)
Total internal gains
             369.9066   366.9536   353.9393   333.9939   314.0076   295.8204   285.0051   290.8132   302.1276   322.2290   344.5279   360.9801 (73)
```

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.9100	36.7938	0.7600	0.7000	0.7700	80.1692	(77)

```
Solar gains     80.1692   136.5578   186.8443   231.5091   259.3095   257.4343   248.1941   227.4538   202.3128   150.9254    96.0242    68.6081 (83)
Total gains    450.0758   503.5114   540.7836   565.5030   573.3171   553.2547   533.1993   518.2670   504.4405   473.1544   440.5521   429.5882 (84)
```

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7. Mean internal temperature (heating season)

```
Temperature during heating periods in the living area from Table 9, Th1 (C)                                      21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
tau           41.0141    41.4616    41.9189    44.3585    44.8631    47.3717    47.3717    47.8674    46.3729    44.8631    43.8539    42.8646
alpha          3.7343     3.7641     3.7946     3.9572     3.9909     4.1581     4.1581     4.1912     4.0915     3.9909     3.9236     3.8576
util living area
               0.9820     0.9712     0.9510     0.9025     0.8115     0.6405     0.4825     0.5106     0.7284     0.9077     0.9685     0.9844 (86)

MIT           19.5038    19.7099    20.0121    20.4319    20.7321    20.9337    20.9839    20.9799    20.8782    20.5066    19.9890    19.5369 (87)
Th 2          19.5457    19.5589    19.5721    19.6387    19.6518    19.7131    19.7131    19.7246    19.6894    19.6518    19.6254    19.5986 (88)
util rest of house
               0.9761     0.9619     0.9345     0.8691     0.7461     0.5334     0.3483     0.3777     0.6284     0.8692     0.9566     0.9793 (89)
MIT 2         17.6545    17.9579    18.3957    19.0202    19.4099    19.6735    19.7081    19.7177    19.6058    19.1400    18.4060    17.7366 (90)
Living area fraction                                                                          fLA = Living area / (4) =      0.5865 (91)
MIT           18.7391    18.9854    19.3437    19.8482    20.1854    20.4126    20.4564    20.4580    20.3521    19.9415    19.3344    18.7925 (92)
Temperature adjustment                                                                                                    0.0000
adjusted MIT  18.7391    18.9854    19.3437    19.8482    20.1854    20.4126    20.4564    20.4580    20.3521    19.9415    19.3344    18.7925 (93)
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8. Space heating requirement

```
                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
Utilisation    0.9717     0.9571     0.9313     0.8749     0.7743     0.5940     0.4273     0.4558     0.6822     0.8788     0.9535     0.9755 (94)
Useful gains 437.3555   481.9305   503.6337   494.7800   443.8999   328.6221   227.8326   236.2439   344.1487   415.7987   420.0617   419.0553 (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
            1003.3499   968.2092   873.2213   703.4114   539.0460   349.6998   232.0085   241.6111   384.2411   593.4365   795.0973   970.2291 (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
             421.0998   326.7793   274.9732   150.2146    70.7887     0.0000     0.0000     0.0000     0.0000   132.1625   270.0256   410.0734 (98)
Space heating                                                                                                          2056.1173 (98)
Space heating per m2                                                                                    (98) / (4) =     50.1003 (99)
```

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)	100.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	2056.1173	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	421.0998	326.7793	274.9732	150.2146	70.7887	0.0000	0.0000	0.0000	0.0000	132.1625	270.0256	410.0734	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	421.0998	326.7793	274.9732	150.2146	70.7887	0.0000	0.0000	0.0000	0.0000	132.1625	270.0256	410.0734	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												2056.1173	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.4358	(232)
Total delivered energy for all uses												3684.6206	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2056.1173	13.1900	271.2019	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	13.1900	187.3069	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.4358	13.1900	27.4927	(250)
Additional standing charges			0.0000	(251)
Total energy cost			486.0015	(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] =	2.3724	(257)
SAP value		66.9051	
SAP rating (Section 12)		67	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2056.1173	0.5190	1067.1249	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			1804.1399	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	0.5190	108.1782	(268)
Total kg/year			1912.3181	(272)
CO2 emissions per m2			46.6000	(273)
EI value			70.2173	
EI rating			70	(274)
EI band			C	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	18.4200	5.9100	12.5100	0.6000	7.5060			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
Total net area of external elements Aum(A, m2)			23.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6840			(33)
Party Wall 1			41.9300	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			41.0400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	3.5550	(36)
Total fabric heat loss (33) + (36) =	31.2390	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff	65.7384	64.2493	64.9886	61.4583	61.4583	58.3434	58.9332	58.9332	60.1625	61.4583	60.8021	63.5266	(39)
Average = Sum(39)m / 12 =												61.6710	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6018	1.5655	1.5835	1.4975	1.4975	1.4216	1.4360	1.4360	1.4659	1.4975	1.4815	1.5479	(40)
HLP (average)												1.5027	(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	1.4342 (42)
Average daily hot water use (litres/day)	68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)

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

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
									Total per year (kWh/year) = Sum(64)m =			1420.0675	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(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	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(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	
Southeast	5.9100	40.5720	0.7600	0.7000	0.7700	88.4014	(77)

Solar gains	88.4014	137.8710	185.1858	236.5964	259.1225	275.8117	261.5588	242.6897	215.4565	159.8709	108.4567	74.9399	(83)
Total gains	458.3080	504.8246	539.1251	570.5903	573.1301	571.6321	546.5639	533.5029	517.5841	482.0999	452.9846	435.9200	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.3537	44.3585	43.8539	46.3729	46.3729	48.8487	48.3599	48.3599	47.3717	46.3729	46.8734	44.8631	
alpha	3.8902	3.9572	3.9236	4.0915	4.0915	4.2566	4.2240	4.2240	4.1581	4.0915	4.1249	3.9909	
util living area													
	0.9795	0.9686	0.9446	0.8842	0.7796	0.5560	0.3940	0.4031	0.6728	0.8846	0.9604	0.9822	(86)
MIT	19.6557	19.8533	20.1366	20.5382	20.7977	20.9679	20.9941	20.9935	20.9203	20.6084	20.1543	19.6770	(87)
Th 2	19.6120	19.6387	19.6254	19.6894	19.6894	19.7468	19.7358	19.7358	19.7131	19.6894	19.7014	19.6518	(88)
util rest of house													
	0.9728	0.9586	0.9260	0.8460	0.7072	0.4451	0.2620	0.2683	0.5646	0.8383	0.9460	0.9764	(89)
MIT 2	17.9162	18.2160	18.6073	19.1983	19.5162	19.7309	19.7347	19.7345	19.6644	19.2992	18.6918	17.9738	(90)
Living area fraction										fLA = Living area / (4) =		0.5865	(91)
MIT	18.9364	19.1763	19.5042	19.9841	20.2678	20.4564	20.4733	20.4729	20.4010	20.0670	19.5496	18.9727	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9364	19.1763	19.5042	19.9841	20.2678	20.4564	20.4733	20.4729	20.4010	20.0670	19.5496	18.9727	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9686	0.9544	0.9241	0.8556	0.7415	0.5095	0.3397	0.3478	0.6252	0.8534	0.9440	0.9726	(94)
Useful gains	443.9379	481.8116	498.2017	488.2078	424.9807	291.2398	185.6819	185.5361	323.5947	411.4018	427.6096	423.9677	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	949.0267	910.8152	819.1301	656.6298	495.8320	300.8414	187.0129	186.9915	349.0013	551.0989	738.7197	919.4018	(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													
	375.7861	288.2904	238.7708	121.2639	52.7134	0.0000	0.0000	0.0000	0.0000	103.9347	223.9993	368.6030	(98)
Space heating												1773.3615	(98)
Space heating per m2											(98) / (4) =	43.2106	(99)

8c. Space cooling requirement

Not applicable

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

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 %)	100.0000 (206)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)
Space heating requirement	1773.3615 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	375.7861	288.2904	238.7708	121.2639	52.7134	0.0000	0.0000	0.0000	0.0000	103.9347	223.9993	368.6030	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	375.7861	288.2904	238.7708	121.2639	52.7134	0.0000	0.0000	0.0000	0.0000	103.9347	223.9993	368.6030	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												1773.3615	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.4358	(232)
Total delivered energy for all uses												3401.8648	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1773.3615	18.2700	323.9931	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	18.2700	259.4463	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.4358	18.2700	38.0812	(250)
Additional standing charges			0.0000	(251)
Total energy cost			621.5207	(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	1773.3615	0.5190	920.3746	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			1657.3897	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	0.5190	108.1782	(268)
Total kg/year			1765.5678	(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	1773.3615	3.0700	5444.2198	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	3.0700	4359.6072	(264)
Space and water heating			9803.8270	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	3.0700	639.8980	(268)
Primary energy kWh/year			10443.7250	(272)
Primary energy kWh/m2/year			254.4767	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 67
Current environmental impact rating:	C 70

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 67
Potential environmental impact rating: C 70

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£622	£622	£0
Space heating	£324	£324	£0
Water heating	£259	£259	£0
Lighting	£38	£38	£0
Total cost of fuels	£622	£622	£0
Total cost of uses	£621	£621	£0
Delivered energy	83 kWh/m²	83 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.8 tonnes	1.8 tonnes	0.0 tonnes
CO2 emissions per m²	43 kg/m²	43 kg/m²	0 kg/m²
Primary energy	254 kWh/m²	254 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-9	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.04, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	67 D	**DER**	N/A	**TER**	N/A
Environmental	70 C	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	1.77	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	9.48 m	41.04 m²	2.50 m

7.0 Living Area	24.07	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	18.42	12.51
External Wall - lobby	Solid Wall	Other	0.60	5.28	3.18

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	41.93

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	41.04

11.1 Party Floors

Description	Construction	Area (m²)
Party Floor 1	Other	41.04

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	North West							2.10	
windows	Window	[1] External Wall	South East	None	0.00					5.91	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate	
Night Ventilation	No	
Air change rate	2.00	

Mechanical Ventilation

Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%

Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 1.05, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

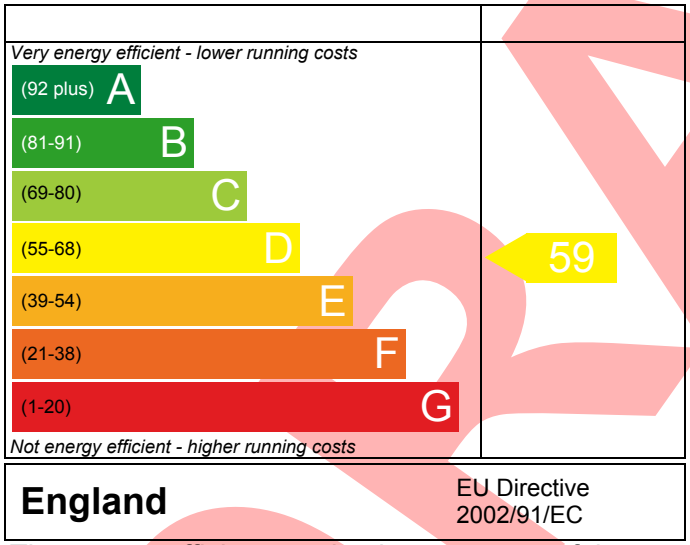
Unit 1.05, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	41.04 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

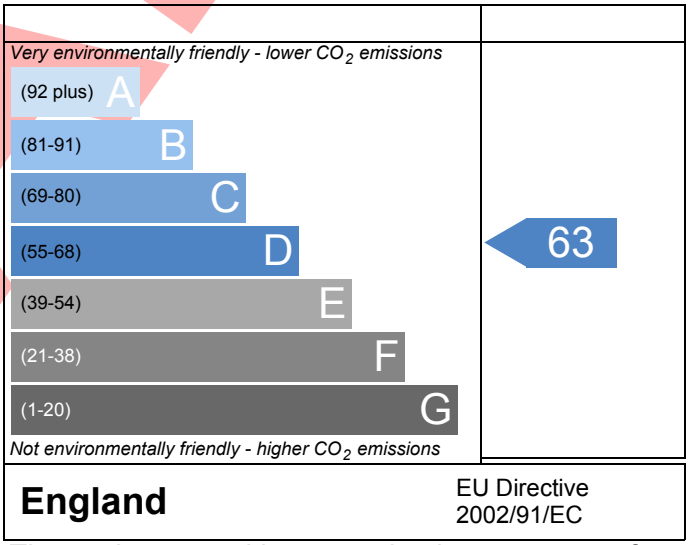
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-10	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.05, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	59 D	**DER**	N/A	**TER**	N/A
Environmental	63 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.22	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400	(1b)	x 2.5000	(2b) =	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	33.6700	5.9100	27.7600	0.6000	16.6560			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
Total net area of external elements Aum(A, m2)			38.9500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.8340			(33)
Party Wall 1			26.6800	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			41.0400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	5.8425	(36)
Total fabric heat loss	(33) + (36) = 42.6765	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff	77.1759	75.6868	76.4261	72.8958	72.8958	69.7809	70.3707	70.3707	71.6000	72.8958	72.2396	74.9641	(39)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 = 73.1085 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8805	1.8442	1.8622	1.7762	1.7762	1.7003	1.7147	1.7147	1.7446	1.7762	1.7602	1.8266	(40)
HLP (average)												1.7814	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4342 (42)

Average daily hot water use (litres/day) 68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m													
	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
									Total per year (kWh/year) = Sum(64)m =			1420.0675	(64)
RHI water heating demand												1420	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.9100	12.9280	0.7600	0.7000	0.7700	28.1686	(81)

Solar gains	28.1686	52.7758	93.5260	157.4534	205.1835	233.4567	215.2581	175.0858	122.2762	67.7746	36.3692	22.7430	(83)
Total gains	398.0752	419.7295	447.4652	491.4473	519.1911	529.2771	500.2632	465.8990	424.4039	390.0036	380.8971	383.7230	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.9286	37.6552	37.2909	39.0969	39.0969	40.8421	40.4998	40.4998	39.8045	39.0969	39.4520	38.0182	
alpha	3.4619	3.5103	3.4861	3.6065	3.6065	3.7228	3.7000	3.7000	3.6536	3.6065	3.6301	3.5345	
util living area													
	0.9877	0.9840	0.9721	0.9370	0.8572	0.6644	0.4971	0.5282	0.8142	0.9469	0.9801	0.9889	(86)
MIT	19.2222	19.3789	19.6983	20.1940	20.5965	20.9042	20.9757	20.9704	20.7673	20.2762	19.7455	19.2531	(87)
Th 2	19.4142	19.4392	19.4268	19.4867	19.4867	19.5406	19.5303	19.5303	19.5090	19.4867	19.4980	19.4514	(88)
util rest of house													
	0.9833	0.9783	0.9611	0.9103	0.7918	0.5289	0.3108	0.3329	0.7058	0.9181	0.9717	0.9850	(89)
MIT 2	17.1672	17.4092	17.8624	18.5985	19.1254	19.4919	19.5258	19.5246	19.3520	18.7247	17.9782	17.2348	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.3725	18.5645	18.9392	19.5343	19.9882	20.3202	20.3762	20.3726	20.1821	19.6346	19.0147	18.4185	(92)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment												0.0000	
adjusted MIT	18.3725	18.5645	18.9392	19.5343	19.9882	20.3202	20.3762	20.3726	20.1821	19.6346	19.0147	18.4185	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9793	0.9739	0.9567	0.9113	0.8165	0.6057	0.4214	0.4492	0.7609	0.9216	0.9681	0.9814	(94)
Useful gains	389.8365	408.7942	428.0787	447.8550	423.8993	320.5936	210.8286	209.2636	322.9497	359.4420	368.7538	376.5770	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1070.6201	1026.6501	920.1058	746.0344	567.7264	350.3123	216.4744	216.2195	399.6754	622.1403	839.0429	1043.3918	(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													
	506.5030	415.1992	366.0681	214.6892	107.0073	0.0000	0.0000	0.0000	0.0000	195.4476	338.6082	496.1102	(98)
Space heating												2639.6327	(98)
RHI space heating demand												2640	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(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	1.1297	1.1075	1.0854	0.9746	0.9525	0.8417	0.8417	0.8196	0.8860	0.9525	0.9968	1.0411	(22b)
Effective ac	1.1297	1.1075	1.0854	0.9750	0.9536	0.8543	0.8543	0.8359	0.8925	0.9536	0.9968	1.0411	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	33.6700	5.9100	27.7600	0.6000	16.6560			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
Total net area of external elements Aum(A, m2)			38.9500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.8340			(33)
Party Wall 1			26.6800	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			41.0400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	5.8425	(36)
Total fabric heat loss (33) + (36) =	42.6765	(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	38.2493	37.4993	36.7494	33.0103	32.2876	28.9235	28.9235	28.3005	30.2193	32.2876	33.7496	35.2494	(38)
Heat transfer coeff	80.9258	80.1758	79.4258	75.6868	74.9641	71.6000	71.6000	70.9770	72.8958	74.9641	76.4261	77.9259	(39)
Average = Sum(39)m / 12 =												75.6306	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9719	1.9536	1.9353	1.8442	1.8266	1.7446	1.7446	1.7295	1.7762	1.8266	1.8622	1.8988	(40)
HLP (average)												1.8429	(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	1.4342	(42)
Average daily hot water use (litres/day)	68.2633	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Total per year (kWh/year) = Sum(64)m =												1420.0675	(64)
Heat gains from water heating, kWh/month	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts (66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(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	
Northwest	5.9100	11.2829	0.7600	0.7000	0.7700	24.5841	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	24.5841	50.0417	90.1592	148.0673	199.0315	212.1887	198.4982	158.2450	109.8604	61.1549	30.9332	20.0766	(83)
Total gains	394.4908	416.9953	444.0985	482.0612	513.0391	508.0091	483.5033	449.0582	411.9881	383.3839	375.4611	381.0567	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.2174	35.5469	35.8825	37.6552	38.0182	39.8045	39.8045	40.1538	39.0969	38.0182	37.2909	36.5732	
alpha	3.3478	3.3698	3.3922	3.5103	3.5345	3.6536	3.6536	3.6769	3.6065	3.5345	3.4861	3.4382	
util living area	0.9885	0.9849	0.9754	0.9473	0.8811	0.7429	0.5966	0.6477	0.8535	0.9569	0.9826	0.9898	(86)
MIT	19.0862	19.2430	19.5615	20.0672	20.5005	20.8331	20.9451	20.9263	20.6891	20.1591	19.5955	19.1232	(87)
Th 2	19.3521	19.3644	19.3768	19.4392	19.4514	19.5090	19.5090	19.5198	19.4867	19.4514	19.4268	19.4017	(88)
util rest of house	0.9844	0.9794	0.9657	0.9247	0.8253	0.6242	0.4192	0.4738	0.7637	0.9338	0.9753	0.9862	(89)
MIT 2	16.9331	17.1678	17.6354	18.3921	18.9809	19.4050	19.4921	19.4935	19.2520	18.5397	17.7181	17.0161	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.1959	18.3849	18.7651	19.3746	19.8722	20.2426	20.3443	20.3338	20.0948	19.4895	18.8192	18.2519	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1959	18.3849	18.7651	19.3746	19.8722	20.2426	20.3443	20.3338	20.0948	19.4895	18.8192	18.2519	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9748	0.9609	0.9235	0.8429	0.6877	0.5239	0.5758	0.8054	0.9345	0.9714	0.9825	(94)
Useful gains	386.7290	406.4989	426.7230	445.1985	432.4292	349.3779	253.2936	258.5727	331.8034	358.2646	364.7157	374.4025	(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	1124.5342	1081.1654	974.1638	792.7854	612.6196	404.0101	268.0939	279.2118	436.9994	666.3901	895.6508	1095.0077	(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	548.9270	453.3759	407.2959	250.2626	134.0616	0.0000	0.0000	0.0000	0.0000	229.2453	382.2733	536.1303	(98)
Space heating												2941.5720	(98)
Space heating per m2											(98) / (4) =	71.6757	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2941.5720	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	548.9270	453.3759	407.2959	250.2626	134.0616	0.0000	0.0000	0.0000	0.0000	229.2453	382.2733	536.1303	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	548.9270	453.3759	407.2959	250.2626	134.0616	0.0000	0.0000	0.0000	0.0000	229.2453	382.2733	536.1303	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												2941.5720	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.4358	(232)
Total delivered energy for all uses												4570.0753	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2941.5720	13.1900	387.9933	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	13.1900	187.3069	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.4358	13.1900	27.4927	(250)
Additional standing charges			0.0000	(251)
Total energy cost			602.7929	(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] =	2.9425	(257)
SAP value		58.9521	
SAP rating (Section 12)		59	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2941.5720	0.5190	1526.6759	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			2263.6909	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	0.5190	108.1782	(268)
Total kg/year			2371.8691	(272)
CO2 emissions per m2			57.7900	(273)
EI value			63.0602	
EI rating			63	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	33.6700	5.9100	27.7600	0.6000	16.6560			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
Total net area of external elements Aum(A, m2)			38.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.8340			(33)
Party Wall 1			26.6800	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			41.0400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	5.8425	(36)
Total fabric heat loss (33) + (36) =	42.6765	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff	77.1759	75.6868	76.4261	72.8958	72.8958	69.7809	70.3707	70.3707	71.6000	72.8958	72.2396	74.9641	(39)
Average = Sum(39)m / 12 =												73.1085	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8805	1.8442	1.8622	1.7762	1.7762	1.7003	1.7147	1.7147	1.7446	1.7762	1.7602	1.8266	(40)
HLP (average)												1.7814	(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	1.4342	(42)
Average daily hot water use (litres/day)	68.2633	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)

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

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
									Total per year (kWh/year) = Sum(64)m =			1420.0675	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(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	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(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	
Northwest	5.9100	12.9280	0.7600	0.7000	0.7700	28.1686	(81)

Solar gains	28.1686	52.7758	93.5260	157.4534	205.1835	233.4567	215.2581	175.0858	122.2762	67.7746	36.3692	22.7430	(83)
Total gains	398.0752	419.7295	447.4652	491.4473	519.1911	529.2771	500.2632	465.8990	424.4039	390.0036	380.8971	383.7230	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.9286	37.6552	37.2909	39.0969	39.0969	40.8421	40.4998	40.4998	39.8045	39.0969	39.4520	38.0182	
alpha	3.4619	3.5103	3.4861	3.6065	3.6065	3.7228	3.7000	3.7000	3.6536	3.6065	3.6301	3.5345	
util living area													
	0.9877	0.9840	0.9721	0.9370	0.8572	0.6644	0.4971	0.5282	0.8142	0.9469	0.9801	0.9889	(86)
MIT	19.2222	19.3789	19.6983	20.1940	20.5965	20.9042	20.9757	20.9704	20.7673	20.2762	19.7455	19.2531	(87)
Th 2	19.4142	19.4392	19.4268	19.4867	19.4867	19.5406	19.5303	19.5303	19.5090	19.4867	19.4980	19.4514	(88)
util rest of house													
	0.9833	0.9783	0.9611	0.9103	0.7918	0.5289	0.3108	0.3329	0.7058	0.9181	0.9717	0.9850	(89)
MIT 2	17.1672	17.4092	17.8624	18.5985	19.1254	19.4919	19.5258	19.5246	19.3520	18.7247	17.9782	17.2348	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.3725	18.5645	18.9392	19.5343	19.9882	20.3202	20.3762	20.3726	20.1821	19.6346	19.0147	18.4185	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3725	18.5645	18.9392	19.5343	19.9882	20.3202	20.3762	20.3726	20.1821	19.6346	19.0147	18.4185	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9793	0.9739	0.9567	0.9113	0.8165	0.6057	0.4214	0.4492	0.7609	0.9216	0.9681	0.9814	(94)
Useful gains	389.8365	408.7942	428.0787	447.8550	423.8993	320.5936	210.8286	209.2636	322.9497	359.4420	368.7538	376.5770	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1070.6201	1026.6501	920.1058	746.0344	567.7264	350.3123	216.4744	216.2195	399.6754	622.1403	839.0429	1043.3918	(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													
	506.5030	415.1992	366.0681	214.6892	107.0073	0.0000	0.0000	0.0000	0.0000	195.4476	338.6082	496.1102	(98)
Space heating												2639.6327	(98)
Space heating per m2											(98) / (4) =	64.3185	(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 %)	100.0000 (206)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)
Space heating requirement	2639.6327 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	506.5030	415.1992	366.0681	214.6892	107.0073	0.0000	0.0000	0.0000	0.0000	195.4476	338.6082	496.1102	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	506.5030	415.1992	366.0681	214.6892	107.0073	0.0000	0.0000	0.0000	0.0000	195.4476	338.6082	496.1102	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												2639.6327	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.4358	(232)
Total delivered energy for all uses												4268.1360	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2639.6327	18.2700	482.2609	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	18.2700	259.4463	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.4358	18.2700	38.0812	(250)
Additional standing charges			0.0000	(251)
Total energy cost			779.7885	(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	2639.6327	0.5190	1369.9694	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			2106.9844	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	0.5190	108.1782	(268)
Total kg/year			2215.1626	(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	2639.6327	3.0700	8103.6725	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	3.0700	4359.6072	(264)
Space and water heating			12463.2797	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	3.0700	639.8980	(268)
Primary energy kWh/year			13103.1776	(272)
Primary energy kWh/m2/year			319.2782	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 59
Current environmental impact rating:	D 63

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 59
Potential environmental impact rating: D 63

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£780	£780	£0
Space heating	£482	£482	£0
Water heating	£259	£259	£0
Lighting	£38	£38	£0
Total cost of fuels	£780	£780	£0
Total cost of uses	£779	£779	£0
Delivered energy	104 kWh/m²	104 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.2 tonnes	2.2 tonnes	0.0 tonnes
CO2 emissions per m²	54 kg/m²	54 kg/m²	0 kg/m²
Primary energy	319 kWh/m²	319 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-10	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.05, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	59 D	**DER**	N/A	**TER**	N/A
Environmental	63 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.22	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	15.58 m	41.04 m²	2.50 m

7.0 Living Area	24.07	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	33.67	27.76
External Wall - lobby	Solid Wall	Other	0.60	5.28	3.18

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	26.68

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	41.04

11.1 Party Floors

Description	Construction	Area (m²)
Party Floor 1	Other	41.04

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	South East							2.10	
windows	Window	[1] External Wall	North West	None	0.00					5.91	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate	
Night Ventilation	No	
Air change rate	2.00	

Mechanical Ventilation

Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%

Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 1.06, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

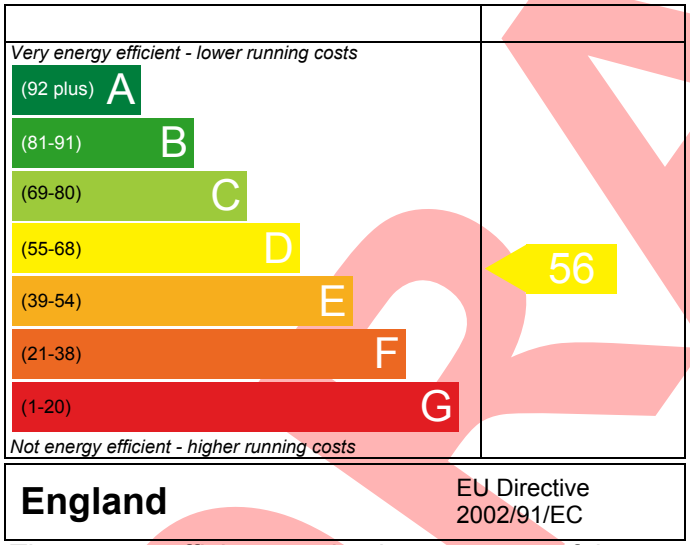
Unit 1.06, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	42.63 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

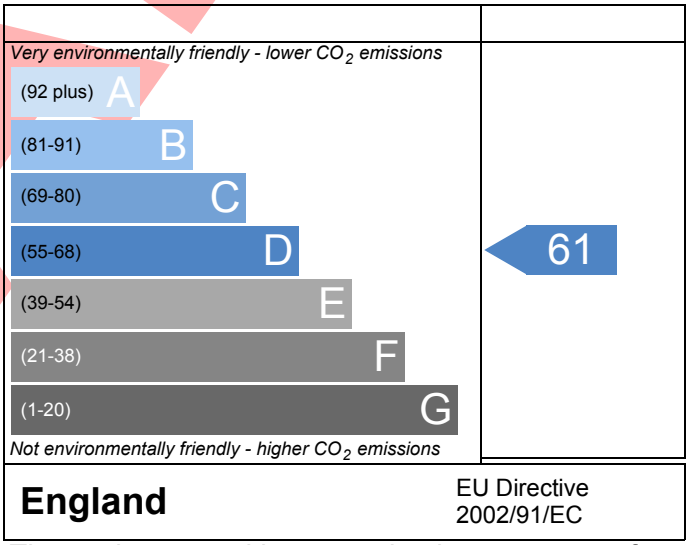
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-11	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.06, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	56 D	**DER**	N/A	**TER**	N/A
Environmental	61 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.42	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.6300	(1b)	x 2.5000	(2b) =	106.5750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.5750	(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) =	0.1877	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9377	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7267	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8357	0.7994	0.8175	0.7267	0.7267	0.6359	0.6540	0.6540	0.6904	0.7267	0.7085	0.7812	(22b)
Effective ac	0.8492	0.8195	0.8342	0.7640	0.7640	0.7022	0.7139	0.7139	0.7383	0.7640	0.7510	0.8051	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	23.9800	7.8800	16.1000	0.6000	9.6600			(29a)
External Wall - lobby	30.5000	2.1000	28.4000	0.4769	13.5453			(29a)
Total net area of external elements Aum(A, m2)			54.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.8270			(33)
Party Wall 1			19.8000	0.0000	0.0000			(32)
Party Floor 1			42.6300					(32d)
Party Ceilings 1			42.6300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.1720	(36)
Total fabric heat loss (33) + (36) =	54.9990	(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	29.8658	28.8211	29.3376	26.8710	26.8710	24.6946	25.1066	25.1066	25.9656	26.8710	26.4125	28.3162	(38)
Heat transfer coeff	84.8648	83.8201	84.3367	81.8700	81.8700	79.6936	80.1057	80.1057	80.9646	81.8700	81.4115	83.3152	(39)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 = 82.0190 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9907	1.9662	1.9783	1.9205	1.9205	1.8694	1.8791	1.8791	1.8992	1.9205	1.9097	1.9544	(40)
HLP (average)												1.9240	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4779 (42)

Average daily hot water use (litres/day) 69.2992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	76.2291	73.4571	70.6852	67.9132	65.1412	62.3693	62.3693	65.1412	67.9132	70.6852	73.4571	76.2291	(44)
Energy conte	113.0455	98.8703	102.0253	88.9482	85.3479	73.6487	68.2464	78.3137	79.2490	92.3571	100.8150	109.4786	(45)
Energy content (annual)										Total = Sum(45)m =		1090.3458	(45)
Distribution loss (46)m = 0.15 x (45)m													
	16.9568	14.8306	15.3038	13.3422	12.8022	11.0473	10.2370	11.7471	11.8874	13.8536	15.1223	16.4218	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
								Total per year (kWh/year) = Sum(64)m =				1436.3658	(64)
RHI water heating demand												1436	(64)
Heat gains from water heating, kWh/month													
	61.0980	54.1096	57.4338	52.3273	51.8886	47.2402	46.2023	49.5497	49.1023	54.2191	56.2730	59.9120	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.0640	25.8144	20.9937	15.8935	11.8806	10.0301	10.8379	14.0875	18.9082	24.0083	28.0213	29.8718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	191.3434	193.3290	188.3255	177.6736	164.2275	151.5901	143.1475	141.1619	146.1655	156.8173	170.2634	182.9009	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	(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)													
	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	(71)
Water heating gains (Table 5)													
	82.1210	80.5202	77.1960	72.6768	69.7427	65.6114	62.0999	66.5991	68.1976	72.8752	78.1569	80.5269	(72)
Total internal gains													
	377.4307	374.5658	361.4173	341.1461	320.7530	302.1338	290.9875	296.7507	308.1735	328.6031	351.3438	368.2017	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.8800	12.9280	0.7600	0.7000	0.7700	37.5581	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	37.5581	70.3678	124.7013	209.9379	273.5781	311.2756	287.0108	233.4478	163.0350	90.3661	48.4922	30.3240	(83)
Total gains	414.9888	444.9335	486.1186	551.0840	594.3311	613.4094	577.9983	530.1985	471.2085	418.9692	399.8361	398.5257	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.8839	35.3187	35.1024	36.1600	36.1600	37.1475	36.9564	36.9564	36.5643	36.1600	36.3636	35.5327	
alpha	3.3256	3.3546	3.3402	3.4107	3.4107	3.4765	3.4638	3.4638	3.4376	3.4107	3.4242	3.3688	
util living area													
	0.9876	0.9834	0.9696	0.9294	0.8413	0.6491	0.4868	0.5235	0.8099	0.9462	0.9803	0.9890	(86)
MIT	19.1078	19.2670	19.6259	20.1389	20.5741	20.8907	20.9707	20.9634	20.7354	20.2000	19.6158	19.1158	(87)
Th 2	19.3395	19.3559	19.3478	19.3869	19.3869	19.4218	19.4152	19.4152	19.4014	19.3869	19.3942	19.3639	(88)
util rest of house													
	0.9831	0.9773	0.9575	0.8994	0.7694	0.5053	0.2902	0.3154	0.6952	0.9161	0.9717	0.9850	(89)
MIT 2	16.9573	17.1972	17.7094	18.4526	19.0158	19.3689	19.4103	19.4088	19.2277	18.5532	17.7277	16.9834	(90)
Living area fraction									fLA = Living area / (4) =			0.6587	(91)
MIT	18.3738	18.5606	18.9718	19.5634	20.0422	20.3713	20.4381	20.4328	20.2208	19.6379	18.9714	18.3880	(92)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment												0.0000	
adjusted MIT	18.3738	18.5606	18.9718	19.5634	20.0422	20.3713	20.4381	20.4328	20.2208	19.6379	18.9714	18.3880	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9796	0.9734	0.9539	0.9033	0.8022	0.5965	0.4208	0.4539	0.7610	0.9219	0.9687	0.9817	(94)
Useful gains	406.5168	433.0882	463.7098	497.8006	476.7481	365.9238	243.2415	240.6815	358.5813	386.2563	387.3213	391.2520	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1177.3975	1136.6480	1018.0964	840.2616	642.0441	404.1519	251.3824	250.9531	455.0846	699.0006	942.0425	1157.0831	(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													
	573.5352	472.7922	412.4637	246.5719	122.9802	0.0000	0.0000	0.0000	0.0000	232.6818	399.3993	569.7784	(98)
Space heating												3030.2027	(98)
RHI space heating demand												3030	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.6300 (1b)	x	2.5000 (2b)	=	106.5750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.5750	(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) =	0.1877	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9377	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7267	(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	0.9265	0.9084	0.8902	0.7994	0.7812	0.6904	0.6904	0.6722	0.7267	0.7812	0.8175	0.8539	(22b)
Effective ac	0.9292	0.9126	0.8962	0.8195	0.8051	0.7383	0.7383	0.7259	0.7640	0.8051	0.8342	0.8645	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	23.9800	7.8800	16.1000	0.6000	9.6600			(29a)
External Wall - lobby	30.5000	2.1000	28.4000	0.4769	13.5453			(29a)
Total net area of external elements Aum(A, m2)			54.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.8270			(33)
Party Wall 1			19.8000	0.0000	0.0000			(32)
Party Floor 1			42.6300					(32d)
Party Ceilings 1			42.6300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.1720	(36)
Total fabric heat loss (33) + (36) =	54.9990	(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	32.6806	32.0944	31.5199	28.8211	28.3162	25.9656	25.9656	25.5303	26.8710	28.3162	29.3376	30.4055	(38)
Heat transfer coeff	87.6797	87.0935	86.5189	83.8201	83.3152	80.9646	80.9646	80.5294	81.8700	83.3152	84.3367	85.4046	(39)
Average = Sum(39)m / 12 =												83.8177	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0568	2.0430	2.0295	1.9662	1.9544	1.8992	1.8992	1.8890	1.9205	1.9544	1.9783	2.0034	(40)
HLP (average)												1.9662	(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	1.4779 (42)
Average daily hot water use (litres/day)	69.2992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.2291	73.4571	70.6852	67.9132	65.1412	62.3693	62.3693	65.1412	67.9132	70.6852	73.4571	76.2291	(44)
Energy conte	113.0455	98.8703	102.0253	88.9482	85.3479	73.6487	68.2464	78.3137	79.2490	92.3571	100.8150	109.4786	(45)
Energy content (annual)										Total = Sum(45)m =		1090.3458	(45)
Distribution loss (46)m = 0.15 x (45)m	16.9568	14.8306	15.3038	13.3422	12.8022	11.0473	10.2370	11.7471	11.8874	13.8536	15.1223	16.4218	(46)

Water storage loss:	
Store volume	110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(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	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
Total per year (kWh/year) = Sum(64)m =												1436.3658	(64)
Heat gains from water heating, kWh/month	61.0980	54.1096	57.4338	52.3273	51.8886	47.2402	46.2023	49.5497	49.1023	54.2191	56.2730	59.9120	(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	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.0640	25.8144	20.9937	15.8935	11.8806	10.0301	10.8379	14.0875	18.9082	24.0083	28.0213	29.8718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.3434	193.3290	188.3255	177.6736	164.2275	151.5901	143.1475	141.1619	146.1655	156.8173	170.2634	182.9009	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	(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)	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	(71)
Water heating gains (Table 5)	82.1210	80.5202	77.1960	72.6768	69.7427	65.6114	62.0999	66.5991	68.1976	72.8752	78.1569	80.5269	(72)
Total internal gains	377.4307	374.5658	361.4173	341.1461	320.7530	302.1338	290.9875	296.7507	308.1735	328.6031	351.3438	368.2017	(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	
Northwest	7.8800	11.2829	0.7600	0.7000	0.7700	32.7788	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	32.7788	66.7223	120.2123	197.4231	265.3754	282.9182	264.6642	210.9934	146.4805	81.5399	41.2442	26.7688	(83)
Total gains	410.2095	441.2880	481.6296	538.5692	586.1284	585.0520	555.6517	507.7441	454.6541	410.1429	392.5881	394.9706	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.7640	33.9913	34.2170	35.3187	35.5327	36.5643	36.5643	36.7620	36.1600	35.5327	35.1024	34.6634	
alpha	3.2509	3.2661	3.2811	3.3546	3.3688	3.4376	3.4376	3.4508	3.4107	3.3688	3.3402	3.3109	
util living area	0.9884	0.9842	0.9729	0.9401	0.8650	0.7255	0.5831	0.6414	0.8490	0.9559	0.9826	0.9898	(86)
MIT	18.9981	19.1660	19.5076	20.0258	20.4854	20.8184	20.9375	20.9131	20.6543	20.0884	19.4944	19.0097	(87)
Th 2	19.2958	19.3048	19.3137	19.3559	19.3639	19.4014	19.4014	19.4083	19.3869	19.3639	19.3478	19.3311	(88)
util rest of house	0.9843	0.9784	0.9623	0.9145	0.8029	0.5991	0.3969	0.4570	0.7539	0.9317	0.9751	0.9862	(89)
MIT 2	16.7728	17.0213	17.5194	18.2775	18.8914	19.2928	19.3835	19.3792	19.1320	18.3844	17.5251	16.8101	(90)
Living area fraction									fLA = Living area / (4) =			0.6587	(91)
MIT	18.2386	18.4340	18.8290	19.4291	19.9413	20.2977	20.4071	20.3896	20.1348	19.5068	18.8223	18.2590	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2386	18.4340	18.8290	19.4291	19.9413	20.2977	20.4071	20.3896	20.1348	19.5068	18.8223	18.2590	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9807	0.9743	0.9582	0.9159	0.8279	0.6754	0.5196	0.5777	0.8043	0.9344	0.9719	0.9830	(94)
Useful gains	402.2971	429.9627	461.5158	493.2557	485.2742	395.1586	288.7096	293.3126	365.6718	383.2358	381.5618	388.2377	(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	1222.1284	1178.7208	1066.6925	882.5524	686.6285	461.3105	308.2437	321.2791	494.0657	742.0740	988.6180	1200.6998	(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	609.9545	503.1655	450.2515	280.2936	149.8076	0.0000	0.0000	0.0000	0.0000	266.9757	437.0804	604.4718	(98)
Space heating												3302.0006	(98)
Space heating per m2											(98) / (4) =	77.4572	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3302.0006	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	609.9545	503.1655	450.2515	280.2936	149.8076	0.0000	0.0000	0.0000	0.0000	266.9757	437.0804	604.4718	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	609.9545	503.1655	450.2515	280.2936	149.8076	0.0000	0.0000	0.0000	0.0000	266.9757	437.0804	604.4718	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(219)
Water heating fuel used												1436.3658	(219)
Annual totals kWh/year													
Space heating fuel - main system												3302.0006	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												205.3115	(232)
Total delivered energy for all uses												4943.6779	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3302.0006	13.1900	435.5339	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1436.3658	13.1900	189.4566	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	205.3115	13.1900	27.0806	(250)
Additional standing charges			0.0000	(251)
Total energy cost			652.0711	(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] =	3.1253	(257)
SAP value		56.4021	
SAP rating (Section 12)		56	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3302.0006	0.5190	1713.7383	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1436.3658	0.5190	745.4738	(264)
Space and water heating			2459.2121	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3115	0.5190	106.5567	(268)
Total kg/year			2565.7688	(272)
CO2 emissions per m2			60.1900	(273)
EI value			60.6764	
EI rating			61	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.6300 (1b)	x	2.5000 (2b)	=	106.5750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.5750	(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) =	0.1877	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9377	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7267	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8357	0.7994	0.8175	0.7267	0.7267	0.6359	0.6540	0.6540	0.6904	0.7267	0.7085	0.7812	(22b)
Effective ac	0.8492	0.8195	0.8342	0.7640	0.7640	0.7022	0.7139	0.7139	0.7383	0.7640	0.7510	0.8051	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	23.9800	7.8800	16.1000	0.6000	9.6600			(29a)
External Wall - lobby	30.5000	2.1000	28.4000	0.4769	13.5453			(29a)
Total net area of external elements Aum(A, m2)			54.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.8270			(33)
Party Wall 1			19.8000	0.0000	0.0000			(32)
Party Floor 1			42.6300					(32d)
Party Ceilings 1			42.6300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.1720	(36)
Total fabric heat loss (33) + (36) =	54.9990	(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	29.8658	28.8211	29.3376	26.8710	26.8710	24.6946	25.1066	25.1066	25.9656	26.8710	26.4125	28.3162	(38)
Heat transfer coeff	84.8648	83.8201	84.3367	81.8700	81.8700	79.6936	80.1057	80.1057	80.9646	81.8700	81.4115	83.3152	(39)
Average = Sum(39)m / 12 =												82.0190	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9907	1.9662	1.9783	1.9205	1.9205	1.8694	1.8791	1.8791	1.8992	1.9205	1.9097	1.9544	(40)
HLP (average)												1.9240	(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	1.4779 (42)
Average daily hot water use (litres/day)	69.2992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.2291	73.4571	70.6852	67.9132	65.1412	62.3693	62.3693	65.1412	67.9132	70.6852	73.4571	76.2291	(44)
Energy conte	113.0455	98.8703	102.0253	88.9482	85.3479	73.6487	68.2464	78.3137	79.2490	92.3571	100.8150	109.4786	(45)
Energy content (annual)										Total = Sum(45)m =		1090.3458	(45)
Distribution loss (46)m = 0.15 x (45)m	16.9568	14.8306	15.3038	13.3422	12.8022	11.0473	10.2370	11.7471	11.8874	13.8536	15.1223	16.4218	(46)

Water storage loss:	
Store volume	110.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800 (48)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(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	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
Total per year (kWh/year) = Sum(64)m =												1436.3658	(64)
Heat gains from water heating, kWh/month	61.0980	54.1096	57.4338	52.3273	51.8886	47.2402	46.2023	49.5497	49.1023	54.2191	56.2730	59.9120	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts (66)m	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.0640	25.8144	20.9937	15.8935	11.8806	10.0301	10.8379	14.0875	18.9082	24.0083	28.0213	29.8718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	191.3434	193.3290	188.3255	177.6736	164.2275	151.5901	143.1475	141.1619	146.1655	156.8173	170.2634	182.9009	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	(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)	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	(71)
Water heating gains (Table 5)	82.1210	80.5202	77.1960	72.6768	69.7427	65.6114	62.0999	66.5991	68.1976	72.8752	78.1569	80.5269	(72)
Total internal gains	377.4307	374.5658	361.4173	341.1461	320.7530	302.1338	290.9875	296.7507	308.1735	328.6031	351.3438	368.2017	(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	
Northwest	7.8800	12.9280	0.7600	0.7000	0.7700	37.5581	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	37.5581	70.3678	124.7013	209.9379	273.5781	311.2756	287.0108	233.4478	163.0350	90.3661	48.4922	30.3240	(83)
Total gains	414.9888	444.9335	486.1186	551.0840	594.3311	613.4094	577.9983	530.1985	471.2085	418.9692	399.8361	398.5257	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.8839	35.3187	35.1024	36.1600	36.1600	37.1475	36.9564	36.9564	36.5643	36.1600	36.3636	35.5327	
alpha	3.3256	3.3546	3.3402	3.4107	3.4107	3.4765	3.4638	3.4638	3.4376	3.4107	3.4242	3.3688	
util living area	0.9876	0.9834	0.9696	0.9294	0.8413	0.6491	0.4868	0.5235	0.8099	0.9462	0.9803	0.9890	(86)
MIT	19.1078	19.2670	19.6259	20.1389	20.5741	20.8907	20.9707	20.9634	20.7354	20.2000	19.6158	19.1158	(87)
Th 2	19.3395	19.3559	19.3478	19.3869	19.3869	19.4218	19.4152	19.4152	19.4014	19.3869	19.3942	19.3639	(88)
util rest of house	0.9831	0.9773	0.9575	0.8994	0.7694	0.5053	0.2902	0.3154	0.6952	0.9161	0.9717	0.9850	(89)
MIT 2	16.9573	17.1972	17.7094	18.4526	19.0158	19.3689	19.4103	19.4088	19.2277	18.5532	17.7277	16.9834	(90)
Living area fraction									fLA = Living area / (4) =			0.6587	(91)
MIT	18.3738	18.5606	18.9718	19.5634	20.0422	20.3713	20.4381	20.4328	20.2208	19.6379	18.9714	18.3880	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3738	18.5606	18.9718	19.5634	20.0422	20.3713	20.4381	20.4328	20.2208	19.6379	18.9714	18.3880	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9796	0.9734	0.9539	0.9033	0.8022	0.5965	0.4208	0.4539	0.7610	0.9219	0.9687	0.9817	(94)
Useful gains	406.5168	433.0882	463.7098	497.8006	476.7481	365.9238	243.2415	240.6815	358.5813	386.2563	387.3213	391.2520	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1177.3975	1136.6480	1018.0964	840.2616	642.0441	404.1519	251.3824	250.9531	455.0846	699.0006	942.0425	1157.0831	(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	573.5352	472.7922	412.4637	246.5719	122.9802	0.0000	0.0000	0.0000	0.0000	232.6818	399.3993	569.7784	(98)
Space heating												3030.2027	(98)
Space heating per m2											(98) / (4) =	71.0815	(99)

8c. Space cooling requirement

Not applicable

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

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3030.2027	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	573.5352	472.7922	412.4637	246.5719	122.9802	0.0000	0.0000	0.0000	0.0000	232.6818	399.3993	569.7784	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	573.5352	472.7922	412.4637	246.5719	122.9802	0.0000	0.0000	0.0000	0.0000	232.6818	399.3993	569.7784	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(219)
Water heating fuel used												1436.3658	(219)
Annual totals kWh/year													
Space heating fuel - main system												3030.2027	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												205.3115	(232)
Total delivered energy for all uses												4671.8800	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3030.2027	18.2700	553.6180	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1436.3658	18.2700	262.4240	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	205.3115	18.2700	37.5104	(250)
Additional standing charges			0.0000	(251)
Total energy cost			853.5525	(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	3030.2027	0.5190	1572.6752	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1436.3658	0.5190	745.4738	(264)
Space and water heating			2318.1490	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3115	0.5190	106.5567	(268)
Total kg/year			2424.7057	(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	3030.2027	3.0700	9302.7223	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1436.3658	3.0700	4409.6430	(264)
Space and water heating			13712.3652	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3115	3.0700	630.3064	(268)
Primary energy kWh/year			14342.6717	(272)
Primary energy kWh/m2/year			336.4455	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 56
Current environmental impact rating:	D 61

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 56
Potential environmental impact rating: D 61

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£854	£854	£0
Space heating	£554	£554	£0
Water heating	£262	£262	£0
Lighting	£38	£38	£0
Total cost of fuels	£854	£854	£0
Total cost of uses	£854	£854	£0
Delivered energy	110 kWh/m²	110 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.4 tonnes	2.4 tonnes	0.0 tonnes
CO2 emissions per m²	57 kg/m²	57 kg/m²	0 kg/m²
Primary energy	336 kWh/m²	336 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-11	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.06, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	56 D	**DER**	N/A	**TER**	N/A
Environmental	61 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.42	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	21.79 m	42.63 m²	2.50 m

7.0 Living Area	28.08	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	23.98	16.10
External Wall - lobby	Solid Wall	Other	0.60	30.50	28.40

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	19.80

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	42.63

11.1 Party Floors

Description	Construction	Area (m²)
Party Floor 1	Other	42.63

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	South East							2.10	
windows	Window	[1] External Wall	North West	None	0.00					7.88	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate	
Night Ventilation	No	
Air change rate	2.00	

Mechanical Ventilation

Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%

Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 1.07, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

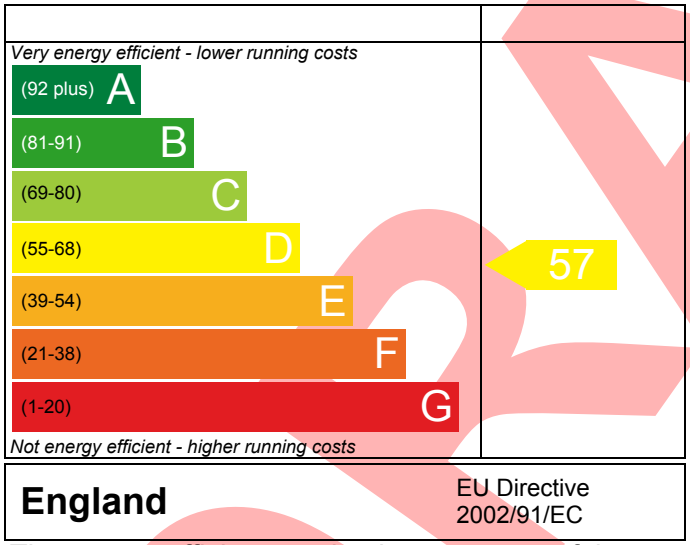
Unit 1.07, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	46.03 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

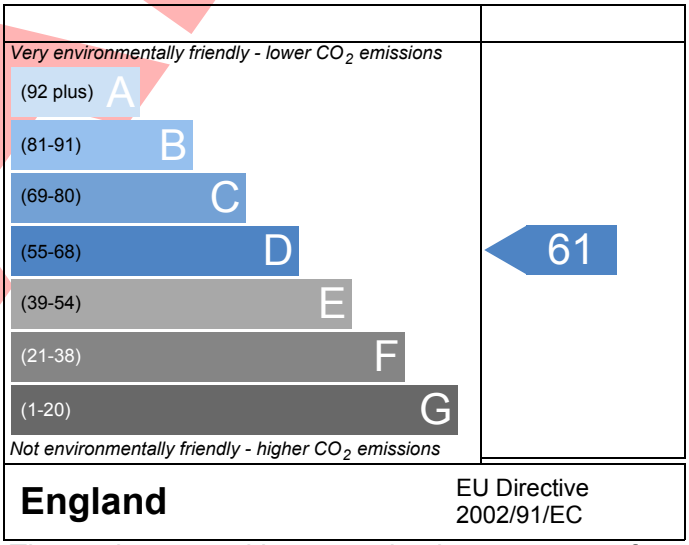
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-12	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.07, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	57 D	**DER**	N/A	**TER**	N/A
Environmental	61 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.50	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.0300 (1b)	x	2.5000 (2b)	=	115.0750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.0300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.0750	(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) =	0.1738	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9238	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7159	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8233	0.7875	0.8054	0.7159	0.7159	0.6265	0.6444	0.6444	0.6801	0.7159	0.6980	0.7696	(22b)
Effective ac	0.8389	0.8101	0.8244	0.7563	0.7563	0.6962	0.7076	0.7076	0.7313	0.7563	0.7436	0.7962	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	27.3500	7.8800	19.4700	0.6000	11.6820			(29a)
External Wall - lobby	27.2500	2.1000	25.1500	0.4769	11.9952			(29a)
Total net area of external elements Aum(A, m2)			54.6000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.2990			(33)
Party Wall 1			19.2300	0.0000	0.0000			(32)
Party Floor 1			46.0300					(32d)
Party Ceilings 1			46.0300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.1900	(36)
Total fabric heat loss (33) + (36) =	55.4890	(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	31.8586	30.7637	31.3051	28.7199	28.7199	26.4388	26.8707	26.8707	27.7709	28.7199	28.2393	30.2345	(38)
Heat transfer coeff	87.3476	86.2526	86.7940	84.2088	84.2088	81.9278	82.3596	82.3596	83.2599	84.2088	83.7283	85.7234	(39)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 = 84.3649 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8976	1.8738	1.8856	1.8294	1.8294	1.7799	1.7893	1.7893	1.8088	1.8294	1.8190	1.8623	(40)
HLP (average)												1.8328	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.5742 (42)

Average daily hot water use (litres/day) 71.5875 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	78.7462	75.8827	73.0192	70.1557	67.2922	64.4287	64.4287	67.2922	70.1557	73.0192	75.8827	78.7462	(44)
Energy conte	116.7784	102.1351	105.3943	91.8853	88.1661	76.0807	70.4999	80.8997	81.8659	95.4068	104.1440	113.0936	(45)
Energy content (annual)										Total = Sum(45)m =		1126.3497	(45)
Distribution loss (46)m = 0.15 x (45)m													
	17.5168	15.3203	15.8091	13.7828	13.2249	11.4121	10.5750	12.1350	12.2799	14.3110	15.6216	16.9640	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(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													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(64)
								Total per year (kWh/year) = Sum(64)m =				1472.3697	(64)
RHI water heating demand												1472	(64)
Heat gains from water heating, kWh/month													
	62.3392	55.1951	58.5540	53.3039	52.8256	48.0488	46.9516	50.4095	49.9724	55.2332	57.3799	61.1140	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	31.4384	27.9233	22.7088	17.1920	12.8512	10.8496	11.7233	15.2384	20.4530	25.9697	30.3105	32.3122	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	204.3871	206.5080	201.1634	189.7854	175.4227	161.9238	152.9057	150.7848	156.1294	167.5074	181.8701	195.3690	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	(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)													
	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	(71)
Water heating gains (Table 5)													
	83.7893	82.1356	78.7016	74.0331	71.0022	66.7345	63.1070	67.7548	69.4061	74.2381	79.6943	82.1425	(72)
Total internal gains													
	397.1184	394.0706	380.0774	358.5142	336.7798	317.0114	305.2397	311.2816	323.4921	345.2189	369.3785	387.3273	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.8800	12.9280	0.7600	0.7000	0.7700	37.5581	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	37.5581	70.3678	124.7013	209.9379	273.5781	311.2756	287.0108	233.4478	163.0350	90.3661	48.4922	30.3240	(83)
Total gains	434.6765	464.4383	504.7787	568.4521	610.3578	628.2870	592.2504	544.7294	486.5271	435.5850	417.8707	417.6513	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5955	37.0601	36.8289	37.9595	37.9595	39.0164	38.8118	38.8118	38.3922	37.9595	38.1774	37.2888	
alpha	3.4397	3.4707	3.4553	3.5306	3.5306	3.6011	3.5875	3.5875	3.5595	3.5306	3.5452	3.4859	
util living area													
	0.9886	0.9847	0.9719	0.9338	0.8480	0.6552	0.4904	0.5264	0.8147	0.9490	0.9817	0.9899	(86)
MIT	19.1836	19.3367	19.6808	20.1750	20.5943	20.8988	20.9738	20.9672	20.7514	20.2369	19.6751	19.1922	(87)
Th 2	19.4025	19.4188	19.4107	19.4495	19.4495	19.4841	19.4775	19.4775	19.4638	19.4495	19.4567	19.4267	(88)
util rest of house													
	0.9846	0.9792	0.9608	0.9058	0.7794	0.5158	0.2999	0.3251	0.7042	0.9208	0.9738	0.9863	(89)
MIT 2	17.1044	17.3359	17.8272	18.5459	19.0910	19.4339	19.4729	19.4715	19.2975	18.6463	17.8517	17.1317	(90)
Living area fraction									fLA = Living area / (4) =			0.6735	(91)
MIT	18.5047	18.6834	19.0756	19.6430	20.1034	20.4204	20.4837	20.4788	20.2767	19.7176	19.0797	18.5194	(92)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment												0.0000	
adjusted MIT	18.5047	18.6834	19.0756	19.6430	20.1034	20.4204	20.4837	20.4788	20.2767	19.7176	19.0797	18.5194	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9815	0.9758	0.9578	0.9100	0.8117	0.6063	0.4291	0.4619	0.7692	0.9268	0.9713	0.9835	(94)
Useful gains	426.6179	453.1985	483.4583	517.2779	495.4297	380.9429	254.1627	251.6364	374.2535	403.7053	405.8736	410.7474	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1223.2729	1180.2295	1056.7652	870.9756	665.5382	419.5069	262.2117	261.8051	472.6381	725.6739	977.9212	1201.7901	(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													
	592.7113	488.5649	426.5403	254.6623	126.5607	0.0000	0.0000	0.0000	0.0000	239.5446	411.8743	588.5358	(98)
Space heating												3128.9942	(98)
RHI space heating demand												3129	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.0300 (1b)	x	2.5000 (2b)	=	115.0750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.0300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.0750	(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) =	0.1738	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9238	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7159	(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	0.9128	0.8949	0.8770	0.7875	0.7696	0.6801	0.6801	0.6622	0.7159	0.7696	0.8054	0.8412	(22b)
Effective ac	0.9166	0.9005	0.8846	0.8101	0.7962	0.7313	0.7313	0.7193	0.7563	0.7962	0.8244	0.8538	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	27.3500	7.8800	19.4700	0.6000	11.6820			(29a)
External Wall - lobby	27.2500	2.1000	25.1500	0.4769	11.9952			(29a)
Total net area of external elements Aum(A, m2)			54.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2990			(33)
Party Wall 1			19.2300	0.0000	0.0000			(32)
Party Floor 1			46.0300					(32d)
Party Ceilings 1			46.0300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.1900	(36)
Total fabric heat loss	(33) + (36) = 55.4890	(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	34.8088	34.1944	33.5922	30.7637	30.2345	27.7709	27.7709	27.3147	28.7199	30.2345	31.3051	32.4243	(38)
Heat transfer coeff	90.2977	89.6833	89.0811	86.2526	85.7234	83.2599	83.2599	82.8037	84.2088	85.7234	86.7940	87.9133	(39)
Average = Sum(39)m / 12 =												86.2501	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9617	1.9484	1.9353	1.8738	1.8623	1.8088	1.8088	1.7989	1.8294	1.8623	1.8856	1.9099	(40)
HLP (average)												1.8738	(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	1.5742	(42)
Average daily hot water use (litres/day)	71.5875	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	78.7462	75.8827	73.0192	70.1557	67.2922	64.4287	64.4287	67.2922	70.1557	73.0192	75.8827	78.7462	(44)
Energy conte	116.7784	102.1351	105.3943	91.8853	88.1661	76.0807	70.4999	80.8997	81.8659	95.4068	104.1440	113.0936	(45)
Energy content (annual)										Total = Sum(45)m =		1126.3497	(45)
Distribution loss (46)m = 0.15 x (45)m	17.5168	15.3203	15.8091	13.7828	13.2249	11.4121	10.5750	12.1350	12.2799	14.3110	15.6216	16.9640	(46)

Water storage loss:		
Store volume	110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(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													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(64)
								Total per year (kWh/year) = Sum(64)m =				1472.3697	(64)
Heat gains from water heating, kWh/month													
	62.3392	55.1951	58.5540	53.3039	52.8256	48.0488	46.9516	50.4095	49.9724	55.2332	57.3799	61.1140	(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	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	31.4384	27.9233	22.7088	17.1920	12.8512	10.8496	11.7233	15.2384	20.4530	25.9697	30.3105	32.3122	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	204.3871	206.5080	201.1634	189.7854	175.4227	161.9238	152.9057	150.7848	156.1294	167.5074	181.8701	195.3690	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	(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)													
	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	(71)
Water heating gains (Table 5)													
	83.7893	82.1356	78.7016	74.0331	71.0022	66.7345	63.1070	67.7548	69.4061	74.2381	79.6943	82.1425	(72)
Total internal gains													
	397.1184	394.0706	380.0774	358.5142	336.7798	317.0114	305.2397	311.2816	323.4921	345.2189	369.3785	387.3273	(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	
Northwest	7.8800	11.2829	0.7600	0.7000	0.7700	32.7788	(81)

Solar gains	32.7788	66.7223	120.2123	197.4231	265.3754	282.9182	264.6642	210.9934	146.4805	81.5399	41.2442	26.7688	(83)
Total gains	429.8972	460.7928	500.2897	555.9373	602.1551	599.9297	569.9039	522.2750	469.9726	426.7588	410.6228	414.0962	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.3999	35.6424	35.8833	37.0601	37.2888	38.3922	38.3922	38.6037	37.9595	37.2888	36.8289	36.3600	
alpha	3.3600	3.3762	3.3922	3.4707	3.4859	3.5595	3.5595	3.5736	3.5306	3.4859	3.4553	3.4240	
util living area													
	0.9894	0.9855	0.9751	0.9441	0.8715	0.7323	0.5879	0.6457	0.8536	0.9585	0.9839	0.9907	(86)
MIT	19.0756	19.2369	19.5651	20.0648	20.5080	20.8296	20.9429	20.9203	20.6735	20.1287	19.5563	19.0882	(87)
Th 2	19.3590	19.3680	19.3768	19.4188	19.4267	19.4638	19.4638	19.4708	19.4495	19.4267	19.4107	19.3941	(88)
util rest of house													
	0.9856	0.9802	0.9653	0.9203	0.8126	0.6100	0.4072	0.4670	0.7625	0.9359	0.9771	0.9874	(89)
MIT 2	16.9220	17.1612	17.6405	18.3742	18.9689	19.3598	19.4469	19.4431	19.2045	18.4817	17.6522	16.9610	(90)
Living area fraction									fLA = Living area / (4) =			0.6735	(91)
MIT	18.3724	18.5591	18.9367	19.5128	20.0054	20.3497	20.4544	20.4380	20.1938	19.5909	18.9345	18.3936	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3724	18.5591	18.9367	19.5128	20.0054	20.3497	20.4544	20.4380	20.1938	19.5909	18.9345	18.3936	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9825	0.9767	0.9619	0.9221	0.8372	0.6856	0.5287	0.5864	0.8122	0.9388	0.9743	0.9846	(94)
Useful gains	422.3740	450.0522	481.2115	512.6038	504.1186	411.3204	301.3362	306.2623	381.7053	400.6573	400.0727	407.7132	(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													
	1270.7045	1224.9948	1107.8723	915.3820	711.9691	478.7162	320.9200	334.3575	513.1513	770.7281	1027.1673	1247.8079	(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													
	631.1579	520.7614	466.2357	290.0003	154.6407	0.0000	0.0000	0.0000	0.0000	275.3326	451.5081	625.0305	(98)
Space heating												3414.6673	(98)
Space heating per m2											(98) / (4) =	74.1835	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)	100.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3414.6673	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	631.1579	520.7614	466.2357	290.0003	154.6407	0.0000	0.0000	0.0000	0.0000	275.3326	451.5081	625.0305	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	631.1579	520.7614	466.2357	290.0003	154.6407	0.0000	0.0000	0.0000	0.0000	275.3326	451.5081	625.0305	(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													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(219)
Water heating fuel used												1472.3697	(219)
Annual totals kWh/year													
Space heating fuel - main system												3414.6673	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												222.0850	(232)
Total delivered energy for all uses												5109.1220	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3414.6673	13.1900	450.3946	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1472.3697	13.1900	194.2056	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	222.0850	13.1900	29.2930	(250)
Additional standing charges			0.0000	(251)
Total energy cost			673.8932	(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] =	3.1093	(257)
SAP value		56.6259	
SAP rating (Section 12)		57	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3414.6673	0.5190	1772.2123	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1472.3697	0.5190	764.1599	(264)
Space and water heating			2536.3722	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	222.0850	0.5190	115.2621	(268)
Total kg/year			2651.6343	(272)
CO2 emissions per m2			57.6100	(273)
EI value			60.8887	
EI rating			61	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.0300 (1b)	x	2.5000 (2b)	=	115.0750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.0300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.0750	(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) =	0.1738	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9238	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7159	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8233	0.7875	0.8054	0.7159	0.7159	0.6265	0.6444	0.6444	0.6801	0.7159	0.6980	0.7696	(22b)
Effective ac	0.8389	0.8101	0.8244	0.7563	0.7563	0.6962	0.7076	0.7076	0.7313	0.7563	0.7436	0.7962	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	27.3500	7.8800	19.4700	0.6000	11.6820			(29a)
External Wall - lobby	27.2500	2.1000	25.1500	0.4769	11.9952			(29a)
Total net area of external elements Aum(A, m2)			54.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.2990			(33)
Party Wall 1			19.2300	0.0000	0.0000			(32)
Party Floor 1			46.0300					(32d)
Party Ceilings 1			46.0300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.1900	(36)
Total fabric heat loss (33) + (36) =	55.4890	(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	31.8586	30.7637	31.3051	28.7199	28.7199	26.4388	26.8707	26.8707	27.7709	28.7199	28.2393	30.2345	(38)
Heat transfer coeff	87.3476	86.2526	86.7940	84.2088	84.2088	81.9278	82.3596	82.3596	83.2599	84.2088	83.7283	85.7234	(39)
Average = Sum(39)m / 12 =												84.3649	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8976	1.8738	1.8856	1.8294	1.8294	1.7799	1.7893	1.7893	1.8088	1.8294	1.8190	1.8623	(40)
HLP (average)												1.8328	(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	1.5742	(42)
Average daily hot water use (litres/day)	71.5875	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	78.7462	75.8827	73.0192	70.1557	67.2922	64.4287	64.4287	67.2922	70.1557	73.0192	75.8827	78.7462	(44)
Energy conte	116.7784	102.1351	105.3943	91.8853	88.1661	76.0807	70.4999	80.8997	81.8659	95.4068	104.1440	113.0936	(45)
Energy content (annual)										Total = Sum(45)m =		1126.3497	(45)
Distribution loss (46)m = 0.15 x (45)m	17.5168	15.3203	15.8091	13.7828	13.2249	11.4121	10.5750	12.1350	12.2799	14.3110	15.6216	16.9640	(46)

Water storage loss:		
Store volume	110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5800	(48)

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(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													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(64)
Total per year (kWh/year) = Sum(64)m =												1472.3697	(64)
Heat gains from water heating, kWh/month													
	62.3392	55.1951	58.5540	53.3039	52.8256	48.0488	46.9516	50.4095	49.9724	55.2332	57.3799	61.1140	(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	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	31.4384	27.9233	22.7088	17.1920	12.8512	10.8496	11.7233	15.2384	20.4530	25.9697	30.3105	32.3122	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	204.3871	206.5080	201.1634	189.7854	175.4227	161.9238	152.9057	150.7848	156.1294	167.5074	181.8701	195.3690	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	(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)													
	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	(71)
Water heating gains (Table 5)													
	83.7893	82.1356	78.7016	74.0331	71.0022	66.7345	63.1070	67.7548	69.4061	74.2381	79.6943	82.1425	(72)
Total internal gains													
	397.1184	394.0706	380.0774	358.5142	336.7798	317.0114	305.2397	311.2816	323.4921	345.2189	369.3785	387.3273	(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	
Northwest	7.8800	12.9280	0.7600	0.7000	0.7700	37.5581	(81)

Solar gains	37.5581	70.3678	124.7013	209.9379	273.5781	311.2756	287.0108	233.4478	163.0350	90.3661	48.4922	30.3240	(83)
Total gains	434.6765	464.4383	504.7787	568.4521	610.3578	628.2870	592.2504	544.7294	486.5271	435.5850	417.8707	417.6513	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5955	37.0601	36.8289	37.9595	37.9595	39.0164	38.8118	38.8118	38.3922	37.9595	38.1774	37.2888	
alpha	3.4397	3.4707	3.4553	3.5306	3.5306	3.6011	3.5875	3.5875	3.5595	3.5306	3.5452	3.4859	
util living area													
	0.9886	0.9847	0.9719	0.9338	0.8480	0.6552	0.4904	0.5264	0.8147	0.9490	0.9817	0.9899	(86)
MIT	19.1836	19.3367	19.6808	20.1750	20.5943	20.8988	20.9738	20.9672	20.7514	20.2369	19.6751	19.1922	(87)
Th 2	19.4025	19.4188	19.4107	19.4495	19.4495	19.4841	19.4775	19.4775	19.4638	19.4495	19.4567	19.4267	(88)
util rest of house													
	0.9846	0.9792	0.9608	0.9058	0.7794	0.5158	0.2999	0.3251	0.7042	0.9208	0.9738	0.9863	(89)
MIT 2	17.1044	17.3359	17.8272	18.5459	19.0910	19.4339	19.4729	19.4715	19.2975	18.6463	17.8517	17.1317	(90)
Living area fraction									fLA = Living area / (4) =			0.6735	(91)
MIT	18.5047	18.6834	19.0756	19.6430	20.1034	20.4204	20.4837	20.4788	20.2767	19.7176	19.0797	18.5194	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5047	18.6834	19.0756	19.6430	20.1034	20.4204	20.4837	20.4788	20.2767	19.7176	19.0797	18.5194	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9815	0.9758	0.9578	0.9100	0.8117	0.6063	0.4291	0.4619	0.7692	0.9268	0.9713	0.9835	(94)
Useful gains	426.6179	453.1985	483.4583	517.2779	495.4297	380.9429	254.1627	251.6364	374.2535	403.7053	405.8736	410.7474	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1223.2729	1180.2295	1056.7652	870.9756	665.5382	419.5069	262.2117	261.8051	472.6381	725.6739	977.9212	1201.7901	(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													
	592.7113	488.5649	426.5403	254.6623	126.5607	0.0000	0.0000	0.0000	0.0000	239.5446	411.8743	588.5358	(98)
Space heating												3128.9942	(98)
Space heating per m2											(98) / (4) =	67.9773	(99)

8c. Space cooling requirement

Not applicable

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

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 %)	100.0000 (206)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)
Space heating requirement	3128.9942 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	592.7113	488.5649	426.5403	254.6623	126.5607	0.0000	0.0000	0.0000	0.0000	239.5446	411.8743	588.5358	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	592.7113	488.5649	426.5403	254.6623	126.5607	0.0000	0.0000	0.0000	0.0000	239.5446	411.8743	588.5358	(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													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(219)
Water heating fuel used												1472.3697	(219)
Annual totals kWh/year													
Space heating fuel - main system												3128.9942	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												222.0850	(232)
Total delivered energy for all uses												4823.4489	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3128.9942	18.2700	571.6672	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1472.3697	18.2700	269.0019	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	222.0850	18.2700	40.5749	(250)
Additional standing charges			0.0000	(251)
Total energy cost			881.2441	(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	3128.9942	0.5190	1623.9480	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1472.3697	0.5190	764.1599	(264)
Space and water heating			2388.1078	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	222.0850	0.5190	115.2621	(268)
Total kg/year			2503.3700	(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	3128.9942	3.0700	9606.0121	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1472.3697	3.0700	4520.1749	(264)
Space and water heating			14126.1870	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	222.0850	3.0700	681.8011	(268)
Primary energy kWh/year			14807.9881	(272)
Primary energy kWh/m2/year			321.7030	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 57
Current environmental impact rating:	D 61

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 57
Potential environmental impact rating: D 61

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£881	£881	£0
Space heating	£572	£572	£0
Water heating	£269	£269	£0
Lighting	£41	£41	£0
Total cost of fuels	£881	£881	£0
Total cost of uses	£882	£882	£0
Delivered energy	105 kWh/m²	105 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.5 tonnes	2.5 tonnes	0.0 tonnes
CO2 emissions per m²	54 kg/m²	54 kg/m²	0 kg/m²
Primary energy	322 kWh/m²	322 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-12	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.07, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	57 D	**DER**	N/A	**TER**	N/A
Environmental	61 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.50	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	21.84 m	46.03 m²	2.50 m

7.0 Living Area	31.00	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	27.35	19.47
External Wall - lobby	Solid Wall	Other	0.60	27.25	25.15

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	19.23

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	46.03

11.1 Party Floors

Description	Construction	Area (m²)
Party Floor 1	Other	46.03

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	South East							2.10	
windows	Window	[1] External Wall	North West	None	0.00					7.88	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate	
Night Ventilation	No	
Air change rate	2.00	

Mechanical Ventilation

Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%

Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 1.08, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

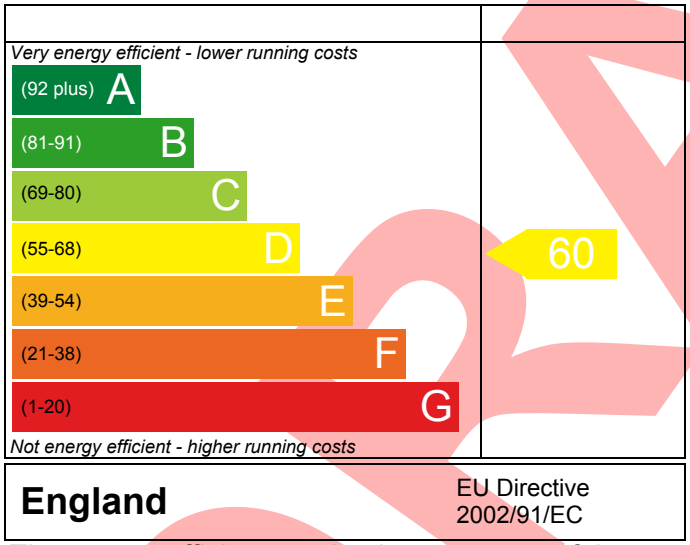
Unit 1.08, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	41.04 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

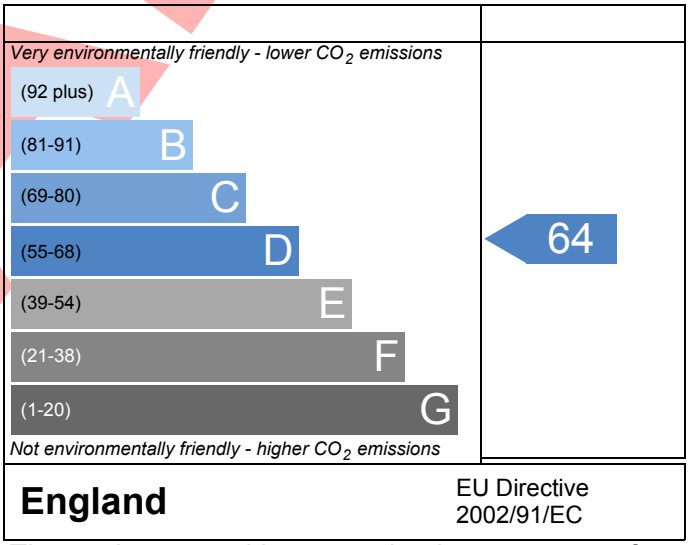
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-13	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.08, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	60 D	**DER**	N/A	**TER**	N/A
Environmental	64 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.14	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400	(1b)	x 2.5000	(2b) =	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	29.7500	5.9100	23.8400	0.6000	14.3040			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
Total net area of external elements Aum(A, m2)			35.0300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.4820			(33)
Party Wall 1			30.6000	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			41.0400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	5.2545	(36)
Total fabric heat loss (33) + (36) =	39.7365	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff	74.2359	72.7468	73.4861	69.9558	69.9558	66.8409	67.4307	67.4307	68.6600	69.9558	69.2996	72.0241	(39)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 = 70.1685 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8089	1.7726	1.7906	1.7046	1.7046	1.6287	1.6430	1.6430	1.6730	1.7046	1.6886	1.7550	(40)
HLP (average)												1.7098	(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 1.4342 (42)

Average daily hot water use (litres/day) 68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m													
	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
								Total per year (kWh/year) = Sum(64)m =				1420.0675	(64)
RHI water heating demand												1420	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.9100	12.9280	0.7600	0.7000	0.7700	28.1686	(81)

Solar gains	28.1686	52.7758	93.5260	157.4534	205.1835	233.4567	215.2581	175.0858	122.2762	67.7746	36.3692	22.7430	(83)
Total gains	398.0752	419.7295	447.4652	491.4473	519.1911	529.2771	500.2632	465.8990	424.4039	390.0036	380.8971	383.7230	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.3911	39.1770	38.7829	40.7400	40.7400	42.6386	42.2656	42.2656	41.5089	40.7400	41.1258	39.5701	
alpha	3.5594	3.6118	3.5855	3.7160	3.7160	3.8426	3.8177	3.8177	3.7673	3.7160	3.7417	3.6380	
util living area													
	0.9876	0.9838	0.9714	0.9340	0.8494	0.6482	0.4805	0.5114	0.8038	0.9446	0.9796	0.9889	(86)
MIT	19.3005	19.4564	19.7674	20.2529	20.6371	20.9202	20.9809	20.9764	20.7946	20.3262	19.8135	19.3325	(87)
Th 2	19.4638	19.4893	19.4766	19.5376	19.5376	19.5924	19.5819	19.5819	19.5602	19.5376	19.5490	19.5017	(88)
util rest of house													
	0.9832	0.9781	0.9603	0.9068	0.7834	0.5172	0.3052	0.3270	0.6960	0.9153	0.9712	0.9850	(89)
MIT 2	17.3108	17.5520	17.9923	18.7140	19.2132	19.5518	19.5783	19.5773	19.4219	18.8273	18.1083	17.3807	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.4778	18.6689	19.0334	19.6165	20.0483	20.3544	20.4009	20.3979	20.2270	19.7064	19.1084	18.5255	(92)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Temperature adjustment												0.0000	
adjusted MIT	18.4778	18.6689	19.0334	19.6165	20.0483	20.3544	20.4009	20.3979	20.2270	19.7064	19.1084	18.5255	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9794	0.9739	0.9561	0.9086	0.8094	0.5919	0.4091	0.4365	0.7516	0.9195	0.9678	0.9815	(94)
Useful gains	389.8656	408.7615	427.8175	446.5078	420.2318	313.2759	204.6756	203.3860	318.9906	358.5892	368.6258	376.6096	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1037.6520	994.3714	891.6358	721.7022	549.0339	337.8391	209.0962	208.8916	386.3505	602.0705	811.3897	1010.1716	(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													
	481.9531	393.5298	345.0808	198.1400	95.8287	0.0000	0.0000	0.0000	0.0000	181.1501	318.7900	471.3701	(98)
Space heating												2485.8425	(98)
RHI space heating demand												2486	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(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	1.1297	1.1075	1.0854	0.9746	0.9525	0.8417	0.8417	0.8196	0.8860	0.9525	0.9968	1.0411	(22b)
Effective ac	1.1297	1.1075	1.0854	0.9750	0.9536	0.8543	0.8543	0.8359	0.8925	0.9536	0.9968	1.0411	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	29.7500	5.9100	23.8400	0.6000	14.3040			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
Total net area of external elements Aum(A, m2)			35.0300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.4820			(33)
Party Wall 1			30.6000	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			41.0400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	5.2545	(36)
Total fabric heat loss (33) + (36) =	39.7365	(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	38.2493	37.4993	36.7494	33.0103	32.2876	28.9235	28.9235	28.3005	30.2193	32.2876	33.7496	35.2494	(38)
Heat transfer coeff	77.9858	77.2358	76.4858	72.7468	72.0241	68.6600	68.6600	68.0370	69.9558	72.0241	73.4861	74.9859	(39)
Average = Sum(39)m / 12 =												72.6906	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9002	1.8820	1.8637	1.7726	1.7550	1.6730	1.6730	1.6578	1.7046	1.7550	1.7906	1.8271	(40)
HLP (average)												1.7712	(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	1.4342 (42)
Average daily hot water use (litres/day)	68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
									Total per year (kWh/year) = Sum(64)m =			1420.0675	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(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	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(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	
Northwest	5.9100	11.2829	0.7600	0.7000	0.7700	24.5841	(81)

Solar gains	24.5841	50.0417	90.1592	148.0673	199.0315	212.1887	198.4982	158.2450	109.8604	61.1549	30.9332	20.0766	(83)
Total gains	394.4908	416.9953	444.0985	482.0612	513.0391	508.0091	483.5033	449.0582	411.9881	383.3839	375.4611	381.0567	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5451	36.9000	37.2618	39.1770	39.5701	41.5089	41.5089	41.8890	40.7400	39.5701	38.7829	38.0072	
alpha	3.4363	3.4600	3.4841	3.6118	3.6380	3.7673	3.7673	3.7926	3.7160	3.6380	3.5855	3.5338	
util living area													
	0.9884	0.9847	0.9749	0.9452	0.8750	0.7295	0.5802	0.6317	0.8455	0.9553	0.9823	0.9898	(86)
MIT	19.1630	19.3183	19.6308	20.1273	20.5446	20.8562	20.9549	20.9386	20.7207	20.2109	19.6626	19.2020	(87)
Th 2	19.4007	19.4132	19.4258	19.4893	19.5017	19.5602	19.5602	19.5712	19.5376	19.5017	19.4766	19.4511	(88)
util rest of house													
	0.9844	0.9792	0.9651	0.9222	0.8186	0.6129	0.4109	0.4645	0.7554	0.9318	0.9750	0.9862	(89)
MIT 2	17.0732	17.3057	17.7647	18.5086	19.0731	19.4708	19.5462	19.5492	19.3270	18.6446	17.8454	17.1601	(90)
Living area fraction										fLA = Living area / (4) =		0.5865	(91)
MIT	18.2989	18.4861	18.8591	19.4580	19.9362	20.2833	20.3724	20.3641	20.1444	19.5633	18.9112	18.3577	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2989	18.4861	18.8591	19.4580	19.9362	20.2833	20.3724	20.3641	20.1444	19.5633	18.9112	18.3577	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9805	0.9749	0.9605	0.9216	0.8374	0.6760	0.5107	0.5626	0.7981	0.9330	0.9713	0.9827	(94)
Useful gains	386.7823	406.5094	426.5700	444.2758	429.6067	343.4175	246.9476	252.6430	328.7991	357.7058	364.6719	374.4558	(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													
	1091.7128	1049.3321	945.2999	768.0575	593.2021	390.2180	259.0163	269.7050	422.8430	645.5707	867.9581	1061.6257	(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													
	524.4683	431.9768	385.9350	233.1229	121.7149	0.0000	0.0000	0.0000	0.0000	214.1714	362.3660	511.2544	(98)
Space heating												2785.0098	(98)
Space heating per m2											(98) / (4) =	67.8609	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2785.0098	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	524.4683	431.9768	385.9350	233.1229	121.7149	0.0000	0.0000	0.0000	0.0000	214.1714	362.3660	511.2544	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	524.4683	431.9768	385.9350	233.1229	121.7149	0.0000	0.0000	0.0000	0.0000	214.1714	362.3660	511.2544	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												2785.0098	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.4358	(232)
Total delivered energy for all uses												4413.5131	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2785.0098	13.1900	367.3428	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	13.1900	187.3069	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.4358	13.1900	27.4927	(250)
Additional standing charges			0.0000	(251)
Total energy cost			582.1424	(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] =	2.8417	(257)
SAP value		60.3583	
SAP rating (Section 12)		60	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2785.0098	0.5190	1445.4201	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			2182.4351	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	0.5190	108.1782	(268)
Total kg/year			2290.6133	(272)
CO2 emissions per m2			55.8100	(273)
EI value			64.3256	
EI rating			64	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

SAP 2012 WORKSHEET FOR Conversion (As Designed) (Version 9.92, January 2014)
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1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	29.7500	5.9100	23.8400	0.6000	14.3040			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
Total net area of external elements Aum(A, m2)			35.0300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.4820			(33)
Party Wall 1			30.6000	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			41.0400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	5.2545	(36)
Total fabric heat loss (33) + (36) =	39.7365	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff	74.2359	72.7468	73.4861	69.9558	69.9558	66.8409	67.4307	67.4307	68.6600	69.9558	69.2996	72.0241	(39)
Average = Sum(39)m / 12 =												70.1685	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8089	1.7726	1.7906	1.7046	1.7046	1.6287	1.6430	1.6430	1.6730	1.7046	1.6886	1.7550	(40)
HLP (average)												1.7098	(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	1.4342	(42)
Average daily hot water use (litres/day)	68.2633	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)

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

Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
									Total per year (kWh/year) = Sum(64)m =			1420.0675	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(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	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(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	
Northwest	5.9100	12.9280	0.7600	0.7000	0.7700	28.1686	(81)

Solar gains	28.1686	52.7758	93.5260	157.4534	205.1835	233.4567	215.2581	175.0858	122.2762	67.7746	36.3692	22.7430	(83)
Total gains	398.0752	419.7295	447.4652	491.4473	519.1911	529.2771	500.2632	465.8990	424.4039	390.0036	380.8971	383.7230	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.3911	39.1770	38.7829	40.7400	40.7400	42.6386	42.2656	42.2656	41.5089	40.7400	41.1258	39.5701	
alpha	3.5594	3.6118	3.5855	3.7160	3.7160	3.8426	3.8177	3.8177	3.7673	3.7160	3.7417	3.6380	
util living area													
	0.9876	0.9838	0.9714	0.9340	0.8494	0.6482	0.4805	0.5114	0.8038	0.9446	0.9796	0.9889	(86)
MIT	19.3005	19.4564	19.7674	20.2529	20.6371	20.9202	20.9809	20.9764	20.7946	20.3262	19.8135	19.3325	(87)
Th 2	19.4638	19.4893	19.4766	19.5376	19.5376	19.5924	19.5819	19.5819	19.5602	19.5376	19.5490	19.5017	(88)
util rest of house													
	0.9832	0.9781	0.9603	0.9068	0.7834	0.5172	0.3052	0.3270	0.6960	0.9153	0.9712	0.9850	(89)
MIT 2	17.3108	17.5520	17.9923	18.7140	19.2132	19.5518	19.5783	19.5773	19.4219	18.8273	18.1083	17.3807	(90)
Living area fraction										fLA = Living area / (4) =		0.5865	(91)
MIT	18.4778	18.6689	19.0334	19.6165	20.0483	20.3544	20.4009	20.3979	20.2270	19.7064	19.1084	18.5255	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4778	18.6689	19.0334	19.6165	20.0483	20.3544	20.4009	20.3979	20.2270	19.7064	19.1084	18.5255	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9794	0.9739	0.9561	0.9086	0.8094	0.5919	0.4091	0.4365	0.7516	0.9195	0.9678	0.9815	(94)
Useful gains	389.8656	408.7615	427.8175	446.5078	420.2318	313.2759	204.6756	203.3860	318.9906	358.5892	368.6258	376.6096	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1037.6520	994.3714	891.6358	721.7022	549.0339	337.8391	209.0962	208.8916	386.3505	602.0705	811.3897	1010.1716	(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													
	481.9531	393.5298	345.0808	198.1400	95.8287	0.0000	0.0000	0.0000	0.0000	181.1501	318.7900	471.3701	(98)
Space heating												2485.8425	(98)
Space heating per m2											(98) / (4) =	60.5712	(99)

8c. Space cooling requirement

Not applicable

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

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2485.8425	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	481.9531	393.5298	345.0808	198.1400	95.8287	0.0000	0.0000	0.0000	0.0000	181.1501	318.7900	471.3701	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	481.9531	393.5298	345.0808	198.1400	95.8287	0.0000	0.0000	0.0000	0.0000	181.1501	318.7900	471.3701	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												2485.8425	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.4358	(232)
Total delivered energy for all uses												4114.3458	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2485.8425	18.2700	454.1634	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	18.2700	259.4463	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.4358	18.2700	38.0812	(250)
Additional standing charges			0.0000	(251)
Total energy cost			751.6910	(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	2485.8425	0.5190	1290.1523	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			2027.1673	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	0.5190	108.1782	(268)
Total kg/year			2135.3455	(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	2485.8425	3.0700	7631.5365	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	3.0700	4359.6072	(264)
Space and water heating			11991.1437	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	3.0700	639.8980	(268)
Primary energy kWh/year			12631.0417	(272)
Primary energy kWh/m2/year			307.7739	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 60
Current environmental impact rating:	D 64

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 60
Potential environmental impact rating: D 64

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£752	£752	£0
Space heating	£454	£454	£0
Water heating	£259	£259	£0
Lighting	£38	£38	£0
Total cost of fuels	£752	£752	£0
Total cost of uses	£751	£751	£0
Delivered energy	100 kWh/m²	100 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.1 tonnes	2.1 tonnes	0.0 tonnes
CO2 emissions per m²	52 kg/m²	52 kg/m²	0 kg/m²
Primary energy	308 kWh/m²	308 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-13	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 1.08, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	60 D	**DER**	N/A	**TER**	N/A
Environmental	64 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.14	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	14.01 m	41.04 m²	2.50 m

7.0 Living Area	24.07	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	29.75	23.84
External Wall - lobby	Solid Wall	Other	0.60	5.28	3.18

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	30.60

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	41.04

11.1 Party Floors

Description	Construction	Area (m²)
Party Floor 1	Other	41.04

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	South East							2.10	
windows	Window	[1] External Wall	North West	None	0.00					5.91	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate	
Night Ventilation	No	
Air change rate	2.00	

Mechanical Ventilation

Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%

Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 2.01, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

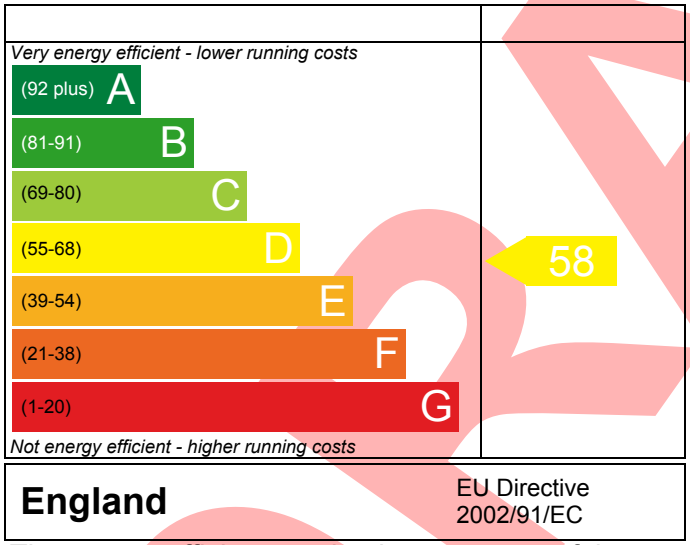
Unit 2.01, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	41.04 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

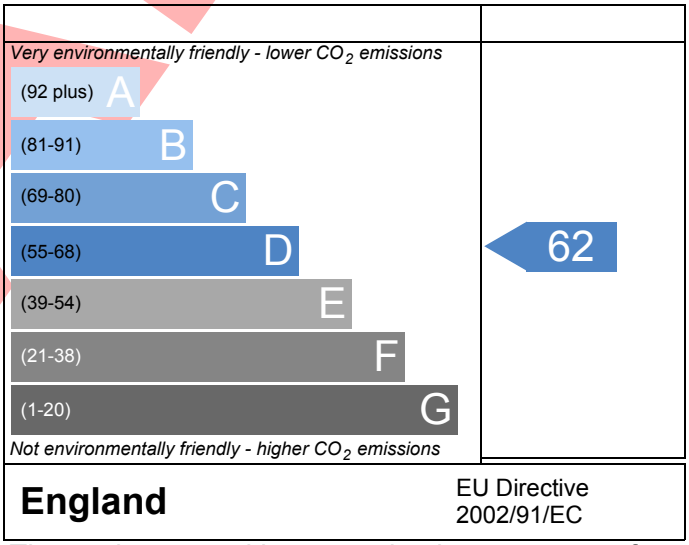
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-14	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.01, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	58 D	**DER**	N/A	**TER**	N/A
Environmental	62 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.29	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400	(1b)	x 2.5000	(2b) =	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	33.6700	7.8800	25.7900	0.6000	15.4740			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
External Roof	19.5000		19.5000	0.1600	3.1200			(30)
Total net area of external elements Aum(A, m2)			58.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.7324			(33)
Party Wall 1			26.6800	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			21.5400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.7675	(36)
Total fabric heat loss (33) + (36) =	52.4999	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff													

CALCULATION OF HEAT DEMAND 09 Jan 2014

	86.9993	85.5102	86.2495	82.7193	82.7193	79.6043	80.1941	80.1941	81.4234	82.7193	82.0630	84.7876 (39)
Average = Sum(39)m / 12 =												82.9320 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1199	2.0836	2.1016	2.0156	2.0156	1.9397	1.9540	1.9540	1.9840	2.0156	1.9996	2.0660	(40)
HLP (average)												2.0208	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4342	(42)
Average daily hot water use (litres/day)												68.2633	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m													
	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
								Total per year (kWh/year) = Sum(64)m =				1420.0675	(64)
RHI water heating demand												1420	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.9998	24.8692	20.2250	15.3116	11.4456	9.6629	10.4411	13.5717	18.2159	23.1292	26.9952	28.7780	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	368.4002	365.6156	352.8511	333.1701	313.3918	295.3005	284.4434	290.0830	301.1476	320.9846	343.0755	359.4317	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.9700	12.9280	0.7600	0.7000	0.7700	9.3895	(75)
Southeast	5.9100	40.5720	0.7600	0.7000	0.7700	88.4014	(77)

Solar gains	97.7909	155.4629	216.3611	289.0809	327.5170	353.6306	333.3115	301.0517	256.2152	182.4625	120.5798	82.5209	(83)
Total gains	466.1910	521.0785	569.2123	622.2509	640.9088	648.9311	617.7549	591.1346	557.3628	503.4470	463.6552	441.9526	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.7589	33.3293	33.0437	34.4539	34.4539	35.8021	35.5388	35.5388	35.0022	34.4539	34.7294	33.6134	
alpha	3.1839	3.2220	3.2029	3.2969	3.2969	3.3868	3.3693	3.3693	3.3335	3.2969	3.3153	3.2409	
util living area													
	0.9810	0.9719	0.9512	0.9021	0.8135	0.6202	0.4583	0.4762	0.7427	0.9116	0.9675	0.9835	(86)
MIT	19.0977	19.3146	19.6842	20.1965	20.5918	20.8974	20.9729	20.9696	20.7872	20.2884	19.6772	19.1088	(87)
Th 2	19.2546	19.2782	19.2665	19.3230	19.3230	19.3739	19.3641	19.3641	19.3440	19.3230	19.3336	19.2897	(88)
util rest of house													
	0.9743	0.9621	0.9328	0.8633	0.7340	0.4747	0.2656	0.2772	0.6143	0.8672	0.9540	0.9777	(89)
MIT 2	16.8920	17.2168	17.7364	18.4779	18.9791	19.3262	19.3599	19.3593	19.2163	18.6177	17.7750	16.9288	(90)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.1856	18.4472	18.8788	19.4858	19.9249	20.2477	20.3059	20.3037	20.1376	19.5976	18.8907	18.2074	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1856	18.4472	18.8788	19.4858	19.9249	20.2477	20.3059	20.3037	20.1376	19.5976	18.8907	18.2074	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9686	0.9557	0.9275	0.8678	0.7661	0.5574	0.3801	0.3955	0.6821	0.8760	0.9493	0.9725	(94)
Useful gains	451.5719	498.0180	527.9695	539.9896	491.0198	361.7311	234.7850	233.8104	380.1895	441.0346	440.1590	429.8202	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1190.6394	1149.8705	1033.1614	842.5649	639.0011	393.8577	241.0580	240.8830	450.8919	702.9117	942.9602	1162.2151	(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	549.8662	438.0449	375.8628	217.8542	110.0981	0.0000	0.0000	0.0000	0.0000	194.8365	362.0169	544.9018	(98)
Space heating												2793.4814	(98)
RHI space heating demand												2793	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(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	1.1297	1.1075	1.0854	0.9746	0.9525	0.8417	0.8417	0.8196	0.8860	0.9525	0.9968	1.0411	(22b)
Effective ac	1.1297	1.1075	1.0854	0.9750	0.9536	0.8543	0.8543	0.8359	0.8925	0.9536	0.9968	1.0411	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	33.6700	7.8800	25.7900	0.6000	15.4740			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
External Roof	19.5000		19.5000	0.1600	3.1200			(30)
Total net area of external elements Aum(A, m2)			58.4500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.7324			(33)
Party Wall 1			26.6800	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			21.5400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.7675	(36)
Total fabric heat loss (33) + (36) =	52.4999	(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	38.2493	37.4993	36.7494	33.0103	32.2876	28.9235	28.9235	28.3005	30.2193	32.2876	33.7496	35.2494	(38)
Heat transfer coeff	90.7493	89.9993	89.2493	85.5102	84.7876	81.4234	81.4234	80.8005	82.7193	84.7876	86.2495	87.7493	(39)
Average = Sum(39)m / 12 =												85.4540	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2112	2.1930	2.1747	2.0836	2.0660	1.9840	1.9840	1.9688	2.0156	2.0660	2.1016	2.1381	(40)
HLP (average)												2.0822	(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	1.4342 (42)
Average daily hot water use (litres/day)	68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (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
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (64)
Total per year (kWh/year) = Sum(64)m = 1420.0675 (64)
Heat gains from water heating, kWh/month
60.5362 53.6182 56.9267 51.8852 51.4644 46.8742 45.8631 49.1605 48.7084 53.7601 55.7719 59.3679 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	27.9998	24.8692	20.2250	15.3116	11.4456	9.6629	10.4411	13.5717	18.2159	23.1292	26.9952	28.7780	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	368.4002	365.6156	352.8511	333.1701	313.3918	295.3005	284.4434	290.0830	301.1476	320.9846	343.0755	359.4317	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.9700	11.2829	0.7600	0.7000	0.7700	8.1947	(75)
Southeast	5.9100	36.7938	0.7600	0.7000	0.7700	80.1692	(77)

Solar gains	88.3639	153.2383	216.8973	280.8649	325.6533	328.1639	314.3602	280.2022	238.9330	171.3104	106.3352	75.3003	(83)
Total gains	456.7640	518.8539	569.7485	614.0350	639.0451	623.4644	598.8036	570.2851	540.0805	492.2950	449.4107	434.7320	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.4052	31.6669	31.9330	33.3293	33.6134	35.0022	35.0022	35.2721	34.4539	33.6134	33.0437	32.4789	
alpha	3.0937	3.1111	3.1289	3.2220	3.2409	3.3335	3.3335	3.3515	3.2969	3.2409	3.2029	3.1653	
util living area													
	0.9828	0.9733	0.9555	0.9149	0.8374	0.6961	0.5497	0.5878	0.7880	0.9270	0.9726	0.9851	(86)
MIT	18.9545	19.1846	19.5542	20.0751	20.5030	20.8270	20.9422	20.9273	20.7130	20.1657	19.5142	18.9716	(87)
Th 2	19.1962	19.2078	19.2194	19.2782	19.2897	19.3440	19.3440	19.3542	19.3230	19.2897	19.2665	19.2428	(88)
util rest of house													
	0.9767	0.9638	0.9388	0.8808	0.7669	0.5649	0.3643	0.4051	0.6756	0.8903	0.9611	0.9799	(89)
MIT 2	16.6523	16.9894	17.5238	18.2853	18.8489	19.2449	19.3286	19.3318	19.1286	18.4324	17.5027	16.7034	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.0025	18.2769	18.7147	19.3350	19.8191	20.1728	20.2749	20.2676	20.0579	19.4490	18.6825	18.0337	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0025	18.2769	18.7147	19.3350	19.8191	20.1728	20.2749	20.2676	20.0579	19.4490	18.6825	18.0337	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9710	0.9572	0.9327	0.8821	0.7918	0.6359	0.4737	0.5124	0.7310	0.8946	0.9559	0.9748	(94)
Useful gains	443.5045	496.6327	531.4055	541.6657	505.9924	396.4707	283.6333	292.2079	394.8023	440.4013	429.5786	423.7632	(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													
	1243.4956	1203.9127	1090.1489	892.3017	688.3956	453.7551	299.2265	312.5033	492.8301	750.2819	998.9835	1213.8967	(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													
	595.1934	475.2922	415.7051	252.4580	135.7080	0.0000	0.0000	0.0000	0.0000	230.5512	409.9715	587.8593	(98)
Space heating												3102.7386	(98)
Space heating per m2											(98) / (4) =	75.6028	(99)

8c. Space cooling requirement

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)	100.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3102.7386	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	595.1934	475.2922	415.7051	252.4580	135.7080	0.0000	0.0000	0.0000	0.0000	230.5512	409.9715	587.8593	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	595.1934	475.2922	415.7051	252.4580	135.7080	0.0000	0.0000	0.0000	0.0000	230.5512	409.9715	587.8593	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												3102.7386	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												197.7939	(232)
Total delivered energy for all uses												4720.6001	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3102.7386	13.1900	409.2512	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	13.1900	187.3069	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	197.7939	13.1900	26.0890	(250)
Additional standing charges			0.0000	(251)
Total energy cost			622.6471	(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] =	3.0394	(257)
SAP value		57.6001	
SAP rating (Section 12)		58	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3102.7386	0.5190	1610.3213	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			2347.3364	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	197.7939	0.5190	102.6551	(268)
Total kg/year			2449.9914	(272)
CO2 emissions per m2			59.7000	(273)
EI value			61.8259	
EI rating			62	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	33.6700	7.8800	25.7900	0.6000	15.4740			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
External Roof	19.5000		19.5000	0.1600	3.1200			(30)
Total net area of external elements Aum(A, m2)			58.4500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.7324			(33)
Party Wall 1			26.6800	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			21.5400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.7675	(36)
Total fabric heat loss (33) + (36) =	52.4999	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff	86.9993	85.5102	86.2495	82.7193	82.7193	79.6043	80.1941	80.1941	81.4234	82.7193	82.0630	84.7876	(39)
Average = Sum(39)m / 12 =												82.9320	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1199	2.0836	2.1016	2.0156	2.0156	1.9397	1.9540	1.9540	1.9840	2.0156	1.9996	2.0660	(40)
HLP (average)												2.0208	(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	1.4342 (42)
Average daily hot water use (litres/day)	68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)

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

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (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
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (64)
Total per year (kWh/year) = Sum(64)m = 1420.0675 (64)
Heat gains from water heating, kWh/month
60.5362 53.6182 56.9267 51.8852 51.4644 46.8742 45.8631 49.1605 48.7084 53.7601 55.7719 59.3679 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
27.9998 24.8692 20.2250 15.3116 11.4456 9.6629 10.4411 13.5717 18.2159 23.1292 26.9952 28.7780 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
185.3099 187.2329 182.3871 172.0711 159.0490 146.8101 138.6337 136.7108 141.5565 151.8725 164.8946 177.1336 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
45.0397 45.0397 45.0397 45.0397 45.0397 45.0397 45.0397 45.0397 45.0397 45.0397 45.0397 45.0397 (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)
-57.3698 -57.3698 -57.3698 -57.3698 -57.3698 -57.3698 -57.3698 -57.3698 -57.3698 -57.3698 -57.3698 -57.3698 (71)
Water heating gains (Table 5)
81.3658 79.7890 76.5144 72.0627 69.1726 65.1030 61.6440 66.0759 67.6506 72.2582 77.4610 79.7956 (72)
Total internal gains
368.4002 365.6156 352.8511 333.1701 313.3918 295.3005 284.4434 290.0830 301.1476 320.9846 343.0755 359.4317 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.9700	12.9280	0.7600	0.7000	0.7700	9.3895	(75)
Southeast	5.9100	40.5720	0.7600	0.7000	0.7700	88.4014	(77)

Solar gains 97.7909 155.4629 216.3611 289.0809 327.5170 353.6306 333.3115 301.0517 256.2152 182.4625 120.5798 82.5209 (83)
Total gains 466.1910 521.0785 569.2123 622.2509 640.9088 648.9311 617.7549 591.1346 557.3628 503.4470 463.6552 441.9526 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.7589	33.3293	33.0437	34.4539	34.4539	35.8021	35.5388	35.5388	35.0022	34.4539	34.7294	33.6134	
alpha	3.1839	3.2220	3.2029	3.2969	3.2969	3.3868	3.3693	3.3693	3.3335	3.2969	3.3153	3.2409	
util living area	0.9810	0.9719	0.9512	0.9021	0.8135	0.6202	0.4583	0.4762	0.7427	0.9116	0.9675	0.9835	(86)
MIT	19.0977	19.3146	19.6842	20.1965	20.5918	20.8974	20.9729	20.9696	20.7872	20.2884	19.6772	19.1088	(87)
Th 2	19.2546	19.2782	19.2665	19.3230	19.3230	19.3739	19.3641	19.3641	19.3440	19.3230	19.3336	19.2897	(88)
util rest of house	0.9743	0.9621	0.9328	0.8633	0.7340	0.4747	0.2656	0.2772	0.6143	0.8672	0.9540	0.9777	(89)
MIT 2	16.8920	17.2168	17.7364	18.4779	18.9791	19.3262	19.3599	19.3593	19.2163	18.6177	17.7750	16.9288	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.1856	18.4472	18.8788	19.4858	19.9249	20.2477	20.3059	20.3037	20.1376	19.5976	18.8907	18.2074	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1856	18.4472	18.8788	19.4858	19.9249	20.2477	20.3059	20.3037	20.1376	19.5976	18.8907	18.2074	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9686	0.9557	0.9275	0.8678	0.7661	0.5574	0.3801	0.3955	0.6821	0.8760	0.9493	0.9725	(94)
Useful gains	451.5719	498.0180	527.9695	539.9896	491.0198	361.7311	234.7850	233.8104	380.1895	441.0346	440.1590	429.8202	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1190.6394	1149.8705	1033.1614	842.5649	639.0011	393.8577	241.0580	240.8830	450.8919	702.9117	942.9602	1162.2151	(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	549.8662	438.0449	375.8628	217.8542	110.0981	0.0000	0.0000	0.0000	0.0000	194.8365	362.0169	544.9018	(98)

Space heating 2793.4814 (98)
Space heating per m2 (98) / (4) = 68.0673 (99)

8c. Space cooling requirement

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

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 %)	100.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	2793.4814	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	549.8662	438.0449	375.8628	217.8542	110.0981	0.0000	0.0000	0.0000	0.0000	194.8365	362.0169	544.9018	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	549.8662	438.0449	375.8628	217.8542	110.0981	0.0000	0.0000	0.0000	0.0000	194.8365	362.0169	544.9018	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												2793.4814	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												197.7939	(232)
Total delivered energy for all uses												4411.3429	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2793.4814	18.2700	510.3691	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	18.2700	259.4463	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	197.7939	18.2700	36.1370	(250)
Additional standing charges			0.0000	(251)
Total energy cost			805.9523	(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	2793.4814	0.5190	1449.8169	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			2186.8319	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	197.7939	0.5190	102.6551	(268)
Total kg/year			2289.4869	(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	2793.4814	3.0700	8575.9879	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	3.0700	4359.6072	(264)
Space and water heating			12935.5952	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	197.7939	3.0700	607.2274	(268)
Primary energy kWh/year			13542.8226	(272)
Primary energy kWh/m2/year			329.9908	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 58
Current environmental impact rating:	D 62

(For testing purposes):

A Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 58
Potential environmental impact rating: D 62

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£806	£806	£0
Space heating	£510	£510	£0
Water heating	£259	£259	£0
Lighting	£36	£36	£0
Total cost of fuels	£806	£806	£0
Total cost of uses	£805	£805	£0
Delivered energy	107 kWh/m²	107 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.3 tonnes	2.3 tonnes	0.0 tonnes
CO2 emissions per m²	56 kg/m²	56 kg/m²	0 kg/m²
Primary energy	330 kWh/m²	330 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
```

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-14	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.01, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	58 D	**DER**	N/A	**TER**	N/A
Environmental	62 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.29	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	15.58 m	41.04 m²	2.50 m

7.0 Living Area	24.07	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	33.67	25.79
External Wall - lobby	Solid Wall	Other	0.60	5.28	3.18

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	26.68

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.16	19.50	19.50

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	21.54

11.1 Party Floors

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Construction	Area (m²)
Party Floor 1	Other	41.04

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	North West							2.10	
windows	Window	[1] External Wall	South East	None	0.00					5.91	
window	Window	[1] External Wall	North East	None	0.00					1.97	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate
Night Ventilation	No
Air change rate	2.00

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	

Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 2.02, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

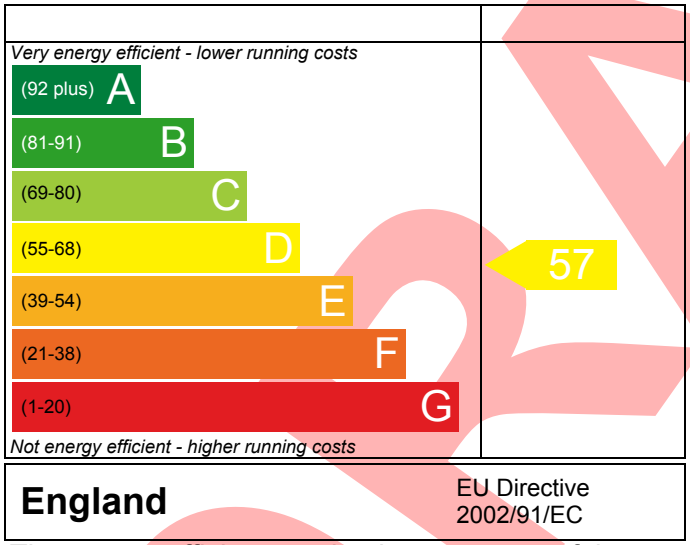
Unit 2.02, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	42.63 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

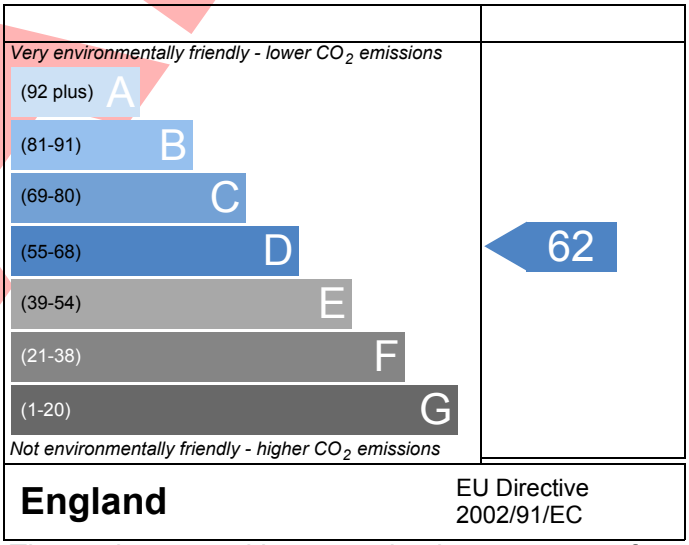
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-15	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.02, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	57 D	**DER**	N/A	**TER**	N/A
Environmental	62 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.37	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.6300	(1b)	x 2.5000	(2b) =	106.5750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.5750	(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) =	0.1877	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9377	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7267	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8357	0.7994	0.8175	0.7267	0.7267	0.6359	0.6540	0.6540	0.6904	0.7267	0.7085	0.7812	(22b)
Effective ac	0.8492	0.8195	0.8342	0.7640	0.7640	0.7022	0.7139	0.7139	0.7383	0.7640	0.7510	0.8051	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	23.9800	7.8800	16.1000	0.6000	9.6600			(29a)
External Wall - lobby	30.5000	2.1000	28.4000	0.4769	13.5453			(29a)
External Roof	15.5000		15.5000	0.1600	2.4800			(30)
Total net area of external elements Aum(A, m2)			69.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.3070			(33)
Party Wall 1			19.8000	0.0000	0.0000			(32)
Party Floor 1			42.6300					(32d)
Party Ceilings 1			27.1300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	10.4970	(36)
Total fabric heat loss (33) + (36) =	59.8040	(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	29.8658	28.8211	29.3376	26.8710	26.8710	24.6946	25.1066	25.1066	25.9656	26.8710	26.4125	28.3162	(38)
Heat transfer coeff													

CALCULATION OF HEAT DEMAND 09 Jan 2014

	89.6698	88.6251	89.1417	86.6750	86.6750	84.4986	84.9107	84.9107	85.7696	86.6750	86.2165	88.1202 (39)
Average = Sum(39)m / 12 =												86.8240 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1034	2.0789	2.0911	2.0332	2.0332	1.9821	1.9918	1.9918	2.0120	2.0332	2.0224	2.0671	(40)
HLP (average)												2.0367	(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												1.4779	(42)
Average daily hot water use (litres/day)												69.2992	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	76.2291	73.4571	70.6852	67.9132	65.1412	62.3693	62.3693	65.1412	67.9132	70.6852	73.4571	76.2291	(44)
Energy conte	113.0455	98.8703	102.0253	88.9482	85.3479	73.6487	68.2464	78.3137	79.2490	92.3571	100.8150	109.4786	(45)
Energy content (annual)										Total = Sum(45)m =		1090.3458	(45)
Distribution loss (46)m = 0.15 x (45)m													
	16.9568	14.8306	15.3038	13.3422	12.8022	11.0473	10.2370	11.7471	11.8874	13.8536	15.1223	16.4218	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
								Total per year (kWh/year) = Sum(64)m =				1436.3658	(64)
RHI water heating demand												1436	(64)
Heat gains from water heating, kWh/month													
	61.0980	54.1096	57.4338	52.3273	51.8886	47.2402	46.2023	49.5497	49.1023	54.2191	56.2730	59.9120	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.0640	25.8144	20.9937	15.8935	11.8806	10.0301	10.8379	14.0875	18.9082	24.0083	28.0213	29.8718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	191.3434	193.3290	188.3255	177.6736	164.2275	151.5901	143.1475	141.1619	146.1655	156.8173	170.2634	182.9009	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	(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)													
	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	(71)
Water heating gains (Table 5)													
	82.1210	80.5202	77.1960	72.6768	69.7427	65.6114	62.0999	66.5991	68.1976	72.8752	78.1569	80.5269	(72)
Total internal gains													
	377.4307	374.5658	361.4173	341.1461	320.7530	302.1338	290.9875	296.7507	308.1735	328.6031	351.3438	368.2017	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.8800	40.5720	0.7600	0.7000	0.7700	117.8685	(77)

Solar gains	117.8685	183.8280	246.9144	315.4619	345.4967	367.7490	348.7451	323.5863	287.2753	213.1612	144.6089	99.9199	(83)
Total gains	495.2991	558.3938	608.3318	656.6080	666.2497	669.8828	639.7326	620.3370	595.4488	541.7643	495.9528	468.1216	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.0146	33.4038	33.2102	34.1554	34.1554	35.0351	34.8651	34.8651	34.5159	34.1554	34.3370	33.5952	
alpha	3.2010	3.2269	3.2140	3.2770	3.2770	3.3357	3.3243	3.3243	3.3011	3.2770	3.2891	3.2397	
util living area													
	0.9798	0.9694	0.9474	0.8995	0.8151	0.6306	0.4665	0.4790	0.7354	0.9050	0.9651	0.9826	(86)
MIT	19.1337	19.3481	19.7201	20.1963	20.5831	20.8868	20.9699	20.9674	20.7885	20.3021	19.6809	19.1236	(87)
Th 2	19.2653	19.2812	19.2733	19.3113	19.3113	19.3453	19.3388	19.3388	19.3254	19.3113	19.3184	19.2890	(88)
util rest of house													
	0.9727	0.9589	0.9279	0.8599	0.7356	0.4823	0.2680	0.2762	0.6052	0.8582	0.9507	0.9765	(89)
MIT 2	16.9497	17.2659	17.7899	18.4688	18.9602	19.2927	19.3342	19.3338	19.2000	18.6254	17.7702	16.9496	(90)
Living area fraction									fLA = Living area / (4) =			0.6587	(91)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	18.3883	18.6375	19.0613	19.6067	20.0292	20.3427	20.4116	20.4098	20.2464	19.7298	19.0288	18.3816 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3883	18.6375	19.0613	19.6067	20.0292	20.3427	20.4116	20.4098	20.2464	19.7298	19.0288	18.3816 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9679	0.9537	0.9249	0.8680	0.7732	0.5765	0.3999	0.4110	0.6830	0.8720	0.9475	0.9720	(94)
Useful gains	479.3758	532.5413	562.6422	569.9395	515.1292	386.2052	255.8251	254.9655	406.6665	472.4041	469.9313	455.0336	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1245.3592	1208.6208	1084.0815	893.3345	678.5966	426.1006	264.2093	264.0588	484.2874	747.9879	1002.5917	1223.2493	(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	569.8917	454.3254	387.9508	232.8444	121.6197	0.0000	0.0000	0.0000	0.0000	205.0344	383.5155	571.5525	(98)
Space heating												2926.7344	(98)
RHI space heating demand												2927	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.6300 (1b)	x	2.5000 (2b)	=	106.5750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.5750	(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) =	0.1877	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9377	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7267	(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	0.9265	0.9084	0.8902	0.7994	0.7812	0.6904	0.6904	0.6722	0.7267	0.7812	0.8175	0.8539	(22b)
Effective ac	0.9292	0.9126	0.8962	0.8195	0.8051	0.7383	0.7383	0.7259	0.7640	0.8051	0.8342	0.8645	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	23.9800	7.8800	16.1000	0.6000	9.6600			(29a)
External Wall - lobby	30.5000	2.1000	28.4000	0.4769	13.5453			(29a)
External Roof	15.5000		15.5000	0.1600	2.4800			(30)
Total net area of external elements Aum(A, m2)			69.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.3070			(33)
Party Wall 1			19.8000	0.0000	0.0000			(32)
Party Floor 1			42.6300					(32d)
Party Ceilings 1			27.1300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	10.4970	(36)
Total fabric heat loss (33) + (36) =	59.8040	(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	32.6806	32.0944	31.5199	28.8211	28.3162	25.9656	25.9656	25.5303	26.8710	28.3162	29.3376	30.4055	(38)
Heat transfer coeff	92.4847	91.8985	91.3239	88.6251	88.1202	85.7696	85.7696	85.3344	86.6750	88.1202	89.1417	90.2096	(39)
Average = Sum(39)m / 12 =												88.6227	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1695	2.1557	2.1422	2.0789	2.0671	2.0120	2.0120	2.0017	2.0332	2.0671	2.0911	2.1161	(40)
HLP (average)												2.0789	(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	1.4779 (42)
Average daily hot water use (litres/day)	69.2992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.2291	73.4571	70.6852	67.9132	65.1412	62.3693	62.3693	65.1412	67.9132	70.6852	73.4571	76.2291	(44)
Energy conte	113.0455	98.8703	102.0253	88.9482	85.3479	73.6487	68.2464	78.3137	79.2490	92.3571	100.8150	109.4786	(45)
Energy content (annual)										Total = Sum(45)m =		1090.3458	(45)
Distribution loss (46)m = 0.15 x (45)m	16.9568	14.8306	15.3038	13.3422	12.8022	11.0473	10.2370	11.7471	11.8874	13.8536	15.1223	16.4218	(46)
Water storage loss:													
Store volume												110.0000	(47)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
142.4335 125.4143 131.4133 117.3882 114.7359 102.0887 97.6344 107.7017 107.6890 121.7451 129.2550 138.8666 (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
142.4335 125.4143 131.4133 117.3882 114.7359 102.0887 97.6344 107.7017 107.6890 121.7451 129.2550 138.8666 (64)
Total per year (kWh/year) = Sum(64)m = 1436.3658 (64)
Heat gains from water heating, kWh/month
61.0980 54.1096 57.4338 52.3273 51.8886 47.2402 46.2023 49.5497 49.1023 54.2191 56.2730 59.9120 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
29.0640 25.8144 20.9937 15.8935 11.8806 10.0301 10.8379 14.0875 18.9082 24.0083 28.0213 29.8718 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
191.3434 193.3290 188.3255 177.6736 164.2275 151.5901 143.1475 141.1619 146.1655 156.8173 170.2634 182.9009 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 (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)
-59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 (71)
Water heating gains (Table 5)
82.1210 80.5202 77.1960 72.6768 69.7427 65.6114 62.0999 66.5991 68.1976 72.8752 78.1569 80.5269 (72)
Total internal gains
377.4307 374.5658 361.4173 341.1461 320.7530 302.1338 290.9875 296.7507 308.1735 328.6031 351.3438 368.2017 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.8800	36.7938	0.7600	0.7000	0.7700	106.8922	(77)

Solar gains	106.8922	182.0770	249.1257	308.6788	345.7460	343.2457	330.9255	303.2717	269.7504	201.2339	128.0322	91.4775	(83)
Total gains	484.3229	556.6428	610.5430	649.8249	666.4990	645.3795	621.9130	600.0225	577.9240	529.8369	479.3761	459.6792	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.0098	32.2140	32.4167	33.4038	33.5952	34.5159	34.5159	34.6920	34.1554	33.5952	33.2102	32.8171	
alpha	3.1340	3.1476	3.1611	3.2269	3.2397	3.3011	3.3011	3.3128	3.2770	3.2397	3.2140	3.1878	
util living area	0.9817	0.9707	0.9514	0.9110	0.8362	0.7020	0.5549	0.5881	0.7791	0.9207	0.9705	0.9844	(86)
MIT	19.0137	19.2512	19.6131	20.0949	20.5051	20.8175	20.9385	20.9244	20.7196	20.1909	19.5446	19.0085	(87)
Th 2	19.2227	19.2315	19.2402	19.2812	19.2890	19.3254	19.3254	19.3322	19.3113	19.2890	19.2733	19.2571	(88)
util rest of house	0.9753	0.9605	0.9336	0.8758	0.7654	0.5698	0.3664	0.4033	0.6647	0.8817	0.9583	0.9789	(89)
MIT 2	16.7524	17.0979	17.6183	18.3128	18.8505	19.2207	19.3090	19.3092	19.1236	18.4637	17.5496	16.7647	(90)
Living area fraction									fLA = Living area / (4) =			0.6587	(91)
MIT	18.2419	18.5163	18.9323	19.4867	19.9404	20.2725	20.3824	20.3731	20.1748	19.6014	18.8637	18.2427	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2419	18.5163	18.9323	19.4867	19.9404	20.2725	20.3824	20.3731	20.1748	19.6014	18.8637	18.2427	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9705	0.9551	0.9296	0.8808	0.7958	0.6501	0.4906	0.5245	0.7293	0.8903	0.9545	0.9745	(94)
Useful gains	470.0179	531.6361	567.5791	572.3684	530.3801	419.5321	305.1301	314.7140	421.5070	471.7390	457.5434	447.9430	(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	1289.4125	1251.3137	1135.3618	938.2432	726.1422	486.5263	324.4115	339.0425	526.5369	793.2042	1048.6364	1266.7849	(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	609.6296	483.6233	422.4303	263.4299	145.6470	0.0000	0.0000	0.0000	0.0000	239.1701	425.5870	609.2184	(98)
Space heating												3198.7355	(98)
Space heating per m2											(98) / (4) =	75.0348	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3198.7355	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	609.6296	483.6233	422.4303	263.4299	145.6470	0.0000	0.0000	0.0000	0.0000	239.1701	425.5870	609.2184	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	609.6296	483.6233	422.4303	263.4299	145.6470	0.0000	0.0000	0.0000	0.0000	239.1701	425.5870	609.2184	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(219)
Water heating fuel used												1436.3658	(219)
Annual totals kWh/year													
Space heating fuel - main system												3198.7355	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												205.3115	(232)
Total delivered energy for all uses												4840.4129	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3198.7355	13.1900	421.9132	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1436.3658	13.1900	189.4566	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	205.3115	13.1900	27.0806	(250)
Additional standing charges			0.0000	(251)
Total energy cost			638.4505	(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] =	3.0600	(257)
SAP value		57.3128	
SAP rating (Section 12)		57	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3198.7355	0.5190	1660.1437	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1436.3658	0.5190	745.4738	(264)
Space and water heating			2405.6176	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3115	0.5190	106.5567	(268)
Total kg/year			2512.1743	(272)
CO2 emissions per m2			58.9300	(273)
EI value			61.5473	
EI rating			62	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.6300 (1b)	x	2.5000 (2b)	=	106.5750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.5750	(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) =	0.1877	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9377	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7267	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8357	0.7994	0.8175	0.7267	0.7267	0.6359	0.6540	0.6540	0.6904	0.7267	0.7085	0.7812	(22b)
Effective ac	0.8492	0.8195	0.8342	0.7640	0.7640	0.7022	0.7139	0.7139	0.7383	0.7640	0.7510	0.8051	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	23.9800	7.8800	16.1000	0.6000	9.6600			(29a)
External Wall - lobby	30.5000	2.1000	28.4000	0.4769	13.5453			(29a)
External Roof	15.5000		15.5000	0.1600	2.4800			(30)
Total net area of external elements Aum(A, m2)			69.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.3070			(33)
Party Wall 1			19.8000	0.0000	0.0000			(32)
Party Floor 1			42.6300					(32d)
Party Ceilings 1			27.1300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	10.4970	(36)
Total fabric heat loss (33) + (36) =	59.8040	(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	29.8658	28.8211	29.3376	26.8710	26.8710	24.6946	25.1066	25.1066	25.9656	26.8710	26.4125	28.3162	(38)
Heat transfer coeff	89.6698	88.6251	89.1417	86.6750	86.6750	84.4986	84.9107	84.9107	85.7696	86.6750	86.2165	88.1202	(39)
Average = Sum(39)m / 12 =												86.8240	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1034	2.0789	2.0911	2.0332	2.0332	1.9821	1.9918	1.9918	2.0120	2.0332	2.0224	2.0671	(40)
HLP (average)												2.0367	(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	1.4779 (42)
Average daily hot water use (litres/day)	69.2992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.2291	73.4571	70.6852	67.9132	65.1412	62.3693	62.3693	65.1412	67.9132	70.6852	73.4571	76.2291	(44)
Energy conte	113.0455	98.8703	102.0253	88.9482	85.3479	73.6487	68.2464	78.3137	79.2490	92.3571	100.8150	109.4786	(45)
Energy content (annual)										Total = Sum(45)m =		1090.3458	(45)
Distribution loss (46)m = 0.15 x (45)m	16.9568	14.8306	15.3038	13.3422	12.8022	11.0473	10.2370	11.7471	11.8874	13.8536	15.1223	16.4218	(46)
Water storage loss:													
Store volume												110.0000	(47)

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

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
142.4335 125.4143 131.4133 117.3882 114.7359 102.0887 97.6344 107.7017 107.6890 121.7451 129.2550 138.8666 (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
142.4335 125.4143 131.4133 117.3882 114.7359 102.0887 97.6344 107.7017 107.6890 121.7451 129.2550 138.8666 (64)
Total per year (kWh/year) = Sum(64)m = 1436.3658 (64)
Heat gains from water heating, kWh/month
61.0980 54.1096 57.4338 52.3273 51.8886 47.2402 46.2023 49.5497 49.1023 54.2191 56.2730 59.9120 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
29.0640 25.8144 20.9937 15.8935 11.8806 10.0301 10.8379 14.0875 18.9082 24.0083 28.0213 29.8718 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
191.3434 193.3290 188.3255 177.6736 164.2275 151.5901 143.1475 141.1619 146.1655 156.8173 170.2634 182.9009 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 (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)
-59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 (71)
Water heating gains (Table 5)
82.1210 80.5202 77.1960 72.6768 69.7427 65.6114 62.0999 66.5991 68.1976 72.8752 78.1569 80.5269 (72)
Total internal gains
377.4307 374.5658 361.4173 341.1461 320.7530 302.1338 290.9875 296.7507 308.1735 328.6031 351.3438 368.2017 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.8800	40.5720	0.7600	0.7000	0.7700	117.8685	(77)

Solar gains	117.8685	183.8280	246.9144	315.4619	345.4967	367.7490	348.7451	323.5863	287.2753	213.1612	144.6089	99.9199	(83)
Total gains	495.2991	558.3938	608.3318	656.6080	666.2497	669.8828	639.7326	620.3370	595.4488	541.7643	495.9528	468.1216	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.0146	33.4038	33.2102	34.1554	34.1554	35.0351	34.8651	34.8651	34.5159	34.1554	34.3370	33.5952	
alpha	3.2010	3.2269	3.2140	3.2770	3.2770	3.3357	3.3243	3.3243	3.3011	3.2770	3.2891	3.2397	
util living area	0.9798	0.9694	0.9474	0.8995	0.8151	0.6306	0.4665	0.4790	0.7354	0.9050	0.9651	0.9826	(86)
MIT	19.1337	19.3481	19.7201	20.1963	20.5831	20.8868	20.9699	20.9674	20.7885	20.3021	19.6809	19.1236	(87)
Th 2	19.2653	19.2812	19.2733	19.3113	19.3113	19.3453	19.3388	19.3388	19.3254	19.3113	19.3184	19.2890	(88)
util rest of house	0.9727	0.9589	0.9279	0.8599	0.7356	0.4823	0.2680	0.2762	0.6052	0.8582	0.9507	0.9765	(89)
MIT 2	16.9497	17.2659	17.7899	18.4688	18.9602	19.2927	19.3342	19.3338	19.2000	18.6254	17.7702	16.9496	(90)
Living area fraction									fLA = Living area / (4) =			0.6587	(91)
MIT	18.3883	18.6375	19.0613	19.6067	20.0292	20.3427	20.4116	20.4098	20.2464	19.7298	19.0288	18.3816	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3883	18.6375	19.0613	19.6067	20.0292	20.3427	20.4116	20.4098	20.2464	19.7298	19.0288	18.3816	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9679	0.9537	0.9249	0.8680	0.7732	0.5765	0.3999	0.4110	0.6830	0.8720	0.9475	0.9720	(94)
Useful gains	479.3758	532.5413	562.6422	569.9395	515.1292	386.2052	255.8251	254.9655	406.6665	472.4041	469.9313	455.0336	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1245.3592	1208.6208	1084.0815	893.3345	678.5966	426.1006	264.2093	264.0588	484.2874	747.9879	1002.5917	1223.2493	(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	569.8917	454.3254	387.9508	232.8444	121.6197	0.0000	0.0000	0.0000	0.0000	205.0344	383.5155	571.5525	(98)
Space heating												2926.7344	(98)
Space heating per m2											(98) / (4) =	68.6543	(99)

8c. Space cooling requirement

Not applicable

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

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2926.7344	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	569.8917	454.3254	387.9508	232.8444	121.6197	0.0000	0.0000	0.0000	0.0000	205.0344	383.5155	571.5525	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	569.8917	454.3254	387.9508	232.8444	121.6197	0.0000	0.0000	0.0000	0.0000	205.0344	383.5155	571.5525	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(219)
Water heating fuel used												1436.3658	(219)
Annual totals kWh/year													
Space heating fuel - main system												2926.7344	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												205.3115	(232)
Total delivered energy for all uses												4568.4117	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2926.7344	18.2700	534.7144	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1436.3658	18.2700	262.4240	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	205.3115	18.2700	37.5104	(250)
Additional standing charges			0.0000	(251)
Total energy cost			834.6488	(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	2926.7344	0.5190	1518.9751	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1436.3658	0.5190	745.4738	(264)
Space and water heating			2264.4490	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3115	0.5190	106.5567	(268)
Total kg/year			2371.0057	(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	2926.7344	3.0700	8985.0746	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1436.3658	3.0700	4409.6430	(264)
Space and water heating			13394.7175	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3115	3.0700	630.3064	(268)
Primary energy kWh/year			14025.0240	(272)
Primary energy kWh/m2/year			328.9942	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 57
Current environmental impact rating:	D 62

(For testing purposes):

A	Not considered
B	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 57
Potential environmental impact rating: D 62

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£835	£835	£0
Space heating	£535	£535	£0
Water heating	£262	£262	£0
Lighting	£38	£38	£0
Total cost of fuels	£835	£835	£0
Total cost of uses	£835	£835	£0
Delivered energy	107 kWh/m²	107 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.4 tonnes	2.4 tonnes	0.0 tonnes
CO2 emissions per m²	56 kg/m²	56 kg/m²	0 kg/m²
Primary energy	329 kWh/m²	329 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-15	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.02, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	57 D	**DER**	N/A	**TER**	N/A
Environmental	62 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.37	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	21.79 m	42.63 m²	2.50 m

7.0 Living Area	28.08	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	23.98	16.10
External Wall - lobby	Solid Wall	Other	0.60	30.50	28.40

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	19.80

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.16	15.50	15.50

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	27.13

11.1 Party Floors

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Construction	Area (m²)
Party Floor 1	Other	42.63

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	North West							2.10	
windows	Window	[1] External Wall	South East	None	0.00					7.88	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate
Night Ventilation	No
Air change rate	2.00

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	

Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 2.03, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

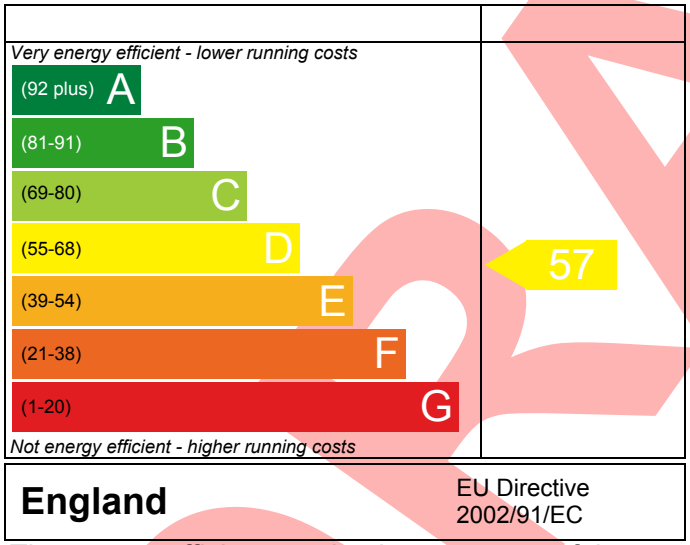
Unit 2.03, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	43.36 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

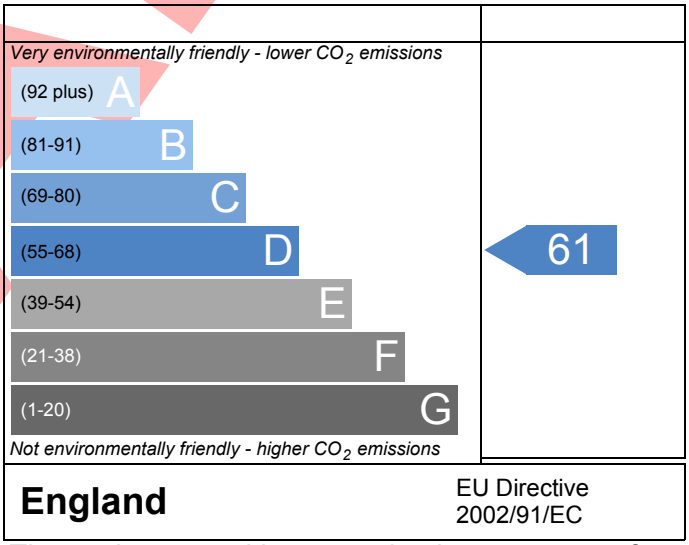
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-16	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.03, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	57 D	**DER**	N/A	**TER**	N/A
Environmental	61 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.42	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	43.3600	(1b)	x 2.5000	(2b) =	108.4000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		108.4000	(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) =	0.1845	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9345	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7242	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8329	0.7967	0.8148	0.7242	0.7242	0.6337	0.6518	0.6518	0.6880	0.7242	0.7061	0.7786	(22b)
Effective ac	0.8468	0.8173	0.8319	0.7623	0.7623	0.7008	0.7124	0.7124	0.7367	0.7623	0.7493	0.8031	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	32.0000	7.8800	24.1200	0.6000	14.4720			(29a)
External Wall - lobby	22.9800	2.1000	20.8800	0.4769	9.9587			(29a)
External Roof	15.9300		15.9300	0.1600	2.5488			(30)
Total net area of external elements Aum(A, m2)			70.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.6012			(33)
Party Wall 1			19.3800	0.0000	0.0000			(32)
Party Floor 1			43.3600					(32d)
Party Ceilings 1			27.4300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	10.6365	(36)
Total fabric heat loss (33) + (36) =	61.2377	(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	30.2932	29.2377	29.7596	27.2676	27.2676	25.0688	25.4851	25.4851	26.3529	27.2676	26.8044	28.7276	(38)
Heat transfer coeff													

CALCULATION OF HEAT DEMAND 09 Jan 2014

	91.5309	90.4754	90.9973	88.5053	88.5053	86.3065	86.7228	86.7228	87.5906	88.5053	88.0421	89.9653 (39)
Average = Sum(39)m / 12 =												88.6558 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1110	2.0866	2.0986	2.0412	2.0412	1.9905	2.0001	2.0001	2.0201	2.0412	2.0305	2.0748	(40)
HLP (average)												2.0446	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4982	(42)
Average daily hot water use (litres/day)												69.7829	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	76.7612	73.9698	71.1785	68.3872	65.5959	62.8046	62.8046	65.5959	68.3872	71.1785	73.9698	76.7612	(44)
Energy conte	113.8346	99.5604	102.7375	89.5690	85.9436	74.1628	68.7227	78.8603	79.8022	93.0017	101.5187	110.2427	(45)
Energy content (annual)										Total = Sum(45)m =		1097.9562	(45)
Distribution loss (46)m = 0.15 x (45)m													
	17.0752	14.9341	15.4106	13.4354	12.8915	11.1244	10.3084	11.8290	11.9703	13.9503	15.2278	16.5364	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(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													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(64)
									Total per year (kWh/year) = Sum(64)m =			1443.9762	(64)
RHI water heating demand												1444	(64)
Heat gains from water heating, kWh/month													
	61.3604	54.3390	57.6706	52.5337	52.0866	47.4111	46.3607	49.7315	49.2862	54.4335	56.5070	60.1661	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5632	26.2578	21.3543	16.1666	12.0847	10.2024	11.0241	14.3295	19.2330	24.4207	28.5026	30.3849	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(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)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	82.4737	80.8617	77.5143	72.9635	70.0089	65.8488	62.3128	66.8434	68.4531	73.1633	78.4819	80.8684	(72)
Total internal gains													
	381.6186	378.7156	365.3883	344.8428	324.1645	305.3007	294.0208	299.8424	311.4320	332.1369	355.1792	372.2695	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.8800	40.5720	0.7600	0.7000	0.7700	117.8685	(77)

Solar gains	117.8685	183.8280	246.9144	315.4619	345.4967	367.7490	348.7451	323.5863	287.2753	213.1612	144.6089	99.9199	(83)
Total gains	499.4870	562.5436	612.3027	660.3047	669.6612	673.0496	642.7659	623.4287	598.7073	545.2981	499.7882	472.1894	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, n1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.8972	33.2810	33.0901	34.0218	34.0218	34.8886	34.7211	34.7211	34.3771	34.0218	34.2008	33.4697	
alpha	3.1931	3.2187	3.2060	3.2681	3.2681	3.3259	3.3147	3.3147	3.2918	3.2681	3.2801	3.2313	
util living area													
	0.9803	0.9703	0.9489	0.9024	0.8199	0.6375	0.4729	0.4854	0.7412	0.9076	0.9660	0.9830	(86)
MIT	19.1186	19.3314	19.7035	20.1808	20.5718	20.8819	20.9683	20.9657	20.7815	20.2895	19.6662	19.1088	(87)
Th 2	19.2604	19.2762	19.2684	19.3060	19.3060	19.3397	19.3333	19.3333	19.3200	19.3060	19.3131	19.2839	(88)
util rest of house													
	0.9733	0.9599	0.9298	0.8636	0.7411	0.4883	0.2716	0.2797	0.6112	0.8616	0.9520	0.9770	(89)
MIT 2	16.9254	17.2392	17.7640	18.4453	18.9441	19.2846	19.3284	19.3280	19.1899	18.6061	17.7464	16.9253	(90)
Living area fraction									fLA = Living area / (4) =			0.6621	(91)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	18.3776	18.6245	19.0482	19.5944	20.0218	20.3422	20.4142	20.4124	20.2438	19.7207	19.0175	18.3710	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3776	18.6245	19.0482	19.5944	20.0218	20.3422	20.4142	20.4124	20.2438	19.7207	19.0175	18.3710	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9686	0.9548	0.9268	0.8713	0.7783	0.5834	0.4061	0.4172	0.6890	0.8750	0.9488	0.9727	(94)
Useful gains	483.7855	537.1324	567.4675	575.3376	521.1680	392.6654	261.0181	260.1063	412.5004	477.1453	474.1959	459.2779	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1270.2290	1232.6847	1105.4507	911.1073	692.2744	435.1773	270.0751	269.9154	494.3414	762.9811	1022.8317	1247.9131	(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	585.1140	467.4111	400.2595	241.7542	127.3032	0.0000	0.0000	0.0000	0.0000	212.6619	395.0178	586.7446	(98)
Space heating												3016.2662	(98)
RHI space heating demand												3016	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	43.3600 (1b)	x	2.5000 (2b)	=	108.4000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	108.4000	(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) =	0.1845	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9345	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7242	(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	0.9234	0.9053	0.8872	0.7967	0.7786	0.6880	0.6880	0.6699	0.7242	0.7786	0.8148	0.8510	(22b)
Effective ac	0.9263	0.9098	0.8936	0.8173	0.8031	0.7367	0.7367	0.7244	0.7623	0.8031	0.8319	0.8621	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	32.0000	7.8800	24.1200	0.6000	14.4720			(29a)
External Wall - lobby	22.9800	2.1000	20.8800	0.4769	9.9587			(29a)
External Roof	15.9300		15.9300	0.1600	2.5488			(30)
Total net area of external elements Aum(A, m2)			70.9100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.6012			(33)
Party Wall 1			19.3800	0.0000	0.0000			(32)
Party Floor 1			43.3600					(32d)
Party Ceilings 1			27.4300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	10.6365	(36)
Total fabric heat loss (33) + (36) =	61.2377	(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	33.1370	32.5448	31.9643	29.2377	28.7276	26.3529	26.3529	25.9131	27.2676	28.7276	29.7596	30.8385	(38)
Heat transfer coeff	94.3747	93.7824	93.2020	90.4754	89.9653	87.5906	87.5906	87.1508	88.5053	89.9653	90.9973	92.0762	(39)
Average = Sum(39)m / 12 =												90.4730	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1765	2.1629	2.1495	2.0866	2.0748	2.0201	2.0201	2.0099	2.0412	2.0748	2.0986	2.1235	(40)
HLP (average)												2.0866	(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	1.4982 (42)
Average daily hot water use (litres/day)	69.7829 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.7612	73.9698	71.1785	68.3872	65.5959	62.8046	62.8046	65.5959	68.3872	71.1785	73.9698	76.7612	(44)
Energy conte	113.8346	99.5604	102.7375	89.5690	85.9436	74.1628	68.7227	78.8603	79.8022	93.0017	101.5187	110.2427	(45)
Energy content (annual)										Total = Sum(45)m =		1097.9562	(45)
Distribution loss (46)m = 0.15 x (45)m	17.0752	14.9341	15.4106	13.4354	12.8915	11.1244	10.3084	11.8290	11.9703	13.9503	15.2278	16.5364	(46)
Water storage loss:													
Store volume												110.0000	(47)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
143.2226 126.1044 132.1255 118.0090 115.3316 102.6028 98.1107 108.2483 108.2422 122.3897 129.9587 139.6307 (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
143.2226 126.1044 132.1255 118.0090 115.3316 102.6028 98.1107 108.2483 108.2422 122.3897 129.9587 139.6307 (64)
Total per year (kWh/year) = Sum(64)m = 1443.9762 (64)
Heat gains from water heating, kWh/month
61.3604 54.3390 57.6706 52.5337 52.0866 47.4111 46.3607 49.7315 49.2862 54.4335 56.5070 60.1661 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5632	26.2578	21.3543	16.1666	12.0847	10.2024	11.0241	14.3295	19.2330	24.4207	28.5026	30.3849	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	194.1296	196.1440	191.0677	180.2607	166.6188	153.7974	145.2318	143.2174	148.2938	159.1007	172.7426	185.5641	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	45.4876	(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)													
	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	-59.9290	(71)
Water heating gains (Table 5)													
	82.4737	80.8617	77.5143	72.9635	70.0089	65.8488	62.3128	66.8434	68.4531	73.1633	78.4819	80.8684	(72)
Total internal gains													
	381.6186	378.7156	365.3883	344.8428	324.1645	305.3007	294.0208	299.8424	311.4320	332.1369	355.1792	372.2695	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	7.8800	36.7938	0.7600	0.7000	0.7700	106.8922	(77)

Solar gains	106.8922	182.0770	249.1257	308.6788	345.7460	343.2457	330.9255	303.2717	269.7504	201.2339	128.0322	91.4775	(83)
Total gains	488.5108	560.7926	614.5140	653.5216	669.9105	648.5464	624.9463	603.1141	581.1824	533.3707	483.2115	463.7470	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.9059	32.1074	32.3074	33.2810	33.4697	34.3771	34.3771	34.5506	34.0218	33.4697	33.0901	32.7024	
alpha	3.1271	3.1405	3.1538	3.2187	3.2313	3.2918	3.2918	3.3034	3.2681	3.2313	3.2060	3.1802	
util living area													
	0.9822	0.9715	0.9528	0.9136	0.8406	0.7083	0.5616	0.5948	0.7843	0.9229	0.9712	0.9847	(86)
MIT	18.9996	19.2352	19.5965	20.0791	20.4929	20.8108	20.9357	20.9211	20.7114	20.1781	19.5307	18.9943	(87)
Th 2	19.2182	19.2270	19.2355	19.2762	19.2839	19.3200	19.3200	19.3267	19.3060	19.2839	19.2684	19.2523	(88)
util rest of house													
	0.9758	0.9615	0.9353	0.8791	0.7706	0.5761	0.3712	0.4083	0.6705	0.8846	0.9593	0.9793	(89)
MIT 2	16.7295	17.0725	17.5925	18.2889	18.8331	19.2110	19.3028	19.3026	19.1120	18.4438	17.5270	16.7415	(90)
Living area fraction									fLA = Living area / (4) =			0.6621	(91)
MIT	18.2326	18.5045	18.9194	19.4743	19.9321	20.2703	20.3840	20.3742	20.1710	19.5921	18.8537	18.2331	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2326	18.5045	18.9194	19.4743	19.9321	20.2703	20.3840	20.3742	20.1710	19.5921	18.8537	18.2331	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9711	0.9561	0.9314	0.8838	0.8004	0.6565	0.4973	0.5312	0.7348	0.8930	0.9555	0.9750	(94)
Useful gains	474.3905	536.1963	572.3442	577.5754	536.2275	425.7855	310.7856	320.3672	427.0653	476.2791	461.7115	452.1592	(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													
	1314.8820	1275.8656	1157.5160	956.7118	740.6027	496.6626	331.4409	346.3587	537.3170	808.9807	1069.5591	1292.1160	(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													
	625.3257	497.0578	435.3678	272.9782	152.0551	0.0000	0.0000	0.0000	0.0000	247.5300	437.6503	624.9279	(98)
Space heating												3292.8927	(98)
Space heating per m2											(98) / (4) =	75.9431	(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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3292.8927	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	625.3257	497.0578	435.3678	272.9782	152.0551	0.0000	0.0000	0.0000	0.0000	247.5300	437.6503	624.9279	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	625.3257	497.0578	435.3678	272.9782	152.0551	0.0000	0.0000	0.0000	0.0000	247.5300	437.6503	624.9279	(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													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(219)
Water heating fuel used												1443.9762	(219)
Annual totals kWh/year													
Space heating fuel - main system												3292.8927	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.8385	(232)
Total delivered energy for all uses												4945.7074	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3292.8927	13.1900	434.3325	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1443.9762	13.1900	190.4605	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.8385	13.1900	27.5458	(250)
Additional standing charges			0.0000	(251)
Total energy cost			652.3388	(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] =	3.1008	(257)
SAP value		56.7445	
SAP rating (Section 12)		57	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3292.8927	0.5190	1709.0113	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1443.9762	0.5190	749.4237	(264)
Space and water heating			2458.4350	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.8385	0.5190	108.3872	(268)
Total kg/year			2566.8221	(272)
CO2 emissions per m2			59.2000	(273)
EI value			61.0017	
EI rating			61	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	43.3600 (1b)	x	2.5000 (2b)	=	108.4000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	43.3600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	108.4000	(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) =	0.1845	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9345	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7242	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8329	0.7967	0.8148	0.7242	0.7242	0.6337	0.6518	0.6518	0.6880	0.7242	0.7061	0.7786	(22b)
Effective ac	0.8468	0.8173	0.8319	0.7623	0.7623	0.7008	0.7124	0.7124	0.7367	0.7623	0.7493	0.8031	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	32.0000	7.8800	24.1200	0.6000	14.4720			(29a)
External Wall - lobby	22.9800	2.1000	20.8800	0.4769	9.9587			(29a)
External Roof	15.9300		15.9300	0.1600	2.5488			(30)
Total net area of external elements Aum(A, m2)			70.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.6012			(33)
Party Wall 1			19.3800	0.0000	0.0000			(32)
Party Floor 1			43.3600					(32d)
Party Ceilings 1			27.4300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	10.6365	(36)
Total fabric heat loss (33) + (36) =	61.2377	(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	30.2932	29.2377	29.7596	27.2676	27.2676	25.0688	25.4851	25.4851	26.3529	27.2676	26.8044	28.7276	(38)
Heat transfer coeff	91.5309	90.4754	90.9973	88.5053	88.5053	86.3065	86.7228	86.7228	87.5906	88.5053	88.0421	89.9653	(39)
Average = Sum(39)m / 12 =												88.6558	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1110	2.0866	2.0986	2.0412	2.0412	1.9905	2.0001	2.0001	2.0201	2.0412	2.0305	2.0748	(40)
HLP (average)												2.0446	(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	1.4982 (42)
Average daily hot water use (litres/day)	69.7829 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.7612	73.9698	71.1785	68.3872	65.5959	62.8046	62.8046	65.5959	68.3872	71.1785	73.9698	76.7612	(44)
Energy conte	113.8346	99.5604	102.7375	89.5690	85.9436	74.1628	68.7227	78.8603	79.8022	93.0017	101.5187	110.2427	(45)
Energy content (annual)										Total = Sum(45)m =		1097.9562	(45)
Distribution loss (46)m = 0.15 x (45)m	17.0752	14.9341	15.4106	13.4354	12.8915	11.1244	10.3084	11.8290	11.9703	13.9503	15.2278	16.5364	(46)
Water storage loss:													
Store volume												110.0000	(47)

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

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
143.2226 126.1044 132.1255 118.0090 115.3316 102.6028 98.1107 108.2483 108.2422 122.3897 129.9587 139.6307 (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
143.2226 126.1044 132.1255 118.0090 115.3316 102.6028 98.1107 108.2483 108.2422 122.3897 129.9587 139.6307 (64)
Total per year (kWh/year) = Sum(64)m = 1443.9762 (64)
Heat gains from water heating, kWh/month
61.3604 54.3390 57.6706 52.5337 52.0866 47.4111 46.3607 49.7315 49.2862 54.4335 56.5070 60.1661 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	89.8936	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
29.5632 26.2578 21.3543 16.1666 12.0847 10.2024 11.0241 14.3295 19.2330 24.4207 28.5026 30.3849 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
194.1296 196.1440 191.0677 180.2607 166.6188 153.7974 145.2318 143.2174 148.2938 159.1007 172.7426 185.5641 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
45.4876 45.4876 45.4876 45.4876 45.4876 45.4876 45.4876 45.4876 45.4876 45.4876 45.4876 45.4876 (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)
-59.9290 -59.9290 -59.9290 -59.9290 -59.9290 -59.9290 -59.9290 -59.9290 -59.9290 -59.9290 -59.9290 -59.9290 (71)
Water heating gains (Table 5)
82.4737 80.8617 77.5143 72.9635 70.0089 65.8488 62.3128 66.8434 68.4531 73.1633 78.4819 80.8684 (72)
Total internal gains
381.6186 378.7156 365.3883 344.8428 324.1645 305.3007 294.0208 299.8424 311.4320 332.1369 355.1792 372.2695 (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	
Southeast	7.8800	40.5720	0.7600	0.7000	0.7700	117.8685	(77)

Solar gains	117.8685	183.8280	246.9144	315.4619	345.4967	367.7490	348.7451	323.5863	287.2753	213.1612	144.6089	99.9199	(83)
Total gains	499.4870	562.5436	612.3027	660.3047	669.6612	673.0496	642.7659	623.4287	598.7073	545.2981	499.7882	472.1894	(84)

---
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.8972	33.2810	33.0901	34.0218	34.0218	34.8886	34.7211	34.7211	34.3771	34.0218	34.2008	33.4697	
alpha	3.1931	3.2187	3.2060	3.2681	3.2681	3.3259	3.3147	3.3147	3.2918	3.2681	3.2801	3.2313	
util living area	0.9803	0.9703	0.9489	0.9024	0.8199	0.6375	0.4729	0.4854	0.7412	0.9076	0.9660	0.9830	(86)
MIT	19.1186	19.3314	19.7035	20.1808	20.5718	20.8819	20.9683	20.9657	20.7815	20.2895	19.6662	19.1088	(87)
Th 2	19.2604	19.2762	19.2684	19.3060	19.3060	19.3397	19.3333	19.3333	19.3200	19.3060	19.3131	19.2839	(88)
util rest of house	0.9733	0.9599	0.9298	0.8636	0.7411	0.4883	0.2716	0.2797	0.6112	0.8616	0.9520	0.9770	(89)
MIT 2	16.9254	17.2392	17.7640	18.4453	18.9441	19.2846	19.3284	19.3280	19.1899	18.6061	17.7464	16.9253	(90)
Living area fraction									fLA = Living area / (4) =			0.6621	(91)
MIT	18.3776	18.6245	19.0482	19.5944	20.0218	20.3422	20.4142	20.4124	20.2438	19.7207	19.0175	18.3710	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3776	18.6245	19.0482	19.5944	20.0218	20.3422	20.4142	20.4124	20.2438	19.7207	19.0175	18.3710	(93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9686	0.9548	0.9268	0.8713	0.7783	0.5834	0.4061	0.4172	0.6890	0.8750	0.9488	0.9727	(94)
Useful gains	483.7855	537.1324	567.4675	575.3376	521.1680	392.6654	261.0181	260.1063	412.5004	477.1453	474.1959	459.2779	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1270.2290	1232.6847	1105.4507	911.1073	692.2744	435.1773	270.0751	269.9154	494.3414	762.9811	1022.8317	1247.9131	(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	585.1140	467.4111	400.2595	241.7542	127.3032	0.0000	0.0000	0.0000	0.0000	212.6619	395.0178	586.7446	(98)
Space heating												3016.2662	(98)
Space heating per m2											(98) / (4) =	69.5633	(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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3016.2662	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	585.1140	467.4111	400.2595	241.7542	127.3032	0.0000	0.0000	0.0000	0.0000	212.6619	395.0178	586.7446	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	585.1140	467.4111	400.2595	241.7542	127.3032	0.0000	0.0000	0.0000	0.0000	212.6619	395.0178	586.7446	(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													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	143.2226	126.1044	132.1255	118.0090	115.3316	102.6028	98.1107	108.2483	108.2422	122.3897	129.9587	139.6307	(219)
Water heating fuel used												1443.9762	(219)
Annual totals kWh/year													
Space heating fuel - main system												3016.2662	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.8385	(232)
Total delivered energy for all uses												4669.0809	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3016.2662	18.2700	551.0718	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1443.9762	18.2700	263.8145	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.8385	18.2700	38.1548	(250)
Additional standing charges			0.0000	(251)
Total energy cost			853.0411	(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	3016.2662	0.5190	1565.4422	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1443.9762	0.5190	749.4237	(264)
Space and water heating			2314.8658	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.8385	0.5190	108.3872	(268)
Total kg/year			2423.2530	(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	3016.2662	3.0700	9259.9373	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1443.9762	3.0700	4433.0070	(264)
Space and water heating			13692.9444	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.8385	3.0700	641.1341	(268)
Primary energy kWh/year			14334.0785	(272)
Primary energy kWh/m2/year			330.5830	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 57
Current environmental impact rating:	D 61

(For testing purposes):	
A	Not considered
B	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 57
Potential environmental impact rating: D 61

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£853	£853	£0
Space heating	£551	£551	£0
Water heating	£264	£264	£0
Lighting	£38	£38	£0
Total cost of fuels	£853	£853	£0
Total cost of uses	£853	£853	£0
Delivered energy	108 kWh/m²	108 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.4 tonnes	2.4 tonnes	0.0 tonnes
CO2 emissions per m²	56 kg/m²	56 kg/m²	0 kg/m²
Primary energy	331 kWh/m²	331 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-16	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.03, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	57 D	**DER**	N/A	**TER**	N/A
Environmental	61 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.42	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	21.99 m	43.36 m²	2.50 m

7.0 Living Area	28.71	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	32.00	24.12
External Wall - lobby	Solid Wall	Other	0.60	22.98	20.88

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	19.38

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.16	15.93	15.93

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	27.43

11.1 Party Floors

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Construction	Area (m²)
Party Floor 1	Other	43.36

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	North West							2.10	
windows	Window	[1] External Wall	South East	None	0.00					7.88	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate
Night Ventilation	No
Air change rate	2.00

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	

Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 2.04, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

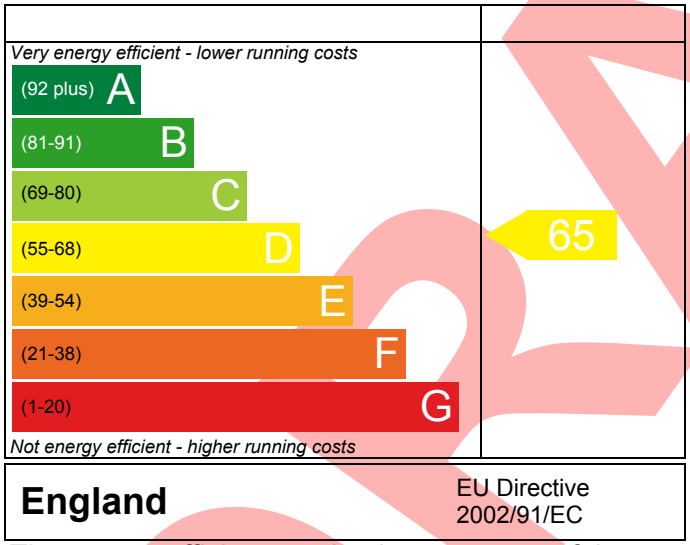
Unit 2.04, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	41.04 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

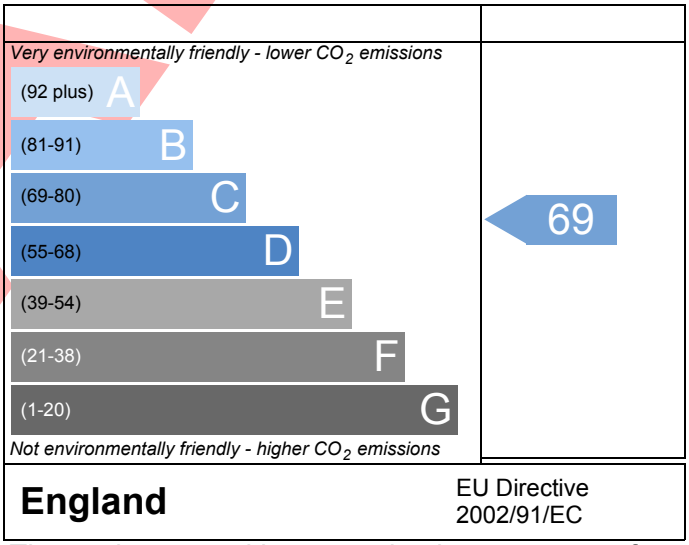
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-17	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.04, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	65 D	**DER**	N/A	**TER**	N/A
Environmental	69 C	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	1.87	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400	(1b)	x 2.5000	(2b) =	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	18.4200	5.9100	12.5100	0.6000	7.5060			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
External Roof	12.4500		12.4500	0.1600	1.9920			(30)
Total net area of external elements Aum(A, m2)			36.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.6760			(33)
Party Wall 1			41.9300	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			28.5900					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	5.4225	(36)
Total fabric heat loss (33) + (36) =	35.0985	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff													

CALCULATION OF HEAT DEMAND 09 Jan 2014

	69.5979	68.1088	68.8481	65.3178	65.3178	62.2029	62.7927	62.7927	64.0220	65.3178	64.6616	67.3861 (39)
Average = Sum(39)m / 12 =												65.5305 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6959	1.6596	1.6776	1.5916	1.5916	1.5157	1.5300	1.5300	1.5600	1.5916	1.5756	1.6420	(40)
HLP (average)												1.5967	(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												1.4342	(42)
Average daily hot water use (litres/day)												68.2633	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m													
	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
								Total per year (kWh/year) = Sum(64)m =				1420.0675	(64)
RHI water heating demand												1420	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.9100	40.5720	0.7600	0.7000	0.7700	88.4014	(77)

Solar gains	88.4014	137.8710	185.1858	236.5964	259.1225	275.8117	261.5588	242.6897	215.4565	159.8709	108.4567	74.9399	(83)
Total gains	458.3080	504.8246	539.1251	570.5903	573.1301	571.6321	546.5639	533.5029	517.5841	482.0999	452.9846	435.9200	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, n1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.9495	41.8448	41.3955	43.6328	43.6328	45.8178	45.3875	45.3875	44.5159	43.6328	44.0756	42.2936	
alpha	3.7300	3.7897	3.7597	3.9089	3.9089	4.0545	4.0258	4.0258	3.9677	3.9089	3.9384	3.8196	
util living area													
	0.9802	0.9702	0.9481	0.8938	0.7974	0.5830	0.4172	0.4267	0.6966	0.8942	0.9630	0.9828	(86)
MIT	19.5448	19.7436	20.0405	20.4616	20.7506	20.9543	20.9907	20.9900	20.8952	20.5435	20.0588	19.5646	(87)
Th 2	19.5438	19.5699	19.5569	19.6195	19.6195	19.6758	19.6650	19.6650	19.6428	19.6195	19.6313	19.5827	(88)
util rest of house													
	0.9737	0.9605	0.9302	0.8568	0.7248	0.4635	0.2707	0.2772	0.5839	0.8491	0.9492	0.9771	(89)
MIT 2	17.7123	18.0136	18.4258	19.0450	19.4047	19.6531	19.6633	19.6631	19.5784	19.1631	18.5086	17.7665	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	18.7870	19.0283	19.3728	19.8758	20.1941	20.4162	20.4418	20.4413	20.3507	19.9727	19.4178	18.8211 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7870	19.0283	19.3728	19.8758	20.1941	20.4162	20.4418	20.4413	20.3507	19.9727	19.4178	18.8211 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9692	0.9559	0.9274	0.8646	0.7576	0.5325	0.3571	0.3655	0.6462	0.8624	0.9465	0.9731	(94)
Useful gains	444.2019	482.5552	499.9940	493.3357	434.2254	304.4013	195.1869	194.9714	334.4530	415.7510	428.7457	424.1802	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	994.3484	955.4483	858.7281	690.7913	522.1552	318.2447	197.2839	197.2509	368.1734	579.5456	777.0908	965.0436	(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	409.3090	317.7842	266.8982	142.1680	65.4198	0.0000	0.0000	0.0000	0.0000	121.8632	250.8084	402.4024	(98)
Space heating												1976.6533	(98)
RHI space heating demand												1977	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(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	1.1297	1.1075	1.0854	0.9746	0.9525	0.8417	0.8417	0.8196	0.8860	0.9525	0.9968	1.0411	(22b)
Effective ac	1.1297	1.1075	1.0854	0.9750	0.9536	0.8543	0.8543	0.8359	0.8925	0.9536	0.9968	1.0411	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	18.4200	5.9100	12.5100	0.6000	7.5060			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
External Roof	12.4500		12.4500	0.1600	1.9920			(30)
Total net area of external elements Aum(A, m2)			36.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.6760			(33)
Party Wall 1			41.9300	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			28.5900					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	5.4225	(36)
Total fabric heat loss (33) + (36) =	35.0985	(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	38.2493	37.4993	36.7494	33.0103	32.2876	28.9235	28.9235	28.3005	30.2193	32.2876	33.7496	35.2494	(38)
Heat transfer coeff	73.3478	72.5978	71.8478	68.1088	67.3861	64.0220	64.0220	63.3990	65.3178	67.3861	68.8481	70.3479	(39)
Average = Sum(39)m / 12 =												68.0526	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7872	1.7690	1.7507	1.6596	1.6420	1.5600	1.5600	1.5448	1.5916	1.6420	1.6776	1.7141	(40)
HLP (average)												1.6582	(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	1.4342 (42)
Average daily hot water use (litres/day)	68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte 111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)	
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (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
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (64)
Total per year (kWh/year) = Sum(64)m = 1420.0675 (64)
Heat gains from water heating, kWh/month
60.5362 53.6182 56.9267 51.8852 51.4644 46.8742 45.8631 49.1605 48.7084 53.7601 55.7719 59.3679 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.9100	36.7938	0.7600	0.7000	0.7700	80.1692	(77)

Solar gains	80.1692	136.5578	186.8443	231.5091	259.3095	257.4343	248.1941	227.4538	202.3128	150.9254	96.0242	68.6081	(83)
Total gains	450.0758	503.5114	540.7836	565.5030	573.3171	553.2547	533.1993	518.2670	504.4405	473.1544	440.5521	429.5882	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.8560	39.2574	39.6672	41.8448	42.2936	44.5159	44.5159	44.9534	43.6328	42.2936	41.3955	40.5130	
alpha	3.5904	3.6172	3.6445	3.7897	3.8196	3.9677	3.9677	3.9969	3.9089	3.8196	3.7597	3.7009	
util living area													
	0.9824	0.9724	0.9537	0.9098	0.8262	0.6653	0.5076	0.5365	0.7492	0.9147	0.9701	0.9848	(86)
MIT	19.3951	19.6031	19.9149	20.3517	20.6787	20.9113	20.9765	20.9710	20.8459	20.4371	19.8942	19.4254	(87)
Th 2	19.4790	19.4918	19.5047	19.5699	19.5827	19.6428	19.6428	19.6541	19.6195	19.5827	19.5569	19.5307	(88)
util rest of house													
	0.9766	0.9632	0.9377	0.8774	0.7612	0.5528	0.3611	0.3920	0.6468	0.8774	0.9585	0.9798	(89)
MIT 2	17.4554	17.7618	18.2138	18.8628	19.2912	19.5897	19.6357	19.6442	19.5133	18.9977	18.2257	17.5321	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.5930	18.8418	19.2115	19.7360	20.1050	20.3648	20.4221	20.4224	20.2948	19.8419	19.2043	18.6425	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5930	18.8418	19.2115	19.7360	20.1050	20.3648	20.4221	20.4224	20.2948	19.8419	19.2043	18.6425	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9720	0.9581	0.9338	0.8817	0.7877	0.6157	0.4474	0.4769	0.7007	0.8854	0.9549	0.9757	(94)
Useful gains	437.4794	482.4264	504.9761	498.6294	451.5791	340.6122	238.5461	247.1779	353.4840	418.9314	420.6934	419.1533	(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													
	1048.3619	1012.1410	913.2958	738.0290	566.3783	369.0743	244.6967	255.0144	404.6326	622.7769	833.3574	1016.0005	(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													
	454.4966	355.9682	303.7898	172.3678	85.4107	0.0000	0.0000	0.0000	0.0000	151.6611	297.1181	444.0543	(98)
Space heating												2264.8665	(98)
Space heating per m2											(98) / (4) =	55.1868	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2264.8665	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	454.4966	355.9682	303.7898	172.3678	85.4107	0.0000	0.0000	0.0000	0.0000	151.6611	297.1181	444.0543	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	454.4966	355.9682	303.7898	172.3678	85.4107	0.0000	0.0000	0.0000	0.0000	151.6611	297.1181	444.0543	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												2264.8665	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.4358	(232)
Total delivered energy for all uses												3893.3698	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2264.8665	13.1900	298.7359	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	13.1900	187.3069	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.4358	13.1900	27.4927	(250)
Additional standing charges			0.0000	(251)
Total energy cost			513.5355	(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] =	2.5068	(257)
SAP value		65.0302	
SAP rating (Section 12)		65	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2264.8665	0.5190	1175.4657	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			1912.4807	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	0.5190	108.1782	(268)
Total kg/year			2020.6589	(272)
CO2 emissions per m2			49.2400	(273)
EI value			68.5300	
EI rating			69	(274)
EI band			C	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	18.4200	5.9100	12.5100	0.6000	7.5060			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
External Roof	12.4500		12.4500	0.1600	1.9920			(30)
Total net area of external elements Aum(A, m2)			36.1500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.6760			(33)
Party Wall 1			41.9300	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			28.5900					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	5.4225	(36)
Total fabric heat loss (33) + (36) =	35.0985	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff	69.5979	68.1088	68.8481	65.3178	65.3178	62.2029	62.7927	62.7927	64.0220	65.3178	64.6616	67.3861	(39)
Average = Sum(39)m / 12 =												65.5305	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6959	1.6596	1.6776	1.5916	1.5916	1.5157	1.5300	1.5300	1.5600	1.5916	1.5756	1.6420	(40)
HLP (average)												1.5967	(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	1.4342 (42)
Average daily hot water use (litres/day)	68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)

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

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (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
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (64)
Total per year (kWh/year) = Sum(64)m = 1420.0675 (64)
Heat gains from water heating, kWh/month
60.5362 53.6182 56.9267 51.8852 51.4644 46.8742 45.8631 49.1605 48.7084 53.7601 55.7719 59.3679 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.9100	40.5720	0.7600	0.7000	0.7700	88.4014	(77)

Solar gains	88.4014	137.8710	185.1858	236.5964	259.1225	275.8117	261.5588	242.6897	215.4565	159.8709	108.4567	74.9399	(83)
Total gains	458.3080	504.8246	539.1251	570.5903	573.1301	571.6321	546.5639	533.5029	517.5841	482.0999	452.9846	435.9200	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.9495	41.8448	41.3955	43.6328	43.6328	45.8178	45.3875	45.3875	44.5159	43.6328	44.0756	42.2936	
alpha	3.7300	3.7897	3.7597	3.9089	3.9089	4.0545	4.0258	4.0258	3.9677	3.9089	3.9384	3.8196	
util living area													
	0.9802	0.9702	0.9481	0.8938	0.7974	0.5830	0.4172	0.4267	0.6966	0.8942	0.9630	0.9828	(86)
MIT	19.5448	19.7436	20.0405	20.4616	20.7506	20.9543	20.9907	20.9900	20.8952	20.5435	20.0588	19.5646	(87)
Th 2	19.5438	19.5699	19.5569	19.6195	19.6195	19.6758	19.6650	19.6650	19.6428	19.6195	19.6313	19.5827	(88)
util rest of house													
	0.9737	0.9605	0.9302	0.8568	0.7248	0.4635	0.2707	0.2772	0.5839	0.8491	0.9492	0.9771	(89)
MIT 2	17.7123	18.0136	18.4258	19.0450	19.4047	19.6531	19.6633	19.6631	19.5784	19.1631	18.5086	17.7665	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.7870	19.0283	19.3728	19.8758	20.1941	20.4162	20.4418	20.4413	20.3507	19.9727	19.4178	18.8211	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7870	19.0283	19.3728	19.8758	20.1941	20.4162	20.4418	20.4413	20.3507	19.9727	19.4178	18.8211	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9692	0.9559	0.9274	0.8646	0.7576	0.5325	0.3571	0.3655	0.6462	0.8624	0.9465	0.9731	(94)
Useful gains	444.2019	482.5552	499.9940	493.3357	434.2254	304.4013	195.1869	194.9714	334.4530	415.7510	428.7457	424.1802	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	994.3484	955.4483	858.7281	690.7913	522.1552	318.2447	197.2839	197.2509	368.1734	579.5456	777.0908	965.0436	(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													
	409.3090	317.7842	266.8982	142.1680	65.4198	0.0000	0.0000	0.0000	0.0000	121.8632	250.8084	402.4024	(98)
Space heating												1976.6533	(98)
Space heating per m2											(98) / (4) =	48.1641	(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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1976.6533	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	409.3090	317.7842	266.8982	142.1680	65.4198	0.0000	0.0000	0.0000	0.0000	121.8632	250.8084	402.4024	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	409.3090	317.7842	266.8982	142.1680	65.4198	0.0000	0.0000	0.0000	0.0000	121.8632	250.8084	402.4024	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												1976.6533	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.4358	(232)
Total delivered energy for all uses												3605.1566	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1976.6533	18.2700	361.1346	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	18.2700	259.4463	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.4358	18.2700	38.0812	(250)
Additional standing charges			0.0000	(251)
Total energy cost			658.6621	(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	1976.6533	0.5190	1025.8830	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			1762.8981	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	0.5190	108.1782	(268)
Total kg/year			1871.0763	(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	1976.6533	3.0700	6068.3255	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	3.0700	4359.6072	(264)
Space and water heating			10427.9328	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	3.0700	639.8980	(268)
Primary energy kWh/year			11067.8307	(272)
Primary energy kWh/m2/year			269.6840	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 65
Current environmental impact rating:	C 69

(For testing purposes):

A	Not considered
B	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 65
Potential environmental impact rating: C 69

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£659	£659	£0
Space heating	£361	£361	£0
Water heating	£259	£259	£0
Lighting	£38	£38	£0
Total cost of fuels	£659	£659	£0
Total cost of uses	£658	£658	£0
Delivered energy	88 kWh/m²	88 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.9 tonnes	1.9 tonnes	0.0 tonnes
CO2 emissions per m²	46 kg/m²	46 kg/m²	0 kg/m²
Primary energy	270 kWh/m²	270 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-17	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.04, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	65 D	**DER**	N/A	**TER**	N/A
Environmental	69 C	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	1.87	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	9.48 m	41.04 m²	2.50 m

7.0 Living Area	24.07	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	18.42	12.51
External Wall - lobby	Solid Wall	Other	0.60	5.28	3.18

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	41.93

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.16	12.45	12.45

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	28.59

11.1 Party Floors

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Construction	Area (m²)
Party Floor 1	Other	41.04

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	North West							2.10	
windows	Window	[1] External Wall	South East	None	0.00					5.91	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate
Night Ventilation	No
Air change rate	2.00

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	

Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 2.05, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

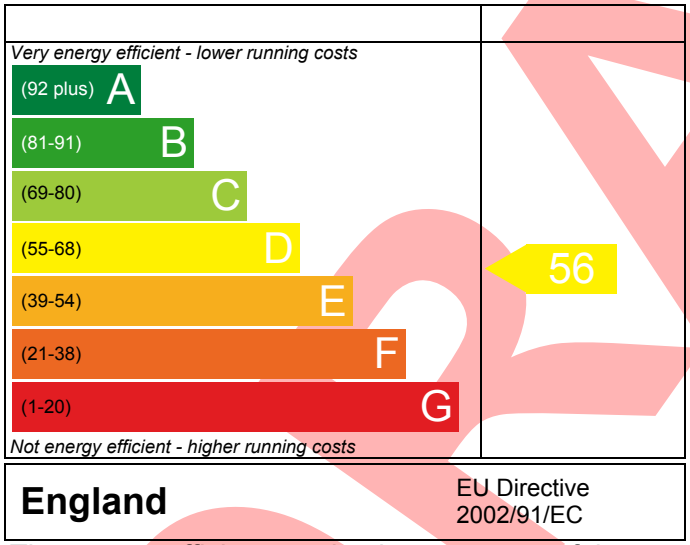
Unit 2.05, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	41.04 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

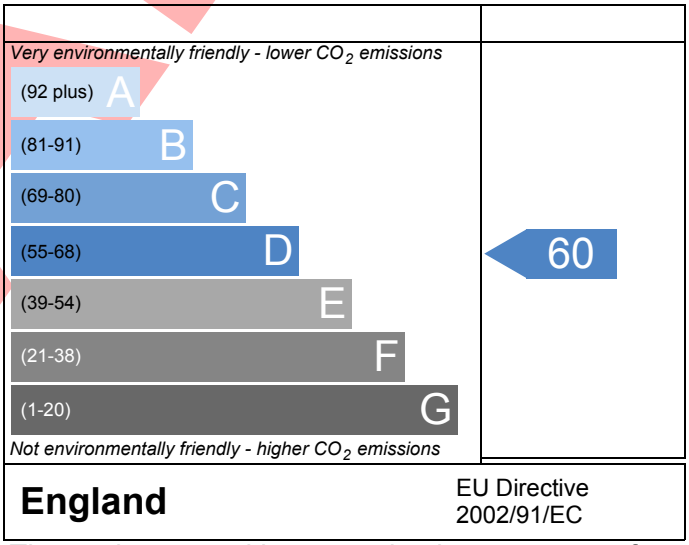
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-18	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.05, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	56 D	**DER**	N/A	**TER**	N/A
Environmental	60 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.38	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400	(1b)	x 2.5000	(2b) =	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	33.6700	5.9100	27.7600	0.6000	16.6560			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
External Roof	19.5000		19.5000	0.1600	3.1200			(30)
Total net area of external elements Aum(A, m2)			58.4500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.9540			(33)
Party Wall 1			26.6800	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			21.5400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.7675	(36)
Total fabric heat loss (33) + (36) =	48.7215	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff													

CALCULATION OF HEAT DEMAND 09 Jan 2014

	83.2209	81.7318	82.4711	78.9408	78.9408	75.8259	76.4157	76.4157	77.6450	78.9408	78.2846	81.0091	(39)
Average = Sum(39)m / 12 =												79.1535	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0278	1.9915	2.0095	1.9235	1.9235	1.8476	1.8620	1.8620	1.8919	1.9235	1.9075	1.9739	(40)
HLP (average)												1.9287	(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												1.4342	(42)
Average daily hot water use (litres/day)												68.2633	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m													
	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
								Total per year (kWh/year) = Sum(64)m =				1420.0675	(64)
RHI water heating demand												1420	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(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	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(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	
Northwest	5.9100	12.9280	0.7600	0.7000	0.7700	28.1686	(81)
Solar gains	28.1686	52.7758	93.5260	157.4534	205.1835	233.4567	215.2581	175.0858	122.2762	67.7746	36.3692	22.7430	(83)
Total gains	398.0752	419.7295	447.4652	491.4473	519.1911	529.2771	500.2632	465.8990	424.4039	390.0036	380.8971	383.7230	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.2462	34.8701	34.5576	36.1030	36.1030	37.5861	37.2960	37.2960	36.7055	36.1030	36.4056	35.1812	
alpha	3.2831	3.3247	3.3038	3.4069	3.4069	3.5057	3.4864	3.4864	3.4470	3.4069	3.4270	3.3454	
util living area													
	0.9878	0.9844	0.9733	0.9419	0.8704	0.6936	0.5287	0.5601	0.8320	0.9508	0.9808	0.9890	(86)
MIT	19.0666	19.2250	19.5609	20.0759	20.5130	20.8679	20.9631	20.9558	20.7100	20.1762	19.6103	19.0955	(87)
Th 2	19.3149	19.3390	19.3270	19.3848	19.3848	19.4369	19.4269	19.4269	19.4063	19.3848	19.3957	19.3508	(88)
util rest of house													
	0.9833	0.9786	0.9625	0.9160	0.8060	0.5501	0.3205	0.3430	0.7229	0.9227	0.9725	0.9850	(89)
MIT 2	16.8833	17.1268	17.6050	18.3685	18.9479	19.3698	19.4204	19.4189	19.2104	18.5207	17.7208	16.9462	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	18.1638	18.3574	18.7522	19.3699	19.8659	20.2484	20.3252	20.3203	20.0899	19.4916	18.8290	18.2067 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1638	18.3574	18.7522	19.3699	19.8659	20.2484	20.3252	20.3203	20.0899	19.4916	18.8290	18.2067 (93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9791	0.9739	0.9575	0.9157	0.8283	0.6305	0.4447	0.4728	0.7768	0.9251	0.9685	0.9811	(94)
Useful gains	389.7356	408.7894	428.4493	450.0153	430.0523	333.7088	222.4709	220.2876	329.6868	360.7906	368.9037	376.4713	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1137.1137	1091.7225	977.4606	794.9240	605.1489	375.2178	231.1725	230.7983	426.2645	662.4429	894.7154	1110.3716	(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	556.0493	458.9310	408.4644	248.3343	130.2719	0.0000	0.0000	0.0000	0.0000	224.4293	378.5844	546.0219	(98)
Space heating												2951.0864	(98)
RHI space heating demand												2951	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(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	1.1297	1.1075	1.0854	0.9746	0.9525	0.8417	0.8417	0.8196	0.8860	0.9525	0.9968	1.0411	(22b)
Effective ac	1.1297	1.1075	1.0854	0.9750	0.9536	0.8543	0.8543	0.8359	0.8925	0.9536	0.9968	1.0411	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	33.6700	5.9100	27.7600	0.6000	16.6560			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
External Roof	19.5000		19.5000	0.1600	3.1200			(30)
Total net area of external elements Aum(A, m2)			58.4500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9540			(33)
Party Wall 1			26.6800	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			21.5400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.7675	(36)
Total fabric heat loss (33) + (36) =	48.7215	(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	38.2493	37.4993	36.7494	33.0103	32.2876	28.9235	28.9235	28.3005	30.2193	32.2876	33.7496	35.2494	(38)
Heat transfer coeff	86.9708	86.2208	85.4708	81.7318	81.0091	77.6450	77.6450	77.0220	78.9408	81.0091	82.4711	83.9709	(39)
Average = Sum(39)m / 12 =												81.6756	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1192	2.1009	2.0826	1.9915	1.9739	1.8919	1.8919	1.8768	1.9235	1.9739	2.0095	2.0461	(40)
HLP (average)												1.9901	(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	1.4342 (42)
Average daily hot water use (litres/day)	68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (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
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (64)
Total per year (kWh/year) = Sum(64)m = 1420.0675 (64)
Heat gains from water heating, kWh/month
60.5362 53.6182 56.9267 51.8852 51.4644 46.8742 45.8631 49.1605 48.7084 53.7601 55.7719 59.3679 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.9100	11.2829	0.7600	0.7000	0.7700	24.5841	(81)

Solar gains	24.5841	50.0417	90.1592	148.0673	199.0315	212.1887	198.4982	158.2450	109.8604	61.1549	30.9332	20.0766	(83)
Total gains	394.4908	416.9953	444.0985	482.0612	513.0391	508.0091	483.5033	449.0582	411.9881	383.3839	375.4611	381.0567	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.7696	33.0547	33.3447	34.8701	35.1812	36.7055	36.7055	37.0024	36.1030	35.1812	34.5576	33.9403	
alpha	3.1846	3.2036	3.2230	3.3247	3.3454	3.4470	3.4470	3.4668	3.4069	3.3454	3.3038	3.2627	
util living area													
	0.9885	0.9851	0.9762	0.9508	0.8913	0.7665	0.6270	0.6769	0.8671	0.9596	0.9830	0.9898	(86)
MIT	18.9334	19.0935	19.4238	19.9471	20.4108	20.7832	20.9224	20.8983	20.6240	20.0556	19.4621	18.9667	(87)
Th 2	19.2551	19.2669	19.2788	19.3390	19.3508	19.4063	19.4063	19.4168	19.3848	19.3508	19.3270	19.3028	(88)
util rest of house													
	0.9843	0.9795	0.9666	0.9288	0.8366	0.6444	0.4343	0.4906	0.7779	0.9369	0.9757	0.9861	(89)
MIT 2	16.6559	16.8949	17.3795	18.1606	18.7954	19.2710	19.3830	19.3811	19.1007	18.3316	17.4663	16.7313	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	17.9917	18.1844	18.5785	19.2084	19.7428	20.1579	20.2859	20.2709	19.9941	19.3427	18.6368	18.0423	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9917	18.1844	18.5785	19.2084	19.7428	20.1579	20.2859	20.2709	19.9941	19.3427	18.6368	18.0423	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9747	0.9613	0.9266	0.8521	0.7082	0.5480	0.5997	0.8176	0.9367	0.9714	0.9822	(94)
Useful gains	386.5914	406.4279	426.9202	446.6707	437.1478	359.7898	264.9705	269.2942	336.8548	359.1347	364.7350	374.2655	(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													
	1190.7780	1145.3924	1032.3554	842.5239	651.5442	431.5447	286.1894	298.1459	465.2858	708.2420	951.4554	1162.3538	(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													
	598.3148	496.5841	450.4438	285.0143	159.5109	0.0000	0.0000	0.0000	0.0000	259.7359	422.4387	586.3377	(98)
Space heating												3258.3802	(98)
Space heating per m2											(98) / (4) =	79.3952	(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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3258.3802	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	598.3148	496.5841	450.4438	285.0143	159.5109	0.0000	0.0000	0.0000	0.0000	259.7359	422.4387	586.3377	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	598.3148	496.5841	450.4438	285.0143	159.5109	0.0000	0.0000	0.0000	0.0000	259.7359	422.4387	586.3377	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												3258.3802	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.4358	(232)
Total delivered energy for all uses												4886.8835	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3258.3802	13.1900	429.7804	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	13.1900	187.3069	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.4358	13.1900	27.4927	(250)
Additional standing charges			0.0000	(251)
Total energy cost			644.5799	(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] =	3.1465	(257)
SAP value		56.1065	
SAP rating (Section 12)		56	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3258.3802	0.5190	1691.0993	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			2428.1144	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	0.5190	108.1782	(268)
Total kg/year			2536.2926	(272)
CO2 emissions per m2			61.8000	(273)
EI value			60.3976	
EI rating			60	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	33.6700	5.9100	27.7600	0.6000	16.6560			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
External Roof	19.5000		19.5000	0.1600	3.1200			(30)
Total net area of external elements Aum(A, m2)			58.4500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9540			(33)
Party Wall 1			26.6800	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			21.5400					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	8.7675	(36)
Total fabric heat loss (33) + (36) =	48.7215	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff	83.2209	81.7318	82.4711	78.9408	78.9408	75.8259	76.4157	76.4157	77.6450	78.9408	78.2846	81.0091	(39)
Average = Sum(39)m / 12 =												79.1535	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0278	1.9915	2.0095	1.9235	1.9235	1.8476	1.8620	1.8620	1.8919	1.9235	1.9075	1.9739	(40)
HLP (average)												1.9287	(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	1.4342 (42)
Average daily hot water use (litres/day)	68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)

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

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (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
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (64)
Total per year (kWh/year) = Sum(64)m = 1420.0675 (64)
Heat gains from water heating, kWh/month
60.5362 53.6182 56.9267 51.8852 51.4644 46.8742 45.8631 49.1605 48.7084 53.7601 55.7719 59.3679 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(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	
Northwest	5.9100	12.9280	0.7600	0.7000	0.7700	28.1686	(81)

Solar gains	28.1686	52.7758	93.5260	157.4534	205.1835	233.4567	215.2581	175.0858	122.2762	67.7746	36.3692	22.7430	(83)
Total gains	398.0752	419.7295	447.4652	491.4473	519.1911	529.2771	500.2632	465.8990	424.4039	390.0036	380.8971	383.7230	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.2462	34.8701	34.5576	36.1030	36.1030	37.5861	37.2960	37.2960	36.7055	36.1030	36.4056	35.1812	
alpha	3.2831	3.3247	3.3038	3.4069	3.4069	3.5057	3.4864	3.4864	3.4470	3.4069	3.4270	3.3454	
util living area													
	0.9878	0.9844	0.9733	0.9419	0.8704	0.6936	0.5287	0.5601	0.8320	0.9508	0.9808	0.9890	(86)
MIT	19.0666	19.2250	19.5609	20.0759	20.5130	20.8679	20.9631	20.9558	20.7100	20.1762	19.6103	19.0955	(87)
Th 2	19.3149	19.3390	19.3270	19.3848	19.3848	19.4369	19.4269	19.4269	19.4063	19.3848	19.3957	19.3508	(88)
util rest of house													
	0.9833	0.9786	0.9625	0.9160	0.8060	0.5501	0.3205	0.3430	0.7229	0.9227	0.9725	0.9850	(89)
MIT 2	16.8833	17.1268	17.6050	18.3685	18.9479	19.3698	19.4204	19.4189	19.2104	18.5207	17.7208	16.9462	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.1638	18.3574	18.7522	19.3699	19.8659	20.2484	20.3252	20.3203	20.0899	19.4916	18.8290	18.2067	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1638	18.3574	18.7522	19.3699	19.8659	20.2484	20.3252	20.3203	20.0899	19.4916	18.8290	18.2067	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9791	0.9739	0.9575	0.9157	0.8283	0.6305	0.4447	0.4728	0.7768	0.9251	0.9685	0.9811	(94)
Useful gains	389.7356	408.7894	428.4493	450.0153	430.0523	333.7088	222.4709	220.2876	329.6868	360.7906	368.9037	376.4713	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1137.1137	1091.7225	977.4606	794.9240	605.1489	375.2178	231.1725	230.7983	426.2645	662.4429	894.7154	1110.3716	(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													
	556.0493	458.9310	408.4644	248.3343	130.2719	0.0000	0.0000	0.0000	0.0000	224.4293	378.5844	546.0219	(98)
Space heating												2951.0864	(98)
Space heating per m2											(98) / (4) =	71.9076	(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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2951.0864	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	556.0493	458.9310	408.4644	248.3343	130.2719	0.0000	0.0000	0.0000	0.0000	224.4293	378.5844	546.0219	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	556.0493	458.9310	408.4644	248.3343	130.2719	0.0000	0.0000	0.0000	0.0000	224.4293	378.5844	546.0219	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												2951.0864	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.4358	(232)
Total delivered energy for all uses												4579.5897	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2951.0864	18.2700	539.1635	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	18.2700	259.4463	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.4358	18.2700	38.0812	(250)
Additional standing charges			0.0000	(251)
Total energy cost			836.6910	(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	2951.0864	0.5190	1531.6138	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			2268.6289	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	0.5190	108.1782	(268)
Total kg/year			2376.8071	(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	2951.0864	3.0700	9059.8353	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	3.0700	4359.6072	(264)
Space and water heating			13419.4425	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	3.0700	639.8980	(268)
Primary energy kWh/year			14059.3405	(272)
Primary energy kWh/m2/year			342.5765	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 56
Current environmental impact rating:	D 60

(For testing purposes):

A	Not considered
B	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 56
Potential environmental impact rating: D 60

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£837	£837	£0
Space heating	£539	£539	£0
Water heating	£259	£259	£0
Lighting	£38	£38	£0
Total cost of fuels	£837	£837	£0
Total cost of uses	£836	£836	£0
Delivered energy	112 kWh/m²	112 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.4 tonnes	2.4 tonnes	0.0 tonnes
CO2 emissions per m²	58 kg/m²	58 kg/m²	0 kg/m²
Primary energy	343 kWh/m²	343 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
```

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-18	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.05, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	56 D	**DER**	N/A	**TER**	N/A
Environmental	60 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.38	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	15.58 m	41.04 m²	2.50 m

7.0 Living Area	24.07	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	33.67	27.76
External Wall - lobby	Solid Wall	Other	0.60	5.28	3.18

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	26.68

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.16	19.50	19.50

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	21.54

11.1 Party Floors

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Construction	Area (m²)
Party Floor 1	Other	41.04

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	South East							2.10	
windows	Window	[1] External Wall	North West	None	0.00					5.91	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate
Night Ventilation	No
Air change rate	2.00

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	

Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 2.06, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

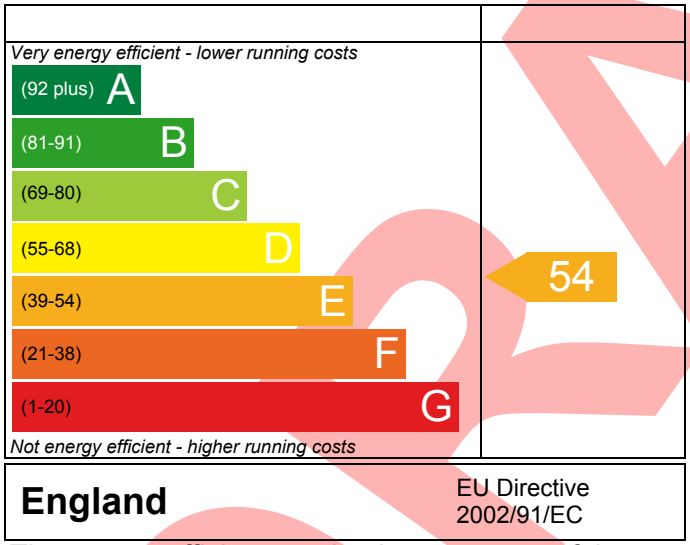
Unit 2.06, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	42.63 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

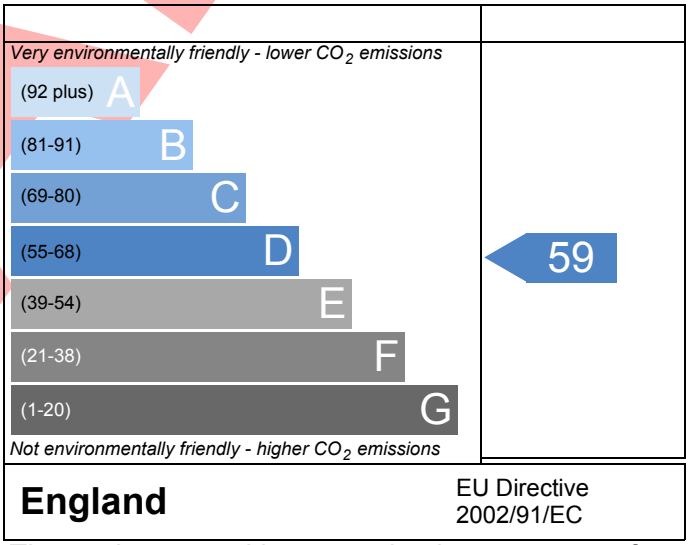
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-19	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.06, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	54 E	**DER**	N/A	**TER**	N/A
Environmental	59 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.55	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.6300	(1b)	x 2.5000	(2b) =	106.5750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		106.5750	(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) =	0.1877 (8)
Pressure test		No
Measured/design AP50		15.0000
Infiltration rate		0.9377 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7267 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8357	0.7994	0.8175	0.7267	0.7267	0.6359	0.6540	0.6540	0.6904	0.7267	0.7085	0.7812	(22b)
Effective ac	0.8492	0.8195	0.8342	0.7640	0.7640	0.7022	0.7139	0.7139	0.7383	0.7640	0.7510	0.8051	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	23.9800	7.8800	16.1000	0.6000	9.6600			(29a)
External Wall - lobby	30.5000	2.1000	28.4000	0.4769	13.5453			(29a)
External Roof	15.5000		15.5000	0.1600	2.4800			(30)
Total net area of external elements Aum(A, m2)			69.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.3070			(33)
Party Wall 1			19.8000	0.0000	0.0000			(32)
Party Floor 1			42.6300					(32d)
Party Ceilings 1			27.1300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	10.4970	(36)
Total fabric heat loss (33) + (36) =	59.8040	(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	29.8658	28.8211	29.3376	26.8710	26.8710	24.6946	25.1066	25.1066	25.9656	26.8710	26.4125	28.3162	(38)
Heat transfer coeff													

CALCULATION OF HEAT DEMAND 09 Jan 2014

	89.6698	88.6251	89.1417	86.6750	86.6750	84.4986	84.9107	84.9107	85.7696	86.6750	86.2165	88.1202	(39)
Average = Sum(39)m / 12 =												86.8240	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1034	2.0789	2.0911	2.0332	2.0332	1.9821	1.9918	1.9918	2.0120	2.0332	2.0224	2.0671	(40)
HLP (average)												2.0367	(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												1.4779	(42)
Average daily hot water use (litres/day)												69.2992	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	76.2291	73.4571	70.6852	67.9132	65.1412	62.3693	62.3693	65.1412	67.9132	70.6852	73.4571	76.2291	(44)
Energy conte	113.0455	98.8703	102.0253	88.9482	85.3479	73.6487	68.2464	78.3137	79.2490	92.3571	100.8150	109.4786	(45)
Energy content (annual)										Total = Sum(45)m =		1090.3458	(45)
Distribution loss (46)m = 0.15 x (45)m													
	16.9568	14.8306	15.3038	13.3422	12.8022	11.0473	10.2370	11.7471	11.8874	13.8536	15.1223	16.4218	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
								Total per year (kWh/year) = Sum(64)m =				1436.3658	(64)
RHI water heating demand												1436	(64)
Heat gains from water heating, kWh/month													
	61.0980	54.1096	57.4338	52.3273	51.8886	47.2402	46.2023	49.5497	49.1023	54.2191	56.2730	59.9120	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.0640	25.8144	20.9937	15.8935	11.8806	10.0301	10.8379	14.0875	18.9082	24.0083	28.0213	29.8718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	191.3434	193.3290	188.3255	177.6736	164.2275	151.5901	143.1475	141.1619	146.1655	156.8173	170.2634	182.9009	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	(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)													
	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	(71)
Water heating gains (Table 5)													
	82.1210	80.5202	77.1960	72.6768	69.7427	65.6114	62.0999	66.5991	68.1976	72.8752	78.1569	80.5269	(72)
Total internal gains													
	377.4307	374.5658	361.4173	341.1461	320.7530	302.1338	290.9875	296.7507	308.1735	328.6031	351.3438	368.2017	(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	
Northwest	7.8800	12.9280	0.7600	0.7000	0.7700	37.5581	(81)

Solar gains	37.5581	70.3678	124.7013	209.9379	273.5781	311.2756	287.0108	233.4478	163.0350	90.3661	48.4922	30.3240	(83)
Total gains	414.9888	444.9335	486.1186	551.0840	594.3311	613.4094	577.9983	530.1985	471.2085	418.9692	399.8361	398.5257	(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, n1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.0146	33.4038	33.2102	34.1554	34.1554	35.0351	34.8651	34.8651	34.5159	34.1554	34.3370	33.5952	
alpha	3.2010	3.2269	3.2140	3.2770	3.2770	3.3357	3.3243	3.3243	3.3011	3.2770	3.2891	3.2397	
util living area													
	0.9876	0.9836	0.9705	0.9332	0.8514	0.6693	0.5083	0.5452	0.8223	0.9488	0.9807	0.9890	(86)
MIT	18.9921	19.1527	19.5234	20.0514	20.5128	20.8640	20.9611	20.9521	20.6926	20.1259	19.5164	18.9993	(87)
Th 2	19.2653	19.2812	19.2733	19.3113	19.3113	19.3453	19.3388	19.3388	19.3254	19.3113	19.3184	19.2890	(88)
util rest of house													
	0.9831	0.9775	0.9585	0.9038	0.7799	0.5191	0.2957	0.3211	0.7067	0.9192	0.9721	0.9850	(89)
MIT 2	16.7469	16.9886	17.5186	18.2838	18.8865	19.2798	19.3326	19.3308	19.1238	18.4035	17.5396	16.7711	(90)
Living area fraction									fLA = Living area / (4) =			0.6587	(91)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	18.2258	18.4141	18.8392	19.4481	19.9577	20.3233	20.4053	20.3987	20.1572	19.5380	18.8417	18.2388 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2258	18.4141	18.8392	19.4481	19.9577	20.3233	20.4053	20.3987	20.1572	19.5380	18.8417	18.2388 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9794	0.9733	0.9546	0.9067	0.8111	0.6137	0.4373	0.4707	0.7719	0.9242	0.9689	0.9815	(94)
Useful gains	406.4255	433.0694	464.0258	499.6551	482.0496	376.4490	252.7527	249.5549	363.7135	387.2062	387.3826	391.1531	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1230.7903	1188.8252	1064.2774	879.5885	672.4007	424.4603	263.6724	263.1160	476.6349	731.3673	986.4647	1210.6655	(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	613.3274	507.8679	446.5872	273.5521	141.6212	0.0000	0.0000	0.0000	0.0000	256.0558	431.3391	609.7172	(98)
Space heating												3280.0679	(98)
RHI space heating demand												3280	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.6300 (1b)	x	2.5000 (2b)	=	106.5750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.5750	(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) =	0.1877	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9377	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7267	(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	0.9265	0.9084	0.8902	0.7994	0.7812	0.6904	0.6904	0.6722	0.7267	0.7812	0.8175	0.8539	(22b)
Effective ac	0.9292	0.9126	0.8962	0.8195	0.8051	0.7383	0.7383	0.7259	0.7640	0.8051	0.8342	0.8645	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	23.9800	7.8800	16.1000	0.6000	9.6600			(29a)
External Wall - lobby	30.5000	2.1000	28.4000	0.4769	13.5453			(29a)
External Roof	15.5000		15.5000	0.1600	2.4800			(30)
Total net area of external elements Aum(A, m2)			69.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.3070			(33)
Party Wall 1			19.8000	0.0000	0.0000			(32)
Party Floor 1			42.6300					(32d)
Party Ceilings 1			27.1300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	10.4970	(36)
Total fabric heat loss (33) + (36) =	59.8040	(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	32.6806	32.0944	31.5199	28.8211	28.3162	25.9656	25.9656	25.5303	26.8710	28.3162	29.3376	30.4055	(38)
Heat transfer coeff	92.4847	91.8985	91.3239	88.6251	88.1202	85.7696	85.7696	85.3344	86.6750	88.1202	89.1417	90.2096	(39)
Average = Sum(39)m / 12 =												88.6227	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1695	2.1557	2.1422	2.0789	2.0671	2.0120	2.0120	2.0017	2.0332	2.0671	2.0911	2.1161	(40)
HLP (average)												2.0789	(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	1.4779 (42)
Average daily hot water use (litres/day)	69.2992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.2291	73.4571	70.6852	67.9132	65.1412	62.3693	62.3693	65.1412	67.9132	70.6852	73.4571	76.2291	(44)
Energy conte	113.0455	98.8703	102.0253	88.9482	85.3479	73.6487	68.2464	78.3137	79.2490	92.3571	100.8150	109.4786	(45)
Energy content (annual)										Total = Sum(45)m =		1090.3458	(45)
Distribution loss (46)m = 0.15 x (45)m	16.9568	14.8306	15.3038	13.3422	12.8022	11.0473	10.2370	11.7471	11.8874	13.8536	15.1223	16.4218	(46)
Water storage loss:													
Store volume												110.0000	(47)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
Total per year (kWh/year) = Sum(64)m =												1436.3658	(64)
Heat gains from water heating, kWh/month													
	61.0980	54.1096	57.4338	52.3273	51.8886	47.2402	46.2023	49.5497	49.1023	54.2191	56.2730	59.9120	(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	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.0640	25.8144	20.9937	15.8935	11.8806	10.0301	10.8379	14.0875	18.9082	24.0083	28.0213	29.8718	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	191.3434	193.3290	188.3255	177.6736	164.2275	151.5901	143.1475	141.1619	146.1655	156.8173	170.2634	182.9009	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	45.3450	(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)													
	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	-59.1144	(71)
Water heating gains (Table 5)													
	82.1210	80.5202	77.1960	72.6768	69.7427	65.6114	62.0999	66.5991	68.1976	72.8752	78.1569	80.5269	(72)
Total internal gains													
	377.4307	374.5658	361.4173	341.1461	320.7530	302.1338	290.9875	296.7507	308.1735	328.6031	351.3438	368.2017	(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	
Northwest	7.8800	11.2829	0.7600	0.7000	0.7700	32.7788	(81)

Solar gains	32.7788	66.7223	120.2123	197.4231	265.3754	282.9182	264.6642	210.9934	146.4805	81.5399	41.2442	26.7688	(83)
Total gains	410.2095	441.2880	481.6296	538.5692	586.1284	585.0520	555.6517	507.7441	454.6541	410.1429	392.5881	394.9706	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.0098	32.2140	32.4167	33.4038	33.5952	34.5159	34.5159	34.6920	34.1554	33.5952	33.2102	32.8171	
alpha	3.1340	3.1476	3.1611	3.2269	3.2397	3.3011	3.3011	3.3128	3.2770	3.2397	3.2140	3.1878	
util living area													
	0.9884	0.9843	0.9736	0.9430	0.8732	0.7425	0.6042	0.6615	0.8586	0.9578	0.9829	0.9898	(86)
MIT	18.8836	19.0539	19.4042	19.9363	20.4192	20.7819	20.9207	20.8920	20.6058	20.0115	19.3954	18.8932	(87)
Th 2	19.2227	19.2315	19.2402	19.2812	19.2890	19.3254	19.3254	19.3322	19.3113	19.2890	19.2733	19.2571	(88)
util rest of house													
	0.9842	0.9785	0.9630	0.9178	0.8118	0.6129	0.4064	0.4676	0.7637	0.9339	0.9753	0.9861	(89)
MIT 2	16.5656	16.8173	17.3281	18.1063	18.7556	19.1951	19.3032	19.2965	19.0209	18.2310	17.3390	16.5988	(90)
Living area fraction									fLA = Living area / (4) =			0.6587	(91)
MIT	18.0925	18.2905	18.6956	19.3117	19.8514	20.2403	20.3686	20.3474	20.0649	19.4038	18.6935	18.1101	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0925	18.2905	18.6956	19.3117	19.8514	20.2403	20.3686	20.3474	20.0649	19.4038	18.6935	18.1101	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9804	0.9742	0.9586	0.9184	0.8352	0.6900	0.5366	0.5943	0.8128	0.9359	0.9719	0.9827	(94)
Useful gains	402.1858	429.9072	461.7082	494.5973	489.5267	403.7072	298.1875	301.7532	369.5535	383.8634	381.5526	388.1234	(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													
	1275.5930	1230.5692	1113.7495	922.7397	718.3017	483.7687	323.2333	336.8505	517.0056	775.7938	1033.4649	1254.8242	(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													
	649.8150	538.0449	485.1188	308.2625	170.2086	0.0000	0.0000	0.0000	0.0000	291.5962	469.3769	644.8254	(98)
Space heating												3557.2484	(98)
Space heating per m2											(98) / (4) =	83.4447	(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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3557.2484	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	649.8150	538.0449	485.1188	308.2625	170.2086	0.0000	0.0000	0.0000	0.0000	291.5962	469.3769	644.8254	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	649.8150	538.0449	485.1188	308.2625	170.2086	0.0000	0.0000	0.0000	0.0000	291.5962	469.3769	644.8254	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(219)
Water heating fuel used												1436.3658	(219)
Annual totals kWh/year													
Space heating fuel - main system												3557.2484	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												205.3115	(232)
Total delivered energy for all uses												5198.9257	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3557.2484	13.1900	469.2011	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1436.3658	13.1900	189.4566	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	205.3115	13.1900	27.0806	(250)
Additional standing charges			0.0000	(251)
Total energy cost			685.7383	(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] =	3.2867	(257)
SAP value		54.1511	
SAP rating (Section 12)		54	(258)
SAP band		E	

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	3557.2484	0.5190	1846.2119	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1436.3658	0.5190	745.4738	(264)
Space and water heating			2591.6857	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3115	0.5190	106.5567	(268)
Total kg/year			2698.2424	(272)
CO2 emissions per m2			63.2900	(273)
EI value			58.5993	
EI rating			59	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	42.6300 (1b)	x	2.5000 (2b)	=	106.5750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	42.6300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.5750	(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) =	0.1877	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9377	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7267	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8357	0.7994	0.8175	0.7267	0.7267	0.6359	0.6540	0.6540	0.6904	0.7267	0.7085	0.7812	(22b)
Effective ac	0.8492	0.8195	0.8342	0.7640	0.7640	0.7022	0.7139	0.7139	0.7383	0.7640	0.7510	0.8051	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	23.9800	7.8800	16.1000	0.6000	9.6600			(29a)
External Wall - lobby	30.5000	2.1000	28.4000	0.4769	13.5453			(29a)
External Roof	15.5000		15.5000	0.1600	2.4800			(30)
Total net area of external elements Aum(A, m2)			69.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.3070			(33)
Party Wall 1			19.8000	0.0000	0.0000			(32)
Party Floor 1			42.6300					(32d)
Party Ceilings 1			27.1300					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	10.4970	(36)
Total fabric heat loss (33) + (36) =	59.8040	(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	29.8658	28.8211	29.3376	26.8710	26.8710	24.6946	25.1066	25.1066	25.9656	26.8710	26.4125	28.3162	(38)
Heat transfer coeff	89.6698	88.6251	89.1417	86.6750	86.6750	84.4986	84.9107	84.9107	85.7696	86.6750	86.2165	88.1202	(39)
Average = Sum(39)m / 12 =												86.8240	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1034	2.0789	2.0911	2.0332	2.0332	1.9821	1.9918	1.9918	2.0120	2.0332	2.0224	2.0671	(40)
HLP (average)												2.0367	(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	1.4779 (42)
Average daily hot water use (litres/day)	69.2992 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	76.2291	73.4571	70.6852	67.9132	65.1412	62.3693	62.3693	65.1412	67.9132	70.6852	73.4571	76.2291	(44)
Energy conte	113.0455	98.8703	102.0253	88.9482	85.3479	73.6487	68.2464	78.3137	79.2490	92.3571	100.8150	109.4786	(45)
Energy content (annual)										Total = Sum(45)m =		1090.3458	(45)
Distribution loss (46)m = 0.15 x (45)m	16.9568	14.8306	15.3038	13.3422	12.8022	11.0473	10.2370	11.7471	11.8874	13.8536	15.1223	16.4218	(46)
Water storage loss:													
Store volume												110.0000	(47)

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

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
142.4335 125.4143 131.4133 117.3882 114.7359 102.0887 97.6344 107.7017 107.6890 121.7451 129.2550 138.8666 (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
142.4335 125.4143 131.4133 117.3882 114.7359 102.0887 97.6344 107.7017 107.6890 121.7451 129.2550 138.8666 (64)
Total per year (kWh/year) = Sum(64)m = 1436.3658 (64)
Heat gains from water heating, kWh/month
61.0980 54.1096 57.4338 52.3273 51.8886 47.2402 46.2023 49.5497 49.1023 54.2191 56.2730 59.9120 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	88.6716	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
29.0640 25.8144 20.9937 15.8935 11.8806 10.0301 10.8379 14.0875 18.9082 24.0083 28.0213 29.8718 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
191.3434 193.3290 188.3255 177.6736 164.2275 151.5901 143.1475 141.1619 146.1655 156.8173 170.2634 182.9009 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 45.3450 (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)
-59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 -59.1144 (71)
Water heating gains (Table 5)
82.1210 80.5202 77.1960 72.6768 69.7427 65.6114 62.0999 66.5991 68.1976 72.8752 78.1569 80.5269 (72)
Total internal gains
377.4307 374.5658 361.4173 341.1461 320.7530 302.1338 290.9875 296.7507 308.1735 328.6031 351.3438 368.2017 (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	
Northwest	7.8800	12.9280	0.7600	0.7000	0.7700	37.5581	(81)

Solar gains	37.5581	70.3678	124.7013	209.9379	273.5781	311.2756	287.0108	233.4478	163.0350	90.3661	48.4922	30.3240	(83)
Total gains	414.9888	444.9335	486.1186	551.0840	594.3311	613.4094	577.9983	530.1985	471.2085	418.9692	399.8361	398.5257	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.0146	33.4038	33.2102	34.1554	34.1554	35.0351	34.8651	34.8651	34.5159	34.1554	34.3370	33.5952	
alpha	3.2010	3.2269	3.2140	3.2770	3.2770	3.3357	3.3243	3.3243	3.3011	3.2770	3.2891	3.2397	
util living area	0.9876	0.9836	0.9705	0.9332	0.8514	0.6693	0.5083	0.5452	0.8223	0.9488	0.9807	0.9890	(86)
MIT	18.9921	19.1527	19.5234	20.0514	20.5128	20.8640	20.9611	20.9521	20.6926	20.1259	19.5164	18.9993	(87)
Th 2	19.2653	19.2812	19.2733	19.3113	19.3113	19.3453	19.3388	19.3388	19.3254	19.3113	19.3184	19.2890	(88)
util rest of house	0.9831	0.9775	0.9585	0.9038	0.7799	0.5191	0.2957	0.3211	0.7067	0.9192	0.9721	0.9850	(89)
MIT 2	16.7469	16.9886	17.5186	18.2838	18.8865	19.2798	19.3326	19.3308	19.1238	18.4035	17.5396	16.7711	(90)
Living area fraction									fLA = Living area / (4) =			0.6587	(91)
MIT	18.2258	18.4141	18.8392	19.4481	19.9577	20.3233	20.4053	20.3987	20.1572	19.5380	18.8417	18.2388	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2258	18.4141	18.8392	19.4481	19.9577	20.3233	20.4053	20.3987	20.1572	19.5380	18.8417	18.2388	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9794	0.9733	0.9546	0.9067	0.8111	0.6137	0.4373	0.4707	0.7719	0.9242	0.9689	0.9815	(94)
Useful gains	406.4255	433.0694	464.0258	499.6551	482.0496	376.4490	252.7527	249.5549	363.7135	387.2062	387.3826	391.1531	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1230.7903	1188.8252	1064.2774	879.5885	672.4007	424.4603	263.6724	263.1160	476.6349	731.3673	986.4647	1210.6655	(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	613.3274	507.8679	446.5872	273.5521	141.6212	0.0000	0.0000	0.0000	0.0000	256.0558	431.3391	609.7172	(98)

Space heating 3280.0679 (98)
Space heating per m2 (98) / (4) = 76.9427 (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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3280.0679	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	613.3274	507.8679	446.5872	273.5521	141.6212	0.0000	0.0000	0.0000	0.0000	256.0558	431.3391	609.7172	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	613.3274	507.8679	446.5872	273.5521	141.6212	0.0000	0.0000	0.0000	0.0000	256.0558	431.3391	609.7172	(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													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	142.4335	125.4143	131.4133	117.3882	114.7359	102.0887	97.6344	107.7017	107.6890	121.7451	129.2550	138.8666	(219)
Water heating fuel used												1436.3658	(219)
Annual totals kWh/year													
Space heating fuel - main system												3280.0679	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												205.3115	(232)
Total delivered energy for all uses												4921.7453	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3280.0679	18.2700	599.2684	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1436.3658	18.2700	262.4240	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	205.3115	18.2700	37.5104	(250)
Additional standing charges			0.0000	(251)
Total energy cost			899.2029	(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	3280.0679	0.5190	1702.3553	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1436.3658	0.5190	745.4738	(264)
Space and water heating			2447.8291	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3115	0.5190	106.5567	(268)
Total kg/year			2554.3858	(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	3280.0679	3.0700	10069.8086	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1436.3658	3.0700	4409.6430	(264)
Space and water heating			14479.4515	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	205.3115	3.0700	630.3064	(268)
Primary energy kWh/year			15109.7580	(272)
Primary energy kWh/m2/year			354.4395	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	E 54
Current environmental impact rating:	D 59

(For testing purposes):

A	Not considered
B	Not considered

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

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:	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: E 54
Potential environmental impact rating: D 59

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£899	£899	£0
Space heating	£599	£599	£0
Water heating	£262	£262	£0
Lighting	£38	£38	£0
Total cost of fuels	£899	£899	£0
Total cost of uses	£899	£899	£0
Delivered energy	115 kWh/m²	115 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.6 tonnes	2.6 tonnes	0.0 tonnes
CO2 emissions per m²	60 kg/m²	60 kg/m²	0 kg/m²
Primary energy	354 kWh/m²	354 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-19	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.06, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	54 E	**DER**	N/A	**TER**	N/A
Environmental	59 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.55	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	21.79 m	42.63 m²	2.50 m

7.0 Living Area	28.08	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	23.98	16.10
External Wall - lobby	Solid Wall	Other	0.60	30.50	28.40

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	19.80

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.16	15.50	15.50

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	27.13

11.1 Party Floors

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Construction	Area (m²)
Party Floor 1	Other	42.63

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	South East							2.10	
windows	Window	[1] External Wall	North West	None	0.00					7.88	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate
Night Ventilation	No
Air change rate	2.00

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	

Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 2.07, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

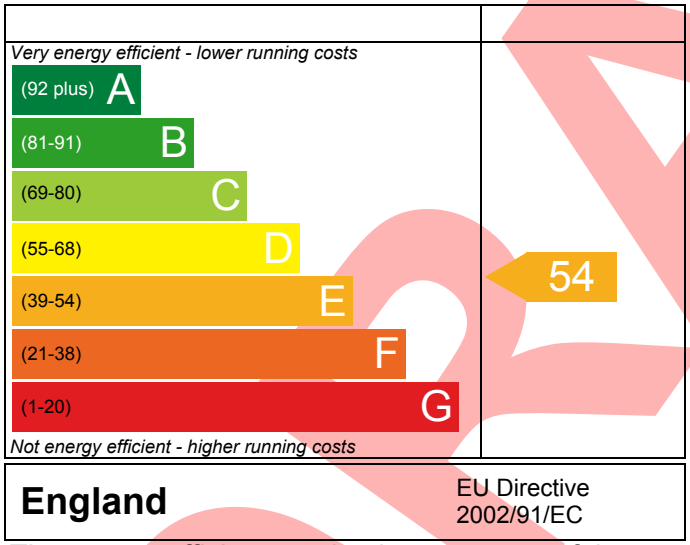
Unit 2.07, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	46.03 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

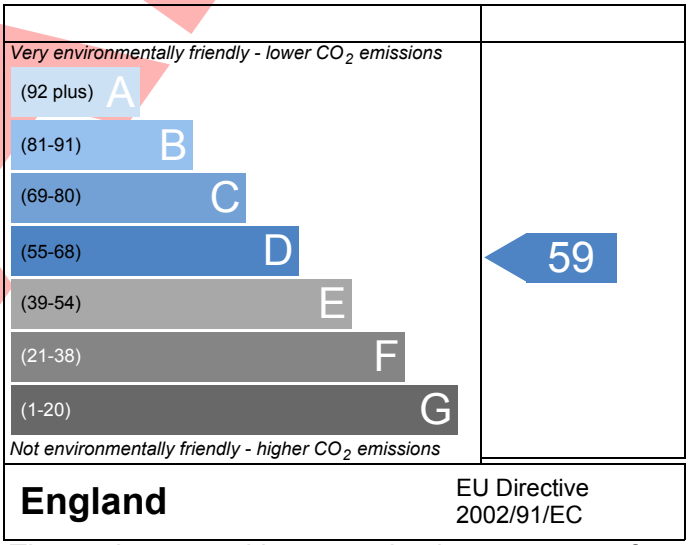
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-20	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.07, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	54 E	**DER**	N/A	**TER**	N/A
Environmental	59 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.64	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.0300 (1b)	x	2.5000 (2b)	=	115.0750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.0300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.0750	(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) =	0.1738	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9238	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7159	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8233	0.7875	0.8054	0.7159	0.7159	0.6265	0.6444	0.6444	0.6801	0.7159	0.6980	0.7696	(22b)
Effective ac	0.8389	0.8101	0.8244	0.7563	0.7563	0.6962	0.7076	0.7076	0.7313	0.7563	0.7436	0.7962	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	27.3500	7.8800	19.4700	0.6000	11.6820			(29a)
External Wall - lobby	27.2500	2.1000	25.1500	0.4769	11.9952			(29a)
External Roof	15.9300		15.9300	0.1600	2.5488			(30)
Total net area of external elements Aum(A, m2)			70.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.8478			(33)
Party Wall 1			19.2300	0.0000	0.0000			(32)
Party Floor 1			46.0300					(32d)
Party Ceilings 1			30.1000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	10.5795	(36)
Total fabric heat loss (33) + (36) =	60.4273	(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	31.8586	30.7637	31.3051	28.7199	28.7199	26.4388	26.8707	26.8707	27.7709	28.7199	28.2393	30.2345	(38)
Heat transfer coeff													

CALCULATION OF HEAT DEMAND 09 Jan 2014

	92.2859	91.1909	91.7323	89.1471	89.1471	86.8661	87.2979	87.2979	88.1982	89.1471	88.6666	90.6617 (39)
Average = Sum(39)m / 12 =												89.3032 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0049	1.9811	1.9929	1.9367	1.9367	1.8872	1.8965	1.8965	1.9161	1.9367	1.9263	1.9696	(40)
HLP (average)												1.9401	(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												1.5742	(42)
Average daily hot water use (litres/day)												71.5875	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	78.7462	75.8827	73.0192	70.1557	67.2922	64.4287	64.4287	67.2922	70.1557	73.0192	75.8827	78.7462	(44)
Energy conte	116.7784	102.1351	105.3943	91.8853	88.1661	76.0807	70.4999	80.8997	81.8659	95.4068	104.1440	113.0936	(45)
Energy content (annual)										Total = Sum(45)m =		1126.3497	(45)
Distribution loss (46)m = 0.15 x (45)m													
	17.5168	15.3203	15.8091	13.7828	13.2249	11.4121	10.5750	12.1350	12.2799	14.3110	15.6216	16.9640	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(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													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(64)
								Total per year (kWh/year) = Sum(64)m =				1472.3697	(64)
RHI water heating demand												1472	(64)
Heat gains from water heating, kWh/month													
	62.3392	55.1951	58.5540	53.3039	52.8256	48.0488	46.9516	50.4095	49.9724	55.2332	57.3799	61.1140	(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	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	31.4384	27.9233	22.7088	17.1920	12.8512	10.8496	11.7233	15.2384	20.4530	25.9697	30.3105	32.3122	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	204.3871	206.5080	201.1634	189.7854	175.4227	161.9238	152.9057	150.7848	156.1294	167.5074	181.8701	195.3690	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	(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)													
	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	(71)
Water heating gains (Table 5)													
	83.7893	82.1356	78.7016	74.0331	71.0022	66.7345	63.1070	67.7548	69.4061	74.2381	79.6943	82.1425	(72)
Total internal gains													
	397.1184	394.0706	380.0774	358.5142	336.7798	317.0114	305.2397	311.2816	323.4921	345.2189	369.3785	387.3273	(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	
Northwest	7.8800	12.9280	0.7600	0.7000	0.7700	37.5581	(81)

Solar gains	37.5581	70.3678	124.7013	209.9379	273.5781	311.2756	287.0108	233.4478	163.0350	90.3661	48.4922	30.3240	(83)
Total gains	434.6765	464.4383	504.7787	568.4521	610.3578	628.2870	592.2504	544.7294	486.5271	435.5850	417.8707	417.6513	(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, n1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.6372	35.0531	34.8463	35.8568	35.8568	36.7983	36.6163	36.6163	36.2425	35.8568	36.0511	35.2577	
alpha	3.3091	3.3369	3.3231	3.3905	3.3905	3.4532	3.4411	3.4411	3.4162	3.3905	3.4034	3.3505	
util living area													
	0.9887	0.9849	0.9728	0.9375	0.8581	0.6758	0.5124	0.5486	0.8273	0.9516	0.9821	0.9899	(86)
MIT	19.0705	19.2251	19.5808	20.0897	20.5346	20.8731	20.9649	20.9566	20.7100	20.1647	19.5780	19.0783	(87)
Th 2	19.3301	19.3459	19.3381	19.3759	19.3759	19.4096	19.4032	19.4032	19.3899	19.3759	19.3829	19.3537	(88)
util rest of house													
	0.9846	0.9794	0.9618	0.9101	0.7900	0.5303	0.3062	0.3317	0.7162	0.9238	0.9742	0.9863	(89)
MIT 2	16.8978	17.1311	17.6400	18.3803	18.9641	19.3469	19.3972	19.3955	19.1957	18.4993	17.6671	16.9232	(90)
Living area fraction									fLA = Living area / (4) =			0.6735	(91)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	18.3610	18.5414	18.9470	19.5315	20.0218	20.3748	20.4530	20.4469	20.2155	19.6209	18.9540	18.3746	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3610	18.5414	18.9470	19.5315	20.0218	20.3748	20.4530	20.4469	20.2155	19.6209	18.9540	18.3746	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9813	0.9758	0.9584	0.9133	0.8207	0.6240	0.4463	0.4794	0.7804	0.9291	0.9715	0.9832	(94)
Useful gains	426.5334	453.1868	483.7814	519.1648	500.9138	392.0744	264.3396	261.1553	379.6889	404.7006	405.9465	410.6553	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1279.1772	1234.8488	1105.1029	912.1131	697.2935	440.8268	275.2506	274.7185	495.2809	759.6149	1024.4576	1257.8939	(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	634.3670	525.2768	462.2632	282.9228	146.1064	0.0000	0.0000	0.0000	0.0000	264.0562	445.3280	630.3455	(98)
Space heating												3390.6661	(98)
RHI space heating demand												3391	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.0300 (1b)	x	2.5000 (2b)	=	115.0750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.0300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.0750	(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) =	0.1738	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9238	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7159	(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	0.9128	0.8949	0.8770	0.7875	0.7696	0.6801	0.6801	0.6622	0.7159	0.7696	0.8054	0.8412	(22b)
Effective ac	0.9166	0.9005	0.8846	0.8101	0.7962	0.7313	0.7313	0.7193	0.7563	0.7962	0.8244	0.8538	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	27.3500	7.8800	19.4700	0.6000	11.6820			(29a)
External Wall - lobby	27.2500	2.1000	25.1500	0.4769	11.9952			(29a)
External Roof	15.9300		15.9300	0.1600	2.5488			(30)
Total net area of external elements Aum(A, m2)			70.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.8478			(33)
Party Wall 1			19.2300	0.0000	0.0000			(32)
Party Floor 1			46.0300					(32d)
Party Ceilings 1			30.1000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	10.5795	(36)
Total fabric heat loss (33) + (36) =	60.4273	(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	34.8088	34.1944	33.5922	30.7637	30.2345	27.7709	27.7709	27.3147	28.7199	30.2345	31.3051	32.4243	(38)
Heat transfer coeff	95.2360	94.6216	94.0194	91.1909	90.6617	88.1982	88.1982	87.7420	89.1471	90.6617	91.7323	92.8516	(39)
Average = Sum(39)m / 12 =												91.1884	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0690	2.0557	2.0426	1.9811	1.9696	1.9161	1.9161	1.9062	1.9367	1.9696	1.9929	2.0172	(40)
HLP (average)												1.9811	(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	1.5742 (42)
Average daily hot water use (litres/day)	71.5875 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	78.7462	75.8827	73.0192	70.1557	67.2922	64.4287	64.4287	67.2922	70.1557	73.0192	75.8827	78.7462	(44)
Energy conte	116.7784	102.1351	105.3943	91.8853	88.1661	76.0807	70.4999	80.8997	81.8659	95.4068	104.1440	113.0936	(45)
Energy content (annual)										Total = Sum(45)m =		1126.3497	(45)
Distribution loss (46)m = 0.15 x (45)m	17.5168	15.3203	15.8091	13.7828	13.2249	11.4121	10.5750	12.1350	12.2799	14.3110	15.6216	16.9640	(46)
Water storage loss:													
Store volume												110.0000	(47)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
146.1664 128.6791 134.7823 120.3253 117.5541 104.5207 99.8879 110.2877 110.3059 124.7948 132.5840 142.4816 (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
146.1664 128.6791 134.7823 120.3253 117.5541 104.5207 99.8879 110.2877 110.3059 124.7948 132.5840 142.4816 (64)
Total per year (kWh/year) = Sum(64)m = 1472.3697 (64)
Heat gains from water heating, kWh/month
62.3392 55.1951 58.5540 53.3039 52.8256 48.0488 46.9516 50.4095 49.9724 55.2332 57.3799 61.1140 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	31.4384	27.9233	22.7088	17.1920	12.8512	10.8496	11.7233	15.2384	20.4530	25.9697	30.3105	32.3122	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	204.3871	206.5080	201.1634	189.7854	175.4227	161.9238	152.9057	150.7848	156.1294	167.5074	181.8701	195.3690	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	(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)													
	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	(71)
Water heating gains (Table 5)													
	83.7893	82.1356	78.7016	74.0331	71.0022	66.7345	63.1070	67.7548	69.4061	74.2381	79.6943	82.1425	(72)
Total internal gains													
	397.1184	394.0706	380.0774	358.5142	336.7798	317.0114	305.2397	311.2816	323.4921	345.2189	369.3785	387.3273	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	7.8800	11.2829	0.7600	0.7000	0.7700	32.7788	(81)

Solar gains	32.7788	66.7223	120.2123	197.4231	265.3754	282.9182	264.6642	210.9934	146.4805	81.5399	41.2442	26.7688	(83)
Total gains	429.8972	460.7928	500.2897	555.9373	602.1551	599.9297	569.9039	522.2750	469.9726	426.7588	410.6228	414.0962	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.5643	33.7822	33.9986	35.0531	35.2577	36.2425	36.2425	36.4310	35.8568	35.2577	34.8463	34.4262	
alpha	3.2376	3.2521	3.2666	3.3369	3.3505	3.4162	3.4162	3.4287	3.3905	3.3505	3.3231	3.2951	
util living area													
	0.9894	0.9856	0.9757	0.9469	0.8797	0.7494	0.6094	0.6662	0.8633	0.9603	0.9842	0.9907	(86)
MIT	18.9637	19.1273	19.4641	19.9775	20.4435	20.7944	20.9270	20.9002	20.6264	20.0536	19.4595	18.9743	(87)
Th 2	19.2877	19.2965	19.3051	19.3459	19.3537	19.3899	19.3899	19.3966	19.3759	19.3537	19.3381	19.3219	(88)
util rest of house													
	0.9856	0.9803	0.9660	0.9236	0.8214	0.6244	0.4175	0.4785	0.7725	0.9380	0.9773	0.9873	(89)
MIT 2	16.7184	16.9609	17.4527	18.2062	18.8355	19.2643	19.3685	19.3624	19.0955	18.3310	17.4694	16.7534	(90)
Living area fraction									fLA = Living area / (4) =			0.6735	(91)
MIT	18.2305	18.4199	18.8073	19.3992	19.9185	20.2947	20.4181	20.3980	20.1265	19.4911	18.8097	18.2491	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2305	18.4199	18.8073	19.3992	19.9185	20.2947	20.4181	20.3980	20.1265	19.4911	18.8097	18.2491	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9823	0.9766	0.9623	0.9245	0.8444	0.7006	0.5465	0.6037	0.8209	0.9404	0.9743	0.9843	(94)
Useful gains	422.2684	450.0022	481.4076	513.9603	508.4880	420.3126	311.4367	315.2740	385.7998	401.3138	400.0718	407.6048	(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													
	1326.6894	1279.2773	1157.1299	957.4277	745.1001	502.2659	336.7490	350.7949	537.2438	806.0865	1074.1541	1304.4817	(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													
	672.8892	557.2729	502.7374	319.2966	176.0394	0.0000	0.0000	0.0000	0.0000	301.1509	485.3393	667.2764	(98)
Space heating												3682.0020	(98)
Space heating per m2											(98) / (4) =	79.9914	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3682.0020	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	672.8892	557.2729	502.7374	319.2966	176.0394	0.0000	0.0000	0.0000	0.0000	301.1509	485.3393	667.2764	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	672.8892	557.2729	502.7374	319.2966	176.0394	0.0000	0.0000	0.0000	0.0000	301.1509	485.3393	667.2764	(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													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(219)
Water heating fuel used												1472.3697	(219)
Annual totals kWh/year													
Space heating fuel - main system												3682.0020	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												222.0850	(232)
Total delivered energy for all uses												5376.4567	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3682.0020	13.1900	485.6561	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1472.3697	13.1900	194.2056	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	222.0850	13.1900	29.2930	(250)
Additional standing charges			0.0000	(251)
Total energy cost			709.1546	(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] =	3.2719	(257)
SAP value		54.3564	
SAP rating (Section 12)		54	(258)
SAP band		E	

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	3682.0020	0.5190	1910.9590	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1472.3697	0.5190	764.1599	(264)
Space and water heating			2675.1189	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	222.0850	0.5190	115.2621	(268)
Total kg/year			2790.3810	(272)
CO2 emissions per m2			60.6200	(273)
EI value			58.7845	
EI rating			59	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	46.0300 (1b)	x	2.5000 (2b)	=	115.0750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.0300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	115.0750	(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) =	0.1738	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9238	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7159	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8233	0.7875	0.8054	0.7159	0.7159	0.6265	0.6444	0.6444	0.6801	0.7159	0.6980	0.7696	(22b)
Effective ac	0.8389	0.8101	0.8244	0.7563	0.7563	0.6962	0.7076	0.7076	0.7313	0.7563	0.7436	0.7962	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			7.8800	2.5180	19.8417			(27)
External Wall	27.3500	7.8800	19.4700	0.6000	11.6820			(29a)
External Wall - lobby	27.2500	2.1000	25.1500	0.4769	11.9952			(29a)
External Roof	15.9300		15.9300	0.1600	2.5488			(30)
Total net area of external elements Aum(A, m2)			70.5300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.8478			(33)
Party Wall 1			19.2300	0.0000	0.0000			(32)
Party Floor 1			46.0300					(32d)
Party Ceilings 1			30.1000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	10.5795	(36)
Total fabric heat loss (33) + (36) =	60.4273	(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	31.8586	30.7637	31.3051	28.7199	28.7199	26.4388	26.8707	26.8707	27.7709	28.7199	28.2393	30.2345	(38)
Heat transfer coeff	92.2859	91.1909	91.7323	89.1471	89.1471	86.8661	87.2979	87.2979	88.1982	89.1471	88.6666	90.6617	(39)
Average = Sum(39)m / 12 =												89.3032	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.0049	1.9811	1.9929	1.9367	1.9367	1.8872	1.8965	1.8965	1.9161	1.9367	1.9263	1.9696	(40)
HLP (average)												1.9401	(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	1.5742 (42)
Average daily hot water use (litres/day)	71.5875 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	78.7462	75.8827	73.0192	70.1557	67.2922	64.4287	64.4287	67.2922	70.1557	73.0192	75.8827	78.7462	(44)
Energy conte	116.7784	102.1351	105.3943	91.8853	88.1661	76.0807	70.4999	80.8997	81.8659	95.4068	104.1440	113.0936	(45)
Energy content (annual)										Total = Sum(45)m =		1126.3497	(45)
Distribution loss (46)m = 0.15 x (45)m	17.5168	15.3203	15.8091	13.7828	13.2249	11.4121	10.5750	12.1350	12.2799	14.3110	15.6216	16.9640	(46)

Water storage loss:	
Store volume	110.0000 (47)

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

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
146.1664 128.6791 134.7823 120.3253 117.5541 104.5207 99.8879 110.2877 110.3059 124.7948 132.5840 142.4816 (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
146.1664 128.6791 134.7823 120.3253 117.5541 104.5207 99.8879 110.2877 110.3059 124.7948 132.5840 142.4816 (64)
Total per year (kWh/year) = Sum(64)m = 1472.3697 (64)
Heat gains from water heating, kWh/month
62.3392 55.1951 58.5540 53.3039 52.8256 48.0488 46.9516 50.4095 49.9724 55.2332 57.3799 61.1140 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	94.4526	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	31.4384	27.9233	22.7088	17.1920	12.8512	10.8496	11.7233	15.2384	20.4530	25.9697	30.3105	32.3122	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	204.3871	206.5080	201.1634	189.7854	175.4227	161.9238	152.9057	150.7848	156.1294	167.5074	181.8701	195.3690	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	46.0195	(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)													
	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	-62.9684	(71)
Water heating gains (Table 5)													
	83.7893	82.1356	78.7016	74.0331	71.0022	66.7345	63.1070	67.7548	69.4061	74.2381	79.6943	82.1425	(72)
Total internal gains													
	397.1184	394.0706	380.0774	358.5142	336.7798	317.0114	305.2397	311.2816	323.4921	345.2189	369.3785	387.3273	(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	
Northwest	7.8800	12.9280	0.7600	0.7000	0.7700	37.5581	(81)

Solar gains	37.5581	70.3678	124.7013	209.9379	273.5781	311.2756	287.0108	233.4478	163.0350	90.3661	48.4922	30.3240	(83)
Total gains	434.6765	464.4383	504.7787	568.4521	610.3578	628.2870	592.2504	544.7294	486.5271	435.5850	417.8707	417.6513	(84)

---
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.6372	35.0531	34.8463	35.8568	35.8568	36.7983	36.6163	36.6163	36.2425	35.8568	36.0511	35.2577	
alpha	3.3091	3.3369	3.3231	3.3905	3.3905	3.4532	3.4411	3.4411	3.4162	3.3905	3.4034	3.3505	
util living area													
	0.9887	0.9849	0.9728	0.9375	0.8581	0.6758	0.5124	0.5486	0.8273	0.9516	0.9821	0.9899	(86)
MIT	19.0705	19.2251	19.5808	20.0897	20.5346	20.8731	20.9649	20.9566	20.7100	20.1647	19.5780	19.0783	(87)
Th 2	19.3301	19.3459	19.3381	19.3759	19.3759	19.4096	19.4032	19.4032	19.3899	19.3759	19.3829	19.3537	(88)
util rest of house													
	0.9846	0.9794	0.9618	0.9101	0.7900	0.5303	0.3062	0.3317	0.7162	0.9238	0.9742	0.9863	(89)
MIT 2	16.8978	17.1311	17.6400	18.3803	18.9641	19.3469	19.3972	19.3955	19.1957	18.4993	17.6671	16.9232	(90)
Living area fraction									fLA = Living area / (4) =			0.6735	(91)
MIT	18.3610	18.5414	18.9470	19.5315	20.0218	20.3748	20.4530	20.4469	20.2155	19.6209	18.9540	18.3746	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3610	18.5414	18.9470	19.5315	20.0218	20.3748	20.4530	20.4469	20.2155	19.6209	18.9540	18.3746	(93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9813	0.9758	0.9584	0.9133	0.8207	0.6240	0.4463	0.4794	0.7804	0.9291	0.9715	0.9832	(94)
Useful gains	426.5334	453.1868	483.7814	519.1648	500.9138	392.0744	264.3396	261.1553	379.6889	404.7006	405.9465	410.6553	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1279.1772	1234.8488	1105.1029	912.1131	697.2935	440.8268	275.2506	274.7185	495.2809	759.6149	1024.4576	1257.8939	(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													
	634.3670	525.2768	462.2632	282.9228	146.1064	0.0000	0.0000	0.0000	0.0000	264.0562	445.3280	630.3455	(98)
Space heating												3390.6661	(98)
Space heating per m2											(98) / (4) =	73.6621	(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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3390.6661	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	634.3670	525.2768	462.2632	282.9228	146.1064	0.0000	0.0000	0.0000	0.0000	264.0562	445.3280	630.3455	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	634.3670	525.2768	462.2632	282.9228	146.1064	0.0000	0.0000	0.0000	0.0000	264.0562	445.3280	630.3455	(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													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	146.1664	128.6791	134.7823	120.3253	117.5541	104.5207	99.8879	110.2877	110.3059	124.7948	132.5840	142.4816	(219)
Water heating fuel used												1472.3697	(219)
Annual totals kWh/year													
Space heating fuel - main system												3390.6661	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												222.0850	(232)
Total delivered energy for all uses												5085.1208	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3390.6661	18.2700	619.4747	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1472.3697	18.2700	269.0019	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	222.0850	18.2700	40.5749	(250)
Additional standing charges			0.0000	(251)
Total energy cost			929.0516	(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	3390.6661	0.5190	1759.7557	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1472.3697	0.5190	764.1599	(264)
Space and water heating			2523.9156	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	222.0850	0.5190	115.2621	(268)
Total kg/year			2639.1777	(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	3390.6661	3.0700	10409.3449	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1472.3697	3.0700	4520.1749	(264)
Space and water heating			14929.5197	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	222.0850	3.0700	681.8011	(268)
Primary energy kWh/year			15611.3208	(272)
Primary energy kWh/m2/year			339.1554	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	E 54
Current environmental impact rating:	D 59

(For testing purposes):

A	Not considered
B	Not considered

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

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:	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: E 54
Potential environmental impact rating: D 59

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£929	£929	£0
Space heating	£619	£619	£0
Water heating	£269	£269	£0
Lighting	£41	£41	£0
Total cost of fuels	£929	£929	£0
Total cost of uses	£929	£929	£0
Delivered energy	110 kWh/m²	110 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.6 tonnes	2.6 tonnes	0.0 tonnes
CO2 emissions per m²	57 kg/m²	57 kg/m²	0 kg/m²
Primary energy	339 kWh/m²	339 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
```

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-20	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.07, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	54 E	**DER**	N/A	**TER**	N/A
Environmental	59 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.64	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	21.84 m	46.03 m²	2.50 m

7.0 Living Area	31.00	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	27.35	19.47
External Wall - lobby	Solid Wall	Other	0.60	27.25	25.15

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	19.23

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.16	15.93	15.93

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	30.10

11.1 Party Floors

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Construction	Area (m²)
Party Floor 1	Other	46.03

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	South East							2.10	
windows	Window	[1] External Wall	North West	None	0.00					7.88	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate
Night Ventilation	No
Air change rate	2.00

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	

Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 2.08, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

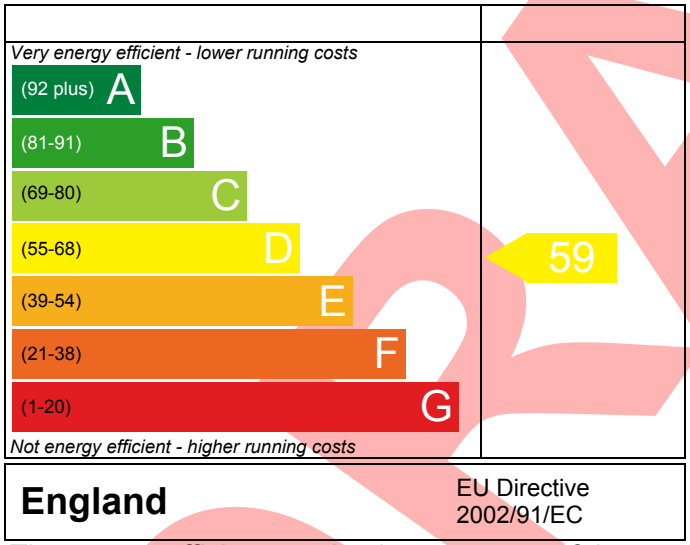
Unit 2.08, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	41.04 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

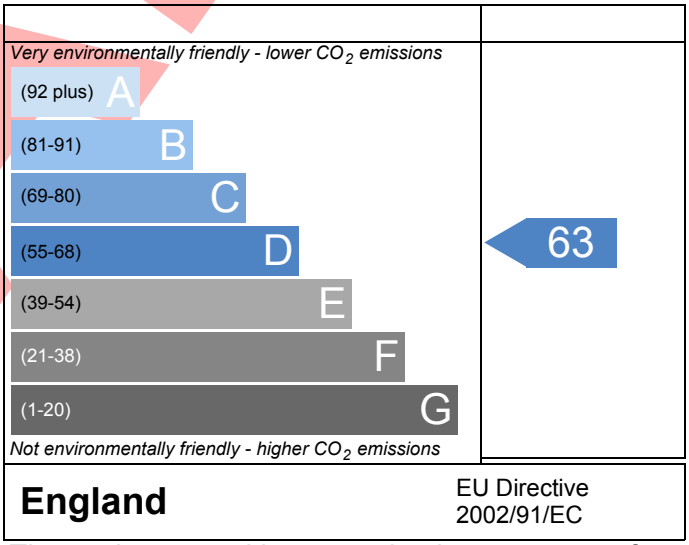
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-21	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.08, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	59 D	**DER**	N/A	**TER**	N/A
Environmental	63 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.24	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400	(1b)	x 2.5000	(2b) =	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	29.7500	5.9100	23.8400	0.6000	14.3040			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
External Roof	12.4500		12.4500	0.1600	1.9920			(30)
Total net area of external elements Aum(A, m2)			47.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.4740			(33)
Party Wall 1			30.6000	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			28.5900					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	7.1220	(36)
Total fabric heat loss (33) + (36) =	43.5960	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff													

CALCULATION OF HEAT DEMAND 09 Jan 2014

	78.0954	76.6063	77.3456	73.8153	73.8153	70.7004	71.2902	71.2902	72.5195	73.8153	73.1591	75.8836 (39)
Average = Sum(39)m / 12 =												74.0280 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9029	1.8666	1.8846	1.7986	1.7986	1.7227	1.7371	1.7371	1.7670	1.7986	1.7826	1.8490	(40)
HLP (average)												1.8038	(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												1.4342	(42)
Average daily hot water use (litres/day)												68.2633	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m													
	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
								Total per year (kWh/year) = Sum(64)m =				1420.0675	(64)
RHI water heating demand												1420	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(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	
Northwest	5.9100	12.9280	0.7600	0.7000	0.7700	28.1686	(81)

Solar gains	28.1686	52.7758	93.5260	157.4534	205.1835	233.4567	215.2581	175.0858	122.2762	67.7746	36.3692	22.7430	(83)
Total gains	398.0752	419.7295	447.4652	491.4473	519.1911	529.2771	500.2632	465.8990	424.4039	390.0036	380.8971	383.7230	(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, n1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.4938	37.2032	36.8476	38.6099	38.6099	40.3109	39.9775	39.9775	39.2998	38.6099	38.9562	37.5575	
alpha	3.4329	3.4802	3.4565	3.5740	3.5740	3.6874	3.6652	3.6652	3.6200	3.5740	3.5971	3.5038	
util living area													
	0.9877	0.9841	0.9724	0.9378	0.8594	0.6692	0.5021	0.5333	0.8172	0.9476	0.9802	0.9889	(86)
MIT	19.1981	19.3550	19.6770	20.1757	20.5838	20.8989	20.9740	20.9684	20.7586	20.2608	19.7245	19.2287	(87)
Th 2	19.3988	19.4237	19.4113	19.4710	19.4710	19.5246	19.5144	19.5144	19.4932	19.4710	19.4822	19.4359	(88)
util rest of house													
	0.9833	0.9784	0.9614	0.9113	0.7941	0.5323	0.3124	0.3346	0.7087	0.9189	0.9719	0.9850	(89)
MIT 2	17.1231	17.3653	17.8224	18.5629	19.0981	19.4732	19.5096	19.5083	19.3302	18.6930	17.9382	17.1899	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	18.3401	18.5323	18.9101	19.5088	19.9695	20.3094	20.3685	20.3646	20.1680	19.6125	18.9859	18.3856 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3401	18.5323	18.9101	19.5088	19.9695	20.3094	20.3685	20.3646	20.1680	19.6125	18.9859	18.3856 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9793	0.9740	0.9568	0.9121	0.8185	0.6098	0.4251	0.4530	0.7636	0.9222	0.9682	0.9813	(94)
Useful gains	389.8244	408.7991	428.1483	448.2320	424.9470	322.7500	212.6865	211.0315	324.0884	359.6792	368.7855	376.5640	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W	1080.8446	1036.6588	928.9308	753.5678	573.5046	354.1644	218.7511	218.4793	403.7886	628.3526	847.6122	1053.6931	(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	514.1190	421.9217	372.5821	219.8418	110.5269	0.0000	0.0000	0.0000	0.0000	199.8930	344.7552	503.7841	(98)
Space heating												2687.4238	(98)
RHI space heating demand												2687	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(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	1.1297	1.1075	1.0854	0.9746	0.9525	0.8417	0.8417	0.8196	0.8860	0.9525	0.9968	1.0411	(22b)
Effective ac	1.1297	1.1075	1.0854	0.9750	0.9536	0.8543	0.8543	0.8359	0.8925	0.9536	0.9968	1.0411	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	29.7500	5.9100	23.8400	0.6000	14.3040			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
External Roof	12.4500		12.4500	0.1600	1.9920			(30)
Total net area of external elements Aum(A, m2)			47.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.4740			(33)
Party Wall 1			30.6000	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			28.5900					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	7.1220	(36)
Total fabric heat loss (33) + (36) =	43.5960	(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	38.2493	37.4993	36.7494	33.0103	32.2876	28.9235	28.9235	28.3005	30.2193	32.2876	33.7496	35.2494	(38)
Heat transfer coeff	81.8453	81.0953	80.3453	76.6063	75.8836	72.5195	72.5195	71.8965	73.8153	75.8836	77.3456	78.8454	(39)
Average = Sum(39)m / 12 =												76.5501	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9943	1.9760	1.9577	1.8666	1.8490	1.7670	1.7670	1.7519	1.7986	1.8490	1.8846	1.9212	(40)
HLP (average)												1.8653	(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	1.4342 (42)
Average daily hot water use (litres/day)	68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte 111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)	
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Total per year (kWh/year) = Sum(64)m =												1420.0675	(64)
Heat gains from water heating, kWh/month													
	60.5362	53.6182	56.9267	51.8852	51.4644	46.8742	45.8631	49.1605	48.7084	53.7601	55.7719	59.3679	(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	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(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	
Northwest	5.9100	11.2829	0.7600	0.7000	0.7700	24.5841	(81)

Solar gains	24.5841	50.0417	90.1592	148.0673	199.0315	212.1887	198.4982	158.2450	109.8604	61.1549	30.9332	20.0766	(83)
Total gains	394.4908	416.9953	444.0985	482.0612	513.0391	508.0091	483.5033	449.0582	411.9881	383.3839	375.4611	381.0567	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.8218	35.1438	35.4719	37.2032	37.5575	39.2998	39.2998	39.6403	38.6099	37.5575	36.8476	36.1467	
alpha	3.3215	3.3429	3.3648	3.4802	3.5038	3.6200	3.6200	3.6427	3.5740	3.5038	3.4565	3.4098	
util living area													
	0.9885	0.9849	0.9755	0.9479	0.8828	0.7469	0.6015	0.6525	0.8558	0.9574	0.9827	0.9898	(86)
MIT	19.0625	19.2199	19.5402	20.0486	20.4868	20.8257	20.9419	20.9222	20.6792	20.1431	19.5748	19.0989	(87)
Th 2	19.3371	19.3494	19.3617	19.4237	19.4359	19.4932	19.4932	19.5039	19.4710	19.4359	19.4113	19.3864	(88)
util rest of house													
	0.9844	0.9794	0.9659	0.9254	0.8272	0.6275	0.4217	0.4766	0.7661	0.9343	0.9753	0.9862	(89)
MIT 2	16.8900	17.1254	17.5956	18.3562	18.9523	19.3845	19.4754	19.4763	19.2287	18.5074	17.6790	16.9718	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.1642	18.3538	18.7361	19.3488	19.8523	20.2298	20.3355	20.3243	20.0794	19.4667	18.7909	18.2194	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1642	18.3538	18.7361	19.3488	19.8523	20.2298	20.3355	20.3243	20.0794	19.4667	18.7909	18.2194	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9748	0.9610	0.9241	0.8444	0.6912	0.5278	0.5797	0.8075	0.9349	0.9714	0.9825	(94)
Useful gains	386.7103	406.4920	426.7624	445.4562	433.2341	351.1133	255.1860	260.3270	332.6625	358.4191	364.7242	374.3838	(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													
	1134.7163	1091.0395	983.1138	800.4451	618.6252	408.2687	270.8955	282.1446	441.3717	672.8374	904.2360	1105.3619	(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													
	556.5165	460.0159	413.9255	255.5920	137.9310	0.0000	0.0000	0.0000	0.0000	233.9272	388.4485	543.8477	(98)
Space heating												2990.2042	(98)
Space heating per m2											(98) / (4) =	72.8607	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2990.2042	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	556.5165	460.0159	413.9255	255.5920	137.9310	0.0000	0.0000	0.0000	0.0000	233.9272	388.4485	543.8477	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	556.5165	460.0159	413.9255	255.5920	137.9310	0.0000	0.0000	0.0000	0.0000	233.9272	388.4485	543.8477	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												2990.2042	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.4358	(232)
Total delivered energy for all uses												4618.7075	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2990.2042	13.1900	394.4079	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	13.1900	187.3069	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.4358	13.1900	27.4927	(250)
Additional standing charges			0.0000	(251)
Total energy cost			609.2075	(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] =	2.9738	(257)
SAP value		58.5153	
SAP rating (Section 12)		59	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2990.2042	0.5190	1551.9160	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			2288.9310	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	0.5190	108.1782	(268)
Total kg/year			2397.1092	(272)
CO2 emissions per m2			58.4100	(273)
EI value			62.6671	
EI rating			63	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	41.0400 (1b)	x	2.5000 (2b)	=	102.6000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.0400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	102.6000	(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							3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.2924	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		1.0424	(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) =	0.8860	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	1.0189	0.9746	0.9968	0.8860	0.8860	0.7753	0.7974	0.7974	0.8417	0.8860	0.8639	0.9525	(22b)
Effective ac	1.0189	0.9750	0.9968	0.8925	0.8925	0.8005	0.8180	0.8180	0.8543	0.8925	0.8732	0.9536	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 2.80)			5.9100	2.5180	14.8813			(27)
External Wall	29.7500	5.9100	23.8400	0.6000	14.3040			(29a)
External Wall - lobby	5.2800	2.1000	3.1800	0.4769	1.5167			(29a)
External Roof	12.4500		12.4500	0.1600	1.9920			(30)
Total net area of external elements Aum(A, m2)			47.4800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.4740			(33)
Party Wall 1			30.6000	0.0000	0.0000			(32)
Party Floor 1			41.0400					(32d)
Party Ceilings 1			28.5900					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	7.1220	(36)
Total fabric heat loss (33) + (36) =	43.5960	(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	34.4994	33.0103	33.7496	30.2193	30.2193	27.1044	27.6942	27.6942	28.9235	30.2193	29.5631	32.2876	(38)
Heat transfer coeff	78.0954	76.6063	77.3456	73.8153	73.8153	70.7004	71.2902	71.2902	72.5195	73.8153	73.1591	75.8836	(39)
Average = Sum(39)m / 12 =												74.0280	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9029	1.8666	1.8846	1.7986	1.7986	1.7227	1.7371	1.7371	1.7670	1.7986	1.7826	1.8490	(40)
HLP (average)												1.8038	(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	1.4342 (42)
Average daily hot water use (litres/day)	68.2633 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.0896	72.3591	69.6286	66.8980	64.1675	61.4370	61.4370	64.1675	66.8980	69.6286	72.3591	75.0896	(44)
Energy conte	111.3557	97.3924	100.5003	87.6186	84.0721	72.5478	67.2262	77.1431	78.0644	90.9766	99.3080	107.8421	(45)
Energy content (annual)										Total = Sum(45)m =		1074.0475	(45)
Distribution loss (46)m = 0.15 x (45)m	16.7034	14.6089	15.0750	13.1428	12.6108	10.8822	10.0839	11.5715	11.7097	13.6465	14.8962	16.1763	(46)
Water storage loss:													
Store volume												110.0000	(47)

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

a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 0.9480 (55)
Total storage loss
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (56)
If cylinder contains dedicated solar storage
29.3880 26.5440 29.3880 28.4400 29.3880 28.4400 29.3880 29.3880 28.4400 29.3880 28.4400 29.3880 (57)
Primary 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 (59)
Total heat required for water heating calculated for each month
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (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
140.7437 123.9364 129.8883 116.0586 113.4601 100.9878 96.6142 106.5311 106.5044 120.3646 127.7480 137.2301 (64)
Total per year (kWh/year) = Sum(64)m = 1420.0675 (64)
Heat gains from water heating, kWh/month
60.5362 53.6182 56.9267 51.8852 51.4644 46.8742 45.8631 49.1605 48.7084 53.7601 55.7719 59.3679 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	86.0546	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	29.5062	26.2072	21.3131	16.1354	12.0614	10.1827	11.0028	14.3019	19.1959	24.3737	28.4477	30.3263	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.3099	187.2329	182.3871	172.0711	159.0490	146.8101	138.6337	136.7108	141.5565	151.8725	164.8946	177.1336	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	45.0397	(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)													
	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	-57.3698	(71)
Water heating gains (Table 5)													
	81.3658	79.7890	76.5144	72.0627	69.1726	65.1030	61.6440	66.0759	67.6506	72.2582	77.4610	79.7956	(72)
Total internal gains													
	369.9066	366.9536	353.9393	333.9939	314.0076	295.8204	285.0051	290.8132	302.1276	322.2290	344.5279	360.9801	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	5.9100	12.9280	0.7600	0.7000	0.7700	28.1686	(81)

Solar gains	28.1686	52.7758	93.5260	157.4534	205.1835	233.4567	215.2581	175.0858	122.2762	67.7746	36.3692	22.7430	(83)
Total gains	398.0752	419.7295	447.4652	491.4473	519.1911	529.2771	500.2632	465.8990	424.4039	390.0036	380.8971	383.7230	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.4938	37.2032	36.8476	38.6099	38.6099	40.3109	39.9775	39.9775	39.2998	38.6099	38.9562	37.5575	
alpha	3.4329	3.4802	3.4565	3.5740	3.5740	3.6874	3.6652	3.6652	3.6200	3.5740	3.5971	3.5038	
util living area													
	0.9877	0.9841	0.9724	0.9378	0.8594	0.6692	0.5021	0.5333	0.8172	0.9476	0.9802	0.9889	(86)
MIT	19.1981	19.3550	19.6770	20.1757	20.5838	20.8989	20.9740	20.9684	20.7586	20.2608	19.7245	19.2287	(87)
Th 2	19.3988	19.4237	19.4113	19.4710	19.4710	19.5246	19.5144	19.5144	19.4932	19.4710	19.4822	19.4359	(88)
util rest of house													
	0.9833	0.9784	0.9614	0.9113	0.7941	0.5323	0.3124	0.3346	0.7087	0.9189	0.9719	0.9850	(89)
MIT 2	17.1231	17.3653	17.8224	18.5629	19.0981	19.4732	19.5096	19.5083	19.3302	18.6930	17.9382	17.1899	(90)
Living area fraction									fLA = Living area / (4) =			0.5865	(91)
MIT	18.3401	18.5323	18.9101	19.5088	19.9695	20.3094	20.3685	20.3646	20.1680	19.6125	18.9859	18.3856	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3401	18.5323	18.9101	19.5088	19.9695	20.3094	20.3685	20.3646	20.1680	19.6125	18.9859	18.3856	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9793	0.9740	0.9568	0.9121	0.8185	0.6098	0.4251	0.4530	0.7636	0.9222	0.9682	0.9813	(94)
Useful gains	389.8244	408.7991	428.1483	448.2320	424.9470	322.7500	212.6865	211.0315	324.0884	359.6792	368.7855	376.5640	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1080.8446	1036.6588	928.9308	753.5678	573.5046	354.1644	218.7511	218.4793	403.7886	628.3526	847.6122	1053.6931	(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													
	514.1190	421.9217	372.5821	219.8418	110.5269	0.0000	0.0000	0.0000	0.0000	199.8930	344.7552	503.7841	(98)
Space heating												2687.4238	(98)
Space heating per m2											(98) / (4) =	65.4830	(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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2687.4238	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	514.1190	421.9217	372.5821	219.8418	110.5269	0.0000	0.0000	0.0000	0.0000	199.8930	344.7552	503.7841	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	514.1190	421.9217	372.5821	219.8418	110.5269	0.0000	0.0000	0.0000	0.0000	199.8930	344.7552	503.7841	(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													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	140.7437	123.9364	129.8883	116.0586	113.4601	100.9878	96.6142	106.5311	106.5044	120.3646	127.7480	137.2301	(219)
Water heating fuel used												1420.0675	(219)
Annual totals kWh/year													
Space heating fuel - main system												2687.4238	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												208.4358	(232)
Total delivered energy for all uses												4315.9271	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2687.4238	18.2700	490.9923	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1420.0675	18.2700	259.4463	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	208.4358	18.2700	38.0812	(250)
Additional standing charges			0.0000	(251)
Total energy cost			788.5199	(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	2687.4238	0.5190	1394.7730	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	0.5190	737.0150	(264)
Space and water heating			2131.7880	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	0.5190	108.1782	(268)
Total kg/year			2239.9662	(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	2687.4238	3.0700	8250.3912	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1420.0675	3.0700	4359.6072	(264)
Space and water heating			12609.9984	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	208.4358	3.0700	639.8980	(268)
Primary energy kWh/year			13249.8963	(272)
Primary energy kWh/m2/year			322.8532	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 59
Current environmental impact rating:	D 63

(For testing purposes):

A	Not considered
B	Not considered

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

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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 59
Potential environmental impact rating: D 63

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£789	£789	£0
Space heating	£491	£491	£0
Water heating	£259	£259	£0
Lighting	£38	£38	£0
Total cost of fuels	£789	£789	£0
Total cost of uses	£788	£788	£0
Delivered energy	105 kWh/m²	105 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.2 tonnes	2.2 tonnes	0.0 tonnes
CO2 emissions per m²	55 kg/m²	55 kg/m²	0 kg/m²
Primary energy	323 kWh/m²	323 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-21	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 2.08, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	59 D	**DER**	N/A	**TER**	N/A
Environmental	63 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.24	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	14.01 m	41.04 m²	2.50 m

7.0 Living Area	24.07	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall	Cavity Wall	Other	0.60	29.75	23.84
External Wall - lobby	Solid Wall	Other	0.60	5.28	3.18

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	30.60

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.16	12.45	12.45

10.1 Party Ceilings

Description	Construction	Area (m²)
Party Ceilings 1	Other	28.59

11.1 Party Floors

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	Construction	Area (m²)
Party Floor 1	Other	41.04

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double glazed			0.76		0.70	2.80

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	South East							2.10	
windows	Window	[1] External Wall	North West	None	0.00					5.91	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate
Night Ventilation	No
Air change rate	2.00

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Description	electric panel	

Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 3.01, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

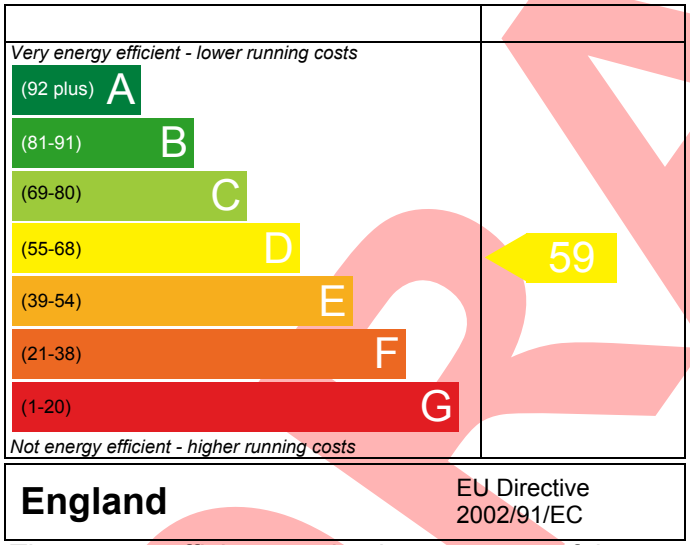
Unit 3.01, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	58.76 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

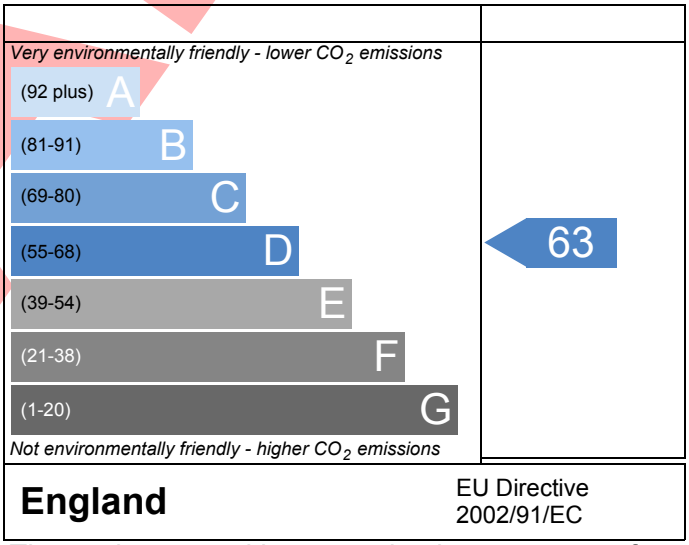
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-22	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 3.01, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	59 D	**DER**	N/A	**TER**	N/A
Environmental	63 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.64	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		58.7600 (1b)	x	2.9800 (2b)	=	175.1048	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.7600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.1048	(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) =	0.1142	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.8642	(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) =	0.7346	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8448	0.8080	0.8264	0.7346	0.7346	0.6428	0.6611	0.6611	0.6979	0.7346	0.7162	0.7897	(22b)
Effective ac	0.8568	0.8265	0.8415	0.7698	0.7698	0.7066	0.7185	0.7185	0.7435	0.7698	0.7565	0.8118	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			4.1100	1.5038	6.1805			(27)
roof light (Uw = 1.60)			3.4500	1.5038	5.1880			(27a)
External Wall - dwarf	17.1900		17.1900	0.2456	4.2221			(29a)
External Wall - lobby	16.2800	2.1000	14.1800	0.2499	3.5437			(29a)
External Wall -dormer	10.1800	4.1100	6.0700	0.2800	1.6996			(29a)
External Roof	30.9300		30.9300	0.1800	5.5674			(30)
External Roof - slope	32.7500	3.4500	29.3000	0.1800	5.2740			(30)
External Roof - dormer	5.9200		5.9200	0.1800	1.0656			(30)
Total net area of external elements Aum(A, m2)			113.2500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.5209			(33)
Party Wall 1			30.9500	0.0000	0.0000			(32)
Party Floor 1			58.7600					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	16.9875	(36)
Total fabric heat loss	(33) + (36) = 53.5084	(37)

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

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	49.5110	47.7570	48.6243	44.4830	44.4830	40.8289	41.5208	41.5208	42.9629	44.4830	43.7132	46.9093	(38)
Heat transfer coeff													
	103.0194	101.2654	102.1326	97.9914	97.9914	94.3373	95.0291	95.0291	96.4713	97.9914	97.2216	100.4177	(39)
Average = Sum(39)m / 12 =												98.2415	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7532	1.7234	1.7381	1.6677	1.6677	1.6055	1.6172	1.6172	1.6418	1.6677	1.6546	1.7089	(40)
HLP (average)												1.6719	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9464	(42)
Average daily hot water use (litres/day)												80.4262	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	88.4688	85.2518	82.0347	78.8177	75.6006	72.3836	72.3836	75.6006	78.8177	82.0347	85.2518	88.4688	(44)
Energy conte	131.1967	114.7455	118.4070	103.2301	99.0518	85.4741	79.2044	90.8882	91.9736	107.1864	117.0024	127.0570	(45)
Energy content (annual)										Total = Sum(45)m =		1265.4171	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.6795	17.2118	17.7611	15.4845	14.8578	12.8211	11.8807	13.6332	13.7960	16.0780	17.5504	19.0585	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	160.5847	141.2895	147.7950	131.6701	128.4398	113.9141	108.5924	120.2762	120.4136	136.5744	145.4424	156.4450	(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													
	160.5847	141.2895	147.7950	131.6701	128.4398	113.9141	108.5924	120.2762	120.4136	136.5744	145.4424	156.4450	(64)
								Total per year (kWh/year) = Sum(64)m =				1611.4371	(64)
RHI water heating demand												1611	(64)
Heat gains from water heating, kWh/month													
	67.1333	59.3881	62.8807	57.0760	56.4451	51.1722	49.8458	53.7307	53.3332	59.1499	61.6553	65.7568	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.5593	36.0244	29.2970	22.1797	16.5796	13.9972	15.1245	19.6594	26.3868	33.5041	39.1042	41.6866	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	253.4465	256.0764	249.4490	235.3399	217.5297	200.7906	189.6079	186.9779	193.6054	207.7145	225.5247	242.2637	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	(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)													
	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	(71)
Water heating gains (Table 5)													
	90.2329	88.3751	84.5171	79.2722	75.8671	71.0724	66.9971	72.2187	74.0739	79.5025	85.6323	88.3829	(72)
Total internal gains													
	471.7906	468.0278	450.8150	424.3437	397.5283	373.4121	359.2813	366.4078	381.6179	408.2729	437.8131	459.8851	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.1100	40.5720	0.6300	0.7000	0.7700	50.9613	(77)
Southeast	3.4500	44.8316	0.6300	0.7000	1.0000	61.3881	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	112.3493	182.9008	261.5457	354.5310	401.5418	432.2920	408.0485	369.5786	312.1794	217.0927	139.5159	94.1320	(83)
Total gains	584.1399	650.9287	712.3607	778.8748	799.0700	805.7041	767.3298	735.9865	693.7973	625.3656	577.3290	554.0171	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.6096	40.2957	39.9535	41.6420	41.6420	43.2550	42.9401	42.9401	42.2981	41.6420	41.9717	40.6358	
alpha	3.6406	3.6864	3.6636	3.7761	3.7761	3.8837	3.8627	3.8627	3.8199	3.7761	3.7981	3.7091	
util living area													
	0.9865	0.9790	0.9602	0.9116	0.8196	0.6138	0.4458	0.4629	0.7440	0.9228	0.9753	0.9885	(86)
MIT	19.3820	19.5774	19.9085	20.3625	20.6971	20.9363	20.9859	20.9840	20.8515	20.4260	19.8888	19.3909	(87)
Th 2	19.5029	19.5241	19.5136	19.5641	19.5641	19.6093	19.6007	19.6007	19.5828	19.5641	19.5736	19.5344	(88)

CALCULATION OF HEAT DEMAND 09 Jan 2014

util rest of house													
	0.9818	0.9718	0.9455	0.8782	0.7486	0.4864	0.2833	0.2951	0.6297	0.8856	0.9654	0.9845	(89)
MIT 2	17.4526	17.7474	18.2139	18.8757	19.3000	19.5776	19.5981	19.5977	19.4887	18.9746	18.2311	17.4856	(90)
Living area fraction									fLA = Living area / (4) =			0.5106	(91)
MIT	18.4376	18.6817	19.0791	19.6347	20.0133	20.2713	20.3066	20.3054	20.1845	19.7156	19.0774	18.4584	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4376	18.6817	19.0791	19.6347	20.0133	20.2713	20.3066	20.3054	20.1845	19.7156	19.0774	18.4584	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9772	0.9663	0.9401	0.8801	0.7734	0.5501	0.3672	0.3819	0.6828	0.8904	0.9608	0.9804	(94)
Useful gains	570.8220	628.9825	669.6925	685.4909	618.0041	443.1816	281.7370	281.0449	473.7101	556.8112	554.6962	543.1674	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1435.8463	1385.4851	1243.8802	1012.7158	765.6342	468.9782	285.7178	285.6041	538.7407	844.2526	1135.2976	1401.6677	(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													
	643.5780	508.3697	427.1957	235.6019	109.8368	0.0000	0.0000	0.0000	0.0000	213.8564	418.0330	638.7242	(98)
Space heating												3195.1958	(98)
RHI space heating demand												3195	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.7600 (1b)	x	2.9800 (2b)	=	175.1048	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.1048	(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) =	0.1142	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.8642	(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) =	0.7346	(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	0.9366	0.9182	0.8999	0.8080	0.7897	0.6979	0.6979	0.6795	0.7346	0.7897	0.8264	0.8631	(22b)
Effective ac	0.9386	0.9216	0.9049	0.8265	0.8118	0.7435	0.7435	0.7309	0.7698	0.8118	0.8415	0.8725	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			4.1100	1.5038	6.1805			(27)
roof light (Uw = 1.60)			3.4500	1.5038	5.1880			(27a)
External Wall - dwarf	17.1900		17.1900	0.2456	4.2221			(29a)
External Wall - lobby	16.2800	2.1000	14.1800	0.2499	3.5437			(29a)
External Wall -dormer	10.1800	4.1100	6.0700	0.2800	1.6996			(29a)
External Roof	30.9300		30.9300	0.1800	5.5674			(30)
External Roof - slope	32.7500	3.4500	29.3000	0.1800	5.2740			(30)
External Roof - dormer	5.9200		5.9200	0.1800	1.0656			(30)
Total net area of external elements Aum(A, m2)			113.2500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.5209			(33)
Party Wall 1			30.9500	0.0000	0.0000			(32)
Party Floor 1			58.7600					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	16.9875	(36)
Total fabric heat loss (33) + (36) =	53.5084	(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	54.2369	53.2528	52.2881	47.7570	46.9093	42.9629	42.9629	42.2321	44.4830	46.9093	48.6243	50.4172	(38)
Heat transfer coeff	107.7453	106.7611	105.7965	101.2654	100.4177	96.4713	96.4713	95.7405	97.9914	100.4177	102.1326	103.9256	(39)
Average = Sum(39)m / 12 =												101.2613	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8337	1.8169	1.8005	1.7234	1.7089	1.6418	1.6418	1.6293	1.6677	1.7089	1.7381	1.7686	(40)
HLP (average)												1.7233	(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	1.9464 (42)
Average daily hot water use (litres/day)	80.4262 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.4688	85.2518	82.0347	78.8177	75.6006	72.3836	72.3836	75.6006	78.8177	82.0347	85.2518	88.4688	(44)
Energy conte	131.1967	114.7455	118.4070	103.2301	99.0518	85.4741	79.2044	90.8882	91.9736	107.1864	117.0024	127.0570	(45)
Energy content (annual)										Total = Sum(45)m =		1265.4171	(45)

Distribution loss (46)m = 0.15 x (45)m

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	19.6795	17.2118	17.7611	15.4845	14.8578	12.8211	11.8807	13.6332	13.7960	16.0780	17.5504	19.0585	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	160.5847	141.2895	147.7950	131.6701	128.4398	113.9141	108.5924	120.2762	120.4136	136.5744	145.4424	156.4450	(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													
	160.5847	141.2895	147.7950	131.6701	128.4398	113.9141	108.5924	120.2762	120.4136	136.5744	145.4424	156.4450	(64)
									Total per year (kWh/year) = Sum(64)m =			1611.4371	(64)
Heat gains from water heating, kWh/month													
	67.1333	59.3881	62.8807	57.0760	56.4451	51.1722	49.8458	53.7307	53.3332	59.1499	61.6553	65.7568	(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	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.5593	36.0244	29.2970	22.1797	16.5796	13.9972	15.1245	19.6594	26.3868	33.5041	39.1042	41.6866	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	253.4465	256.0764	249.4490	235.3399	217.5297	200.7906	189.6079	186.9779	193.6054	207.7145	225.5247	242.2637	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	(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)													
	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	(71)
Water heating gains (Table 5)													
	90.2329	88.3751	84.5171	79.2722	75.8671	71.0724	66.9971	72.2187	74.0739	79.5025	85.6323	88.3829	(72)
Total internal gains													
	471.7906	468.0278	450.8150	424.3437	397.5283	373.4121	359.2813	366.4078	381.6179	408.2729	437.8131	459.8851	(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	
Southeast	4.1100	36.7938	0.6300	0.7000	0.7700	46.2156	(77)
Southeast	3.4500	39.9751	0.6300	0.7000	1.0000	54.7382	(82)

Solar gains	100.9538	179.3430	261.2263	344.0745	399.5630	401.7182	385.2875	343.9056	290.3341	202.8471	122.3548	85.4171	(83)
Total gains	572.7443	647.3708	712.0413	768.4182	797.0912	775.1303	744.5688	710.3134	671.9521	611.1200	560.1679	545.3022	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.8722	38.2214	38.5699	40.2957	40.6358	42.2981	42.2981	42.6210	41.6420	40.6358	39.9535	39.2642	
alpha	3.5248	3.5481	3.5713	3.6864	3.7091	3.8199	3.8199	3.8414	3.7761	3.7091	3.6636	3.6176	
util living area													
	0.9879	0.9803	0.9644	0.9248	0.8451	0.6945	0.5394	0.5783	0.7931	0.9382	0.9797	0.9897	(86)
MIT	19.2467	19.4547	19.7891	20.2552	20.6225	20.8840	20.9665	20.9565	20.7908	20.3168	19.7428	19.2673	(87)
Th 2	19.4465	19.4582	19.4697	19.5241	19.5344	19.5828	19.5828	19.5919	19.5641	19.5344	19.5136	19.4920	(88)
util rest of house													
	0.9837	0.9734	0.9514	0.8958	0.7825	0.5780	0.3801	0.4205	0.6931	0.9082	0.9714	0.9862	(89)
MIT 2	17.2220	17.5293	18.0156	18.7028	19.1881	19.5126	19.5727	19.5770	19.4150	18.8075	17.9834	17.2799	(90)
Living area fraction									fLA = Living area / (4) =			0.5106	(91)
MIT	18.2558	18.5123	18.9211	19.4954	19.9204	20.2127	20.2843	20.2813	20.1174	19.5780	18.8816	18.2946	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2558	18.5123	18.9211	19.4954	19.9204	20.2127	20.2843	20.2813	20.1174	19.5780	18.8816	18.2946	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9791	0.9677	0.9453	0.8952	0.8012	0.6335	0.4621	0.5015	0.7362	0.9093	0.9666	0.9822	(94)
Useful gains	560.7853	626.4709	673.1088	687.8562	638.6296	491.0623	344.0868	356.2188	494.6646	555.6954	541.4523	535.6080	(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													
	1503.6672	1453.2662	1314.1049	1072.9457	825.4748	541.4673	355.4282	371.5948	589.6542	901.5541	1203.2906	1464.7861	(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													
	701.5041	555.6064	476.9011	277.2644	139.0128	0.0000	0.0000	0.0000	0.0000	257.3189	476.5236	691.3085	(98)
Space heating												3575.4399	(98)
Space heating per m2											(98) / (4) =	60.8482	(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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3575.4399	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	701.5041	555.6064	476.9011	277.2644	139.0128	0.0000	0.0000	0.0000	0.0000	257.3189	476.5236	691.3085	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	701.5041	555.6064	476.9011	277.2644	139.0128	0.0000	0.0000	0.0000	0.0000	257.3189	476.5236	691.3085	(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													
	160.5847	141.2895	147.7950	131.6701	128.4398	113.9141	108.5924	120.2762	120.4136	136.5744	145.4424	156.4450	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	160.5847	141.2895	147.7950	131.6701	128.4398	113.9141	108.5924	120.2762	120.4136	136.5744	145.4424	156.4450	(219)
Water heating fuel used												1611.4371	(219)
Annual totals kWh/year													
Space heating fuel - main system												3575.4399	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												286.5161	(232)
Total delivered energy for all uses												5473.3931	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3575.4399	13.1900	471.6005	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1611.4371	13.1900	212.5486	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	286.5161	13.1900	37.7915	(250)
Additional standing charges			0.0000	(251)
Total energy cost			721.9406	(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] =	2.9223	(257)
SAP value		59.2343	
SAP rating (Section 12)		59	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3575.4399	0.5190	1855.6533	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1611.4371	0.5190	836.3358	(264)
Space and water heating			2691.9892	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	286.5161	0.5190	148.7019	(268)
Total kg/year			2840.6910	(272)
CO2 emissions per m2			48.3400	(273)
EI value			63.3141	
EI rating			63	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.7600 (1b)	x	2.9800 (2b)	=	175.1048	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	175.1048	(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) =	0.1142	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.8642	(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) =	0.7346	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8448	0.8080	0.8264	0.7346	0.7346	0.6428	0.6611	0.6611	0.6979	0.7346	0.7162	0.7897	(22b)
Effective ac	0.8568	0.8265	0.8415	0.7698	0.7698	0.7066	0.7185	0.7185	0.7435	0.7698	0.7565	0.8118	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			4.1100	1.5038	6.1805			(27)
roof light (Uw = 1.60)			3.4500	1.5038	5.1880			(27a)
External Wall - dwarf	17.1900		17.1900	0.2456	4.2221			(29a)
External Wall - lobby	16.2800	2.1000	14.1800	0.2499	3.5437			(29a)
External Wall -dormer	10.1800	4.1100	6.0700	0.2800	1.6996			(29a)
External Roof	30.9300		30.9300	0.1800	5.5674			(30)
External Roof - slope	32.7500	3.4500	29.3000	0.1800	5.2740			(30)
External Roof - dormer	5.9200		5.9200	0.1800	1.0656			(30)
Total net area of external elements Aum(A, m2)			113.2500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.5209			(33)
Party Wall 1			30.9500	0.0000	0.0000			(32)
Party Floor 1			58.7600					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	16.9875	(36)
Total fabric heat loss	(33) + (36) = 53.5084	(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	49.5110	47.7570	48.6243	44.4830	44.4830	40.8289	41.5208	41.5208	42.9629	44.4830	43.7132	46.9093	(38)
Heat transfer coeff	103.0194	101.2654	102.1326	97.9914	97.9914	94.3373	95.0291	95.0291	96.4713	97.9914	97.2216	100.4177	(39)
Average = Sum(39)m / 12 =												98.2415	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7532	1.7234	1.7381	1.6677	1.6677	1.6055	1.6172	1.6172	1.6418	1.6677	1.6546	1.7089	(40)
HLP (average)												1.6719	(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	1.9464 (42)
Average daily hot water use (litres/day)	80.4262 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.4688	85.2518	82.0347	78.8177	75.6006	72.3836	72.3836	75.6006	78.8177	82.0347	85.2518	88.4688	(44)
Energy conte	131.1967	114.7455	118.4070	103.2301	99.0518	85.4741	79.2044	90.8882	91.9736	107.1864	117.0024	127.0570	(45)
Energy content (annual)											Total = Sum(45)m =	1265.4171	(45)

Distribution loss (46)m = 0.15 x (45)m

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

	19.6795	17.2118	17.7611	15.4845	14.8578	12.8211	11.8807	13.6332	13.7960	16.0780	17.5504	19.0585	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	160.5847	141.2895	147.7950	131.6701	128.4398	113.9141	108.5924	120.2762	120.4136	136.5744	145.4424	156.4450	(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													
	160.5847	141.2895	147.7950	131.6701	128.4398	113.9141	108.5924	120.2762	120.4136	136.5744	145.4424	156.4450	(64)
									Total per year (kWh/year) = Sum(64)m =			1611.4371	(64)
Heat gains from water heating, kWh/month													
	67.1333	59.3881	62.8807	57.0760	56.4451	51.1722	49.8458	53.7307	53.3332	59.1499	61.6553	65.7568	(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	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	116.7819	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.5593	36.0244	29.2970	22.1797	16.5796	13.9972	15.1245	19.6594	26.3868	33.5041	39.1042	41.6866	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	253.4465	256.0764	249.4490	235.3399	217.5297	200.7906	189.6079	186.9779	193.6054	207.7145	225.5247	242.2637	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	48.6246	(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)													
	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	-77.8546	(71)
Water heating gains (Table 5)													
	90.2329	88.3751	84.5171	79.2722	75.8671	71.0724	66.9971	72.2187	74.0739	79.5025	85.6323	88.3829	(72)
Total internal gains													
	471.7906	468.0278	450.8150	424.3437	397.5283	373.4121	359.2813	366.4078	381.6179	408.2729	437.8131	459.8851	(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	
Southeast	4.1100	40.5720	0.6300	0.7000	0.7700	50.9613	(77)
Southeast	3.4500	44.8316	0.6300	0.7000	1.0000	61.3881	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	112.3493	182.9008	261.5457	354.5310	401.5418	432.2920	408.0485	369.5786	312.1794	217.0927	139.5159	94.1320	(83)
Total gains	584.1399	650.9287	712.3607	778.8748	799.0700	805.7041	767.3298	735.9865	693.7973	625.3656	577.3290	554.0171	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.6096	40.2957	39.9535	41.6420	41.6420	43.2550	42.9401	42.9401	42.2981	41.6420	41.9717	40.6358	
alpha	3.6406	3.6864	3.6636	3.7761	3.7761	3.8837	3.8627	3.8627	3.8199	3.7761	3.7981	3.7091	
util living area													
	0.9865	0.9790	0.9602	0.9116	0.8196	0.6138	0.4458	0.4629	0.7440	0.9228	0.9753	0.9885	(86)
MIT	19.3820	19.5774	19.9085	20.3625	20.6971	20.9363	20.9859	20.9840	20.8515	20.4260	19.8888	19.3909	(87)
Th 2	19.5029	19.5241	19.5136	19.5641	19.5641	19.6093	19.6007	19.6007	19.5828	19.5641	19.5736	19.5344	(88)
util rest of house													
	0.9818	0.9718	0.9455	0.8782	0.7486	0.4864	0.2833	0.2951	0.6297	0.8856	0.9654	0.9845	(89)
MIT 2	17.4526	17.7474	18.2139	18.8757	19.3000	19.5776	19.5981	19.5977	19.4887	18.9746	18.2311	17.4856	(90)
Living area fraction									fLA = Living area / (4) =			0.5106	(91)
MIT	18.4376	18.6817	19.0791	19.6347	20.0133	20.2713	20.3066	20.3054	20.1845	19.7156	19.0774	18.4584	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4376	18.6817	19.0791	19.6347	20.0133	20.2713	20.3066	20.3054	20.1845	19.7156	19.0774	18.4584	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9772	0.9663	0.9401	0.8801	0.7734	0.5501	0.3672	0.3819	0.6828	0.8904	0.9608	0.9804	(94)
Useful gains	570.8220	628.9825	669.6925	685.4909	618.0041	443.1816	281.7370	281.0449	473.7101	556.8112	554.6962	543.1674	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1435.8463	1385.4851	1243.8802	1012.7158	765.6342	468.9782	285.7178	285.6041	538.7407	844.2526	1135.2976	1401.6677	(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													
	643.5780	508.3697	427.1957	235.6019	109.8368	0.0000	0.0000	0.0000	0.0000	213.8564	418.0330	638.7242	(98)
Space heating												3195.1958	(98)
Space heating per m2											(98) / (4) =	54.3771	(99)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)
Space heating requirement	3195.1958 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	643.5780	508.3697	427.1957	235.6019	109.8368	0.0000	0.0000	0.0000	0.0000	213.8564	418.0330	638.7242	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	643.5780	508.3697	427.1957	235.6019	109.8368	0.0000	0.0000	0.0000	0.0000	213.8564	418.0330	638.7242	(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													
	160.5847	141.2895	147.7950	131.6701	128.4398	113.9141	108.5924	120.2762	120.4136	136.5744	145.4424	156.4450	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	160.5847	141.2895	147.7950	131.6701	128.4398	113.9141	108.5924	120.2762	120.4136	136.5744	145.4424	156.4450	(219)
Water heating fuel used												1611.4371	(219)
Annual totals kWh/year													
Space heating fuel - main system												3195.1958	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												286.5161	(232)
Total delivered energy for all uses												5093.1490	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3195.1958	18.2700	583.7623	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1611.4371	18.2700	294.4096	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	286.5161	18.2700	52.3465	(250)
Additional standing charges			0.0000	(251)
Total energy cost			930.5183	(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	3195.1958	0.5190	1658.3066	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1611.4371	0.5190	836.3358	(264)
Space and water heating			2494.6425	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	286.5161	0.5190	148.7019	(268)
Total kg/year			2643.3443	(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	3195.1958	3.0700	9809.2511	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1611.4371	3.0700	4947.1119	(264)
Space and water heating			14756.3629	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	286.5161	3.0700	879.6045	(268)
Primary energy kWh/year			15635.9675	(272)
Primary energy kWh/m2/year			266.0988	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 59
Current environmental impact rating:	D 63

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

(For testing purposes):

A		Not considered
B		Not considered
C		Not considered
D		Not considered
E	Low energy lighting	Already installed
F		Not considered
G		Not considered
H		Not considered
I		Not considered
J		Not considered
K		Not considered
M		Not considered
N	Solar water heating	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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 59
Potential environmental impact rating: D 63

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£931	£931	£0
Space heating	£584	£584	£0
Water heating	£294	£294	£0
Lighting	£52	£52	£0
Total cost of fuels	£931	£931	£0
Total cost of uses	£930	£930	£0
Delivered energy	87 kWh/m²	87 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.6 tonnes	2.6 tonnes	0.0 tonnes
CO2 emissions per m²	45 kg/m²	45 kg/m²	0 kg/m²
Primary energy	266 kWh/m²	266 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-22	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 3.01, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	59 D	**DER**	N/A	**TER**	N/A
Environmental	63 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.64	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	23.35 m	58.76 m²	2.98 m

7.0 Living Area	30.00	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall - dwarf	Timber Frame	Timber framed wall (one layer of plasterboard)	0.28	17.19	17.19
External Wall - lobby	Solid Wall	Other	0.28	16.28	14.18
External Wall -dormer	Timber Frame	Timber framed wall (one layer of plasterboard)	0.28	10.18	6.07

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	30.95

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof	External Flat Roof	Plasterboard, insulated flat roof	0.18	30.93	30.93
External Roof - slope	External Slope Roof	Plasterboard, insulated slope	0.18	32.75	29.30
External Roof - dormer	External Flat Roof	Plasterboard, insulated flat roof	0.18	5.92	5.92

11.1 Party Floors

Description	Construction	Area (m²)
Party Floor 1	Other	58.76

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

HIBEC

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.60
roof light	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.60

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	South West							2.10	
windows	Window	[3] External Wall - dormer	South East	None	0.00					4.11	
roof lights	Roof Window	[2] External Roof - slope	South East	None						3.45	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate
Night Ventilation	No
Air change rate	2.00

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 3.02, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

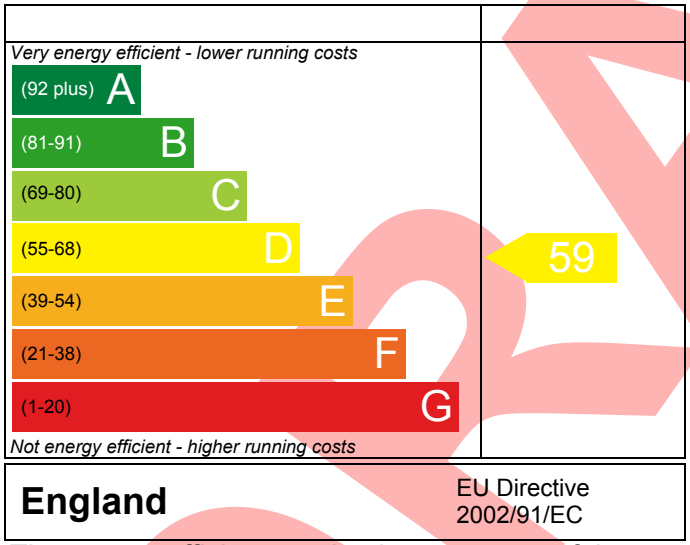
Unit 3.02, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	71.4 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

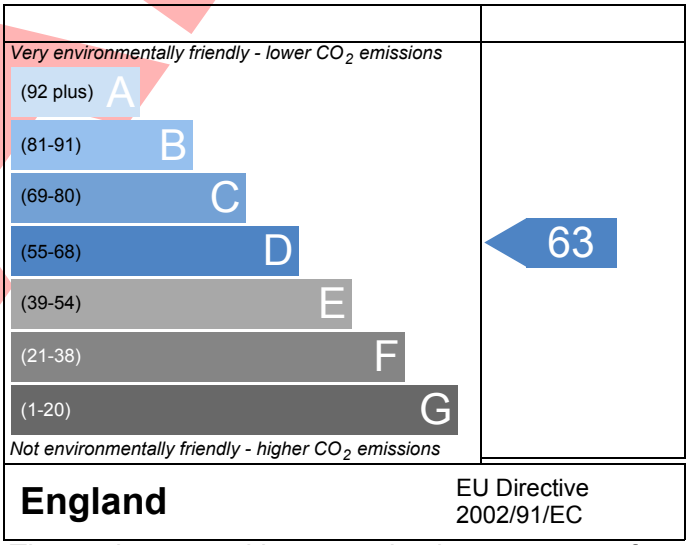
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-23	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 3.02, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	59 D	**DER**	N/A	**TER**	N/A
Environmental	63 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.96	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.4000 (1b)	x	2.9000 (2b)	=	207.0600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	207.0600	(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) =	0.0966	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.8466	(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) =	0.7196	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8275	0.7916	0.8096	0.7196	0.7196	0.6297	0.6476	0.6476	0.6836	0.7196	0.7016	0.7736	(22b)
Effective ac	0.8424	0.8133	0.8277	0.7589	0.7589	0.6982	0.7097	0.7097	0.7337	0.7589	0.7461	0.7992	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			4.1100	1.5038	6.1805			(27)
roof light (Uw = 1.60)			3.4500	1.5038	5.1880			(27a)
External Wall - dwarf	19.4900		19.4900	0.2456	4.7870			(29a)
External Wall - lobby	12.5000	2.1000	10.4000	0.2499	2.5991			(29a)
External Wall -dormer	10.1800	4.1100	6.0700	0.2800	1.6996			(29a)
External Roof	47.7000		47.7000	0.1800	8.5860			(30)
External Roof - slope	27.0100	3.4500	23.5600	0.1800	4.2408			(30)
External Roof - dormer	5.9200		5.9200	0.1800	1.0656			(30)
Total net area of external elements Aum(A, m2)			122.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.1265			(33)
Party Wall 1			43.5000	0.0000	0.0000			(32)
Party Floor 1			71.4000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	18.4200	(36)
Total fabric heat loss (33) + (36) =	56.5465	(37)

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

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	57.5619	55.5716	56.5557	51.8564	51.8564	47.7100	48.4950	48.4950	50.1315	51.8564	50.9829	54.6096	(38)
Heat transfer coeff													
	114.1084	112.1181	113.1022	108.4029	108.4029	104.2565	105.0415	105.0415	106.6780	108.4029	107.5294	111.1561	(39)
Average = Sum(39)m / 12 =												108.6867	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5982	1.5703	1.5841	1.5182	1.5182	1.4602	1.4712	1.4712	1.4941	1.5182	1.5060	1.5568	(40)
HLP (average)												1.5222	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2796	(42)
Average daily hot water use (litres/day)												88.3412	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	97.1753	93.6416	90.1080	86.5743	83.0407	79.5070	79.5070	83.0407	86.5743	90.1080	93.6416	97.1753	(44)
Energy conte	144.1081	126.0379	130.0598	113.3893	108.7997	93.8859	86.9991	99.8327	101.0250	117.7349	128.5169	139.5610	(45)
Energy content (annual)										Total = Sum(45)m =		1389.9505	(45)
Distribution loss (46)m = 0.15 x (45)m													
	21.6162	18.9057	19.5090	17.0084	16.3200	14.0829	13.0499	14.9749	15.1538	17.6602	19.2775	20.9342	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	173.4961	152.5819	159.4478	141.8293	138.1877	122.3259	116.3871	129.2207	129.4650	147.1229	156.9569	168.9490	(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													
	173.4961	152.5819	159.4478	141.8293	138.1877	122.3259	116.3871	129.2207	129.4650	147.1229	156.9569	168.9490	(64)
									Total per year (kWh/year) = Sum(64)m =			1735.9705	(64)
RHI water heating demand												1736	(64)
Heat gains from water heating, kWh/month													
	71.4264	63.1428	66.7553	60.4539	59.6863	53.9691	52.4376	56.7048	56.3428	62.6573	65.4839	69.9144	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	50.0051	44.4141	36.1200	27.3451	20.4408	17.2570	18.6468	24.2378	32.5319	41.3068	48.2111	51.3949	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.3168	302.4228	294.5958	277.9332	256.8996	237.1310	223.9243	220.8183	228.6453	245.3079	266.3415	286.1101	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	(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)													
	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	(71)
Water heating gains (Table 5)													
	96.0032	93.9625	89.7249	83.9638	80.2235	74.9570	70.4806	76.2161	78.2539	84.2168	90.9498	93.9710	(72)
Total internal gains													
	541.8750	537.3493	516.9906	485.7921	454.1139	425.8949	409.6017	417.8222	435.9811	467.3814	502.0524	528.0260	(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	
Southeast	4.1100	40.5720	0.6300	0.7000	0.7700	50.9613	(77)
Southeast	3.4500	44.8316	0.6300	0.7000	1.0000	61.3881	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	112.3493	182.9008	261.5457	354.5310	401.5418	432.2920	408.0485	369.5786	312.1794	217.0927	139.5159	94.1320	(83)
Total gains	654.2244	720.2501	778.5363	840.3231	855.6557	858.1869	817.6502	787.4008	748.1605	684.4741	641.5683	622.1581	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.4528	44.2242	43.8394	45.7399	45.7399	47.5590	47.2036	47.2036	46.4794	45.7399	46.1114	44.6069	
alpha	3.8969	3.9483	3.9226	4.0493	4.0493	4.1706	4.1469	4.1469	4.0986	4.0493	4.0741	3.9738	
util living area													
	0.9893	0.9835	0.9683	0.9272	0.8430	0.6384	0.4637	0.4799	0.7655	0.9346	0.9801	0.9910	(86)
MIT	19.4975	19.6737	19.9750	20.3970	20.7132	20.9422	20.9881	20.9866	20.8638	20.4657	19.9703	19.5090	(87)
Th 2	19.6147	19.6352	19.6250	19.6738	19.6738	19.7175	19.7092	19.7092	19.6919	19.6738	19.6830	19.6452	(88)

CALCULATION OF HEAT DEMAND 09 Jan 2014

util rest of house													
	0.9857	0.9779	0.9567	0.8992	0.7795	0.5173	0.3078	0.3194	0.6595	0.9029	0.9721	0.9878	(89)
MIT 2	17.6913	17.9592	18.3852	19.0077	19.4153	19.6873	19.7067	19.7064	19.6017	19.1116	18.4218	17.7280	(90)
Living area fraction										fLA = Living area / (4) =		0.5438	(91)
MIT	18.6736	18.8916	19.2498	19.7632	20.1211	20.3698	20.4036	20.4026	20.2880	19.8480	19.2640	18.6966	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6736	18.8916	19.2498	19.7632	20.1211	20.3698	20.4036	20.4026	20.2880	19.8480	19.2640	18.6966	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9823	0.9738	0.9526	0.9014	0.8034	0.5818	0.3934	0.4076	0.7121	0.9079	0.9688	0.9849	(94)
Useful gains	642.6350	701.4085	741.6637	757.4591	687.4028	499.2716	321.6416	320.9225	532.7373	621.4673	621.5700	612.7354	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1617.3236	1557.5021	1396.7921	1134.2460	858.6755	528.5552	326.0081	325.8998	606.7894	948.3106	1275.7241	1578.0349	(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													
	725.1683	575.2949	487.4155	271.2866	127.4269	0.0000	0.0000	0.0000	0.0000	243.1715	470.9909	718.1828	(98)
Space heating												3618.9374	(98)
RHI space heating demand												3619	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.4000 (1b)	x	2.9000 (2b)	=	207.0600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	207.0600	(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) =	0.0966	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.8466	(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) =	0.7196	(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	0.9175	0.8995	0.8815	0.7916	0.7736	0.6836	0.6836	0.6656	0.7196	0.7736	0.8096	0.8455	(22b)
Effective ac	0.9209	0.9046	0.8885	0.8133	0.7992	0.7337	0.7337	0.7215	0.7589	0.7992	0.8277	0.8575	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			4.1100	1.5038	6.1805			(27)
roof light (Uw = 1.60)			3.4500	1.5038	5.1880			(27a)
External Wall - dwarf	19.4900		19.4900	0.2456	4.7870			(29a)
External Wall - lobby	12.5000	2.1000	10.4000	0.2499	2.5991			(29a)
External Wall -dormer	10.1800	4.1100	6.0700	0.2800	1.6996			(29a)
External Roof	47.7000		47.7000	0.1800	8.5860			(30)
External Roof - slope	27.0100	3.4500	23.5600	0.1800	4.2408			(30)
External Roof - dormer	5.9200		5.9200	0.1800	1.0656			(30)
Total net area of external elements Aum(A, m2)			122.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.1265			(33)
Party Wall 1			43.5000	0.0000	0.0000			(32)
Party Floor 1			71.4000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	18.4200	(36)
Total fabric heat loss	(33) + (36) = 56.5465	(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	62.9246	61.8079	60.7132	55.5716	54.6096	50.1315	50.1315	49.3022	51.8564	54.6096	56.5557	58.5902	(38)
Heat transfer coeff	119.4712	118.3544	117.2597	112.1181	111.1561	106.6780	106.6780	105.8487	108.4029	111.1561	113.1022	115.1367	(39)
Average = Sum(39)m / 12 =												112.1135	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6733	1.6576	1.6423	1.5703	1.5568	1.4941	1.4941	1.4825	1.5182	1.5568	1.5841	1.6126	(40)
HLP (average)												1.5702	(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	2.2796 (42)
Average daily hot water use (litres/day)	88.3412 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.1753	93.6416	90.1080	86.5743	83.0407	79.5070	79.5070	83.0407	86.5743	90.1080	93.6416	97.1753	(44)
Energy conte	144.1081	126.0379	130.0598	113.3893	108.7997	93.8859	86.9991	99.8327	101.0250	117.7349	128.5169	139.5610	(45)
Energy content (annual)										Total = Sum(45)m =		1389.9505	(45)

Distribution loss (46)m = 0.15 x (45)m

	21.6162	18.9057	19.5090	17.0084	16.3200	14.0829	13.0499	14.9749	15.1538	17.6602	19.2775	20.9342	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	173.4961	152.5819	159.4478	141.8293	138.1877	122.3259	116.3871	129.2207	129.4650	147.1229	156.9569	168.9490	(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													
	173.4961	152.5819	159.4478	141.8293	138.1877	122.3259	116.3871	129.2207	129.4650	147.1229	156.9569	168.9490	(64)
								Total per year (kWh/year) = Sum(64)m =				1735.9705	(64)
Heat gains from water heating, kWh/month													
	71.4264	63.1428	66.7553	60.4539	59.6863	53.9691	52.4376	56.7048	56.3428	62.6573	65.4839	69.9144	(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	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	50.0051	44.4141	36.1200	27.3451	20.4408	17.2570	18.6468	24.2378	32.5319	41.3068	48.2111	51.3949	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.3168	302.4228	294.5958	277.9332	256.8996	237.1310	223.9243	220.8183	228.6453	245.3079	266.3415	286.1101	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	(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)													
	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	(71)
Water heating gains (Table 5)													
	96.0032	93.9625	89.7249	83.9638	80.2235	74.9570	70.4806	76.2161	78.2539	84.2168	90.9498	93.9710	(72)
Total internal gains													
	541.8750	537.3493	516.9906	485.7921	454.1139	425.8949	409.6017	417.8222	435.9811	467.3814	502.0524	528.0260	(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	
Southeast	4.1100	36.7938	0.6300	0.7000	0.7700	46.2156	(77)
Southeast	3.4500	39.9751	0.6300	0.7000	1.0000	54.7382	(82)

Solar gains	100.9538	179.3430	261.2263	344.0745	399.5630	401.7182	385.2875	343.9056	290.3341	202.8471	122.3548	85.4171	(83)
Total gains	642.8288	716.6923	778.2169	829.8665	853.6769	827.6131	794.8892	761.7278	726.3152	670.2285	624.4072	613.4432	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.5023	41.8940	42.2851	44.2242	44.6069	46.4794	46.4794	46.8436	45.7399	44.6069	43.8394	43.0647	
alpha	3.7668	3.7929	3.8190	3.9483	3.9738	4.0986	4.0986	4.1229	4.0493	3.9738	3.9226	3.8710	
util living area													
	0.9904	0.9846	0.9719	0.9389	0.8674	0.7200	0.5605	0.5987	0.8136	0.9484	0.9837	0.9920	(86)
MIT	19.3686	19.5553	19.8606	20.2944	20.6409	20.8925	20.9705	20.9617	20.8064	20.3627	19.8324	19.3916	(87)
Th 2	19.5601	19.5714	19.5825	19.6352	19.6452	19.6919	19.6919	19.7007	19.6738	19.6452	19.6250	19.6041	(88)
util rest of house													
	0.9872	0.9792	0.9616	0.9150	0.8123	0.6109	0.4083	0.4485	0.7222	0.9233	0.9771	0.9892	(89)
MIT 2	17.4695	17.7468	18.1934	18.8401	19.3049	19.6237	19.6823	19.6866	19.5300	18.9517	18.1851	17.5310	(90)
Living area fraction									fLA = Living area / (4) =			0.5438	(91)
MIT	18.5023	18.7304	19.1001	19.6310	20.0314	20.3137	20.3829	20.3800	20.2242	19.7191	19.0810	18.5429	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5023	18.7304	19.1001	19.6310	20.0314	20.3137	20.3829	20.3800	20.2242	19.7191	19.0810	18.5429	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9750	0.9571	0.9149	0.8301	0.6663	0.4916	0.5305	0.7644	0.9249	0.9736	0.9863	(94)
Useful gains	632.4118	698.7822	744.8617	759.2164	708.6303	551.4688	390.8049	404.0755	555.1734	619.9268	607.9268	605.0333	(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													
	1696.7655	1636.8838	1477.4835	1203.1385	926.0886	609.5268	403.5516	421.2829	663.8758	1013.6410	1355.0734	1651.3928	(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													
	791.8792	630.4042	545.0706	319.6239	161.7890	0.0000	0.0000	0.0000	0.0000	292.9234	537.9455	778.4915	(98)
Space heating												4058.1273	(98)
Space heating per m2											(98) / (4) =	56.8365	(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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												4058.1273	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	791.8792	630.4042	545.0706	319.6239	161.7890	0.0000	0.0000	0.0000	0.0000	292.9234	537.9455	778.4915	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	791.8792	630.4042	545.0706	319.6239	161.7890	0.0000	0.0000	0.0000	0.0000	292.9234	537.9455	778.4915	(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													
	173.4961	152.5819	159.4478	141.8293	138.1877	122.3259	116.3871	129.2207	129.4650	147.1229	156.9569	168.9490	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	173.4961	152.5819	159.4478	141.8293	138.1877	122.3259	116.3871	129.2207	129.4650	147.1229	156.9569	168.9490	(219)
Water heating fuel used												1735.9705	(219)
Annual totals kWh/year													
Space heating fuel - main system												4058.1273	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												353.2423	(232)
Total delivered energy for all uses												6147.3401	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4058.1273	13.1900	535.2670	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1735.9705	13.1900	228.9745	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	353.2423	13.1900	46.5927	(250)
Additional standing charges			0.0000	(251)
Total energy cost			810.8342	(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] =	2.9257	(257)
SAP value		59.1866	
SAP rating (Section 12)		59	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4058.1273	0.5190	2106.1681	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1735.9705	0.5190	900.9687	(264)
Space and water heating			3007.1368	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	353.2423	0.5190	183.3327	(268)
Total kg/year			3190.4695	(272)
CO2 emissions per m2			44.6800	(273)
EI value			63.2712	
EI rating			63	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.4000 (1b)	x	2.9000 (2b)	=	207.0600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	207.0600	(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) =	0.0966	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.8466	(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) =	0.7196	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8275	0.7916	0.8096	0.7196	0.7196	0.6297	0.6476	0.6476	0.6836	0.7196	0.7016	0.7736	(22b)
Effective ac	0.8424	0.8133	0.8277	0.7589	0.7589	0.6982	0.7097	0.7097	0.7337	0.7589	0.7461	0.7992	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			4.1100	1.5038	6.1805			(27)
roof light (Uw = 1.60)			3.4500	1.5038	5.1880			(27a)
External Wall - dwarf	19.4900		19.4900	0.2456	4.7870			(29a)
External Wall - lobby	12.5000	2.1000	10.4000	0.2499	2.5991			(29a)
External Wall -dormer	10.1800	4.1100	6.0700	0.2800	1.6996			(29a)
External Roof	47.7000		47.7000	0.1800	8.5860			(30)
External Roof - slope	27.0100	3.4500	23.5600	0.1800	4.2408			(30)
External Roof - dormer	5.9200		5.9200	0.1800	1.0656			(30)
Total net area of external elements Aum(A, m2)			122.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.1265			(33)
Party Wall 1			43.5000	0.0000	0.0000			(32)
Party Floor 1			71.4000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	18.4200	(36)
Total fabric heat loss	(33) + (36) = 56.5465	(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	57.5619	55.5716	56.5557	51.8564	51.8564	47.7100	48.4950	48.4950	50.1315	51.8564	50.9829	54.6096	(38)
Heat transfer coeff	114.1084	112.1181	113.1022	108.4029	108.4029	104.2565	105.0415	105.0415	106.6780	108.4029	107.5294	111.1561	(39)
Average = Sum(39)m / 12 =												108.6867	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5982	1.5703	1.5841	1.5182	1.5182	1.4602	1.4712	1.4712	1.4941	1.5182	1.5060	1.5568	(40)
HLP (average)												1.5222	(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	2.2796 (42)
Average daily hot water use (litres/day)	88.3412 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.1753	93.6416	90.1080	86.5743	83.0407	79.5070	79.5070	83.0407	86.5743	90.1080	93.6416	97.1753	(44)
Energy conte	144.1081	126.0379	130.0598	113.3893	108.7997	93.8859	86.9991	99.8327	101.0250	117.7349	128.5169	139.5610	(45)
Energy content (annual)										Total = Sum(45)m =		1389.9505	(45)

Distribution loss (46)m = 0.15 x (45)m

	21.6162	18.9057	19.5090	17.0084	16.3200	14.0829	13.0499	14.9749	15.1538	17.6602	19.2775	20.9342	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	173.4961	152.5819	159.4478	141.8293	138.1877	122.3259	116.3871	129.2207	129.4650	147.1229	156.9569	168.9490	(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													
	173.4961	152.5819	159.4478	141.8293	138.1877	122.3259	116.3871	129.2207	129.4650	147.1229	156.9569	168.9490	(64)
									Total per year (kWh/year) = Sum(64)m =			1735.9705	(64)
Heat gains from water heating, kWh/month													
	71.4264	63.1428	66.7553	60.4539	59.6863	53.9691	52.4376	56.7048	56.3428	62.6573	65.4839	69.9144	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	136.7777	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	50.0051	44.4141	36.1200	27.3451	20.4408	17.2570	18.6468	24.2378	32.5319	41.3068	48.2111	51.3949	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	299.3168	302.4228	294.5958	277.9332	256.8996	237.1310	223.9243	220.8183	228.6453	245.3079	266.3415	286.1101	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	50.9574	(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)													
	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	-91.1851	(71)
Water heating gains (Table 5)													
	96.0032	93.9625	89.7249	83.9638	80.2235	74.9570	70.4806	76.2161	78.2539	84.2168	90.9498	93.9710	(72)
Total internal gains													
	541.8750	537.3493	516.9906	485.7921	454.1139	425.8949	409.6017	417.8222	435.9811	467.3814	502.0524	528.0260	(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	
Southeast	4.1100	40.5720	0.6300	0.7000	0.7700	50.9613	(77)
Southeast	3.4500	44.8316	0.6300	0.7000	1.0000	61.3881	(82)

Solar gains	112.3493	182.9008	261.5457	354.5310	401.5418	432.2920	408.0485	369.5786	312.1794	217.0927	139.5159	94.1320	(83)
Total gains	654.2244	720.2501	778.5363	840.3231	855.6557	858.1869	817.6502	787.4008	748.1605	684.4741	641.5683	622.1581	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.4528	44.2242	43.8394	45.7399	45.7399	47.5590	47.2036	47.2036	46.4794	45.7399	46.1114	44.6069	
alpha	3.8969	3.9483	3.9226	4.0493	4.0493	4.1706	4.1469	4.1469	4.0986	4.0493	4.0741	3.9738	
util living area													
	0.9893	0.9835	0.9683	0.9272	0.8430	0.6384	0.4637	0.4799	0.7655	0.9346	0.9801	0.9910	(86)
MIT	19.4975	19.6737	19.9750	20.3970	20.7132	20.9422	20.9881	20.9866	20.8638	20.4657	19.9703	19.5090	(87)
Th 2	19.6147	19.6352	19.6250	19.6738	19.6738	19.7175	19.7092	19.7092	19.6919	19.6738	19.6830	19.6452	(88)
util rest of house													
	0.9857	0.9779	0.9567	0.8992	0.7795	0.5173	0.3078	0.3194	0.6595	0.9029	0.9721	0.9878	(89)
MIT 2	17.6913	17.9592	18.3852	19.0077	19.4153	19.6873	19.7067	19.7064	19.6017	19.1116	18.4218	17.7280	(90)
Living area fraction									fLA = Living area / (4) =			0.5438	(91)
MIT	18.6736	18.8916	19.2498	19.7632	20.1211	20.3698	20.4036	20.4026	20.2880	19.8480	19.2640	18.6966	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6736	18.8916	19.2498	19.7632	20.1211	20.3698	20.4036	20.4026	20.2880	19.8480	19.2640	18.6966	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9823	0.9738	0.9526	0.9014	0.8034	0.5818	0.3934	0.4076	0.7121	0.9079	0.9688	0.9849	(94)
Useful gains	642.6350	701.4085	741.6637	757.4591	687.4028	499.2716	321.6416	320.9225	532.7373	621.4673	621.5700	612.7354	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1617.3236	1557.5021	1396.7921	1134.2460	858.6755	528.5552	326.0081	325.8998	606.7894	948.3106	1275.7241	1578.0349	(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													
	725.1683	575.2949	487.4155	271.2866	127.4269	0.0000	0.0000	0.0000	0.0000	243.1715	470.9909	718.1828	(98)
Space heating												3618.9374	(98)
Space heating per m2											(98) / (4) =	50.6854	(99)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3618.9374	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	725.1683	575.2949	487.4155	271.2866	127.4269	0.0000	0.0000	0.0000	0.0000	243.1715	470.9909	718.1828	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	725.1683	575.2949	487.4155	271.2866	127.4269	0.0000	0.0000	0.0000	0.0000	243.1715	470.9909	718.1828	(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													
	173.4961	152.5819	159.4478	141.8293	138.1877	122.3259	116.3871	129.2207	129.4650	147.1229	156.9569	168.9490	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	173.4961	152.5819	159.4478	141.8293	138.1877	122.3259	116.3871	129.2207	129.4650	147.1229	156.9569	168.9490	(219)
Water heating fuel used												1735.9705	(219)
Annual totals kWh/year													
Space heating fuel - main system												3618.9374	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												353.2423	(232)
Total delivered energy for all uses												5708.1502	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3618.9374	18.2700	661.1799	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1735.9705	18.2700	317.1618	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	353.2423	18.2700	64.5374	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1042.8790	(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	3618.9374	0.5190	1878.2285	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1735.9705	0.5190	900.9687	(264)
Space and water heating			2779.1972	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	353.2423	0.5190	183.3327	(268)
Total kg/year			2962.5300	(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	3618.9374	3.0700	11110.1379	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1735.9705	3.0700	5329.4295	(264)
Space and water heating			16439.5674	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	353.2423	3.0700	1084.4538	(268)
Primary energy kWh/year			17524.0212	(272)
Primary energy kWh/m2/year			245.4345	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 59
Current environmental impact rating:	D 63

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

(For testing purposes):

A		Not considered
B		Not considered
C		Not considered
D		Not considered
E	Low energy lighting	Already installed
F		Not considered
G		Not considered
H		Not considered
I		Not considered
J		Not considered
K		Not considered
M		Not considered
N	Solar water heating	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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 59
Potential environmental impact rating: D 63

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£1043	£1043	£0
Space heating	£661	£661	£0
Water heating	£317	£317	£0
Lighting	£65	£65	£0
Total cost of fuels	£1043	£1043	£0
Total cost of uses	£1043	£1043	£0
Delivered energy	80 kWh/m²	80 kWh/m²	0 kWh/m²
Carbon dioxide emissions	3.0 tonnes	3.0 tonnes	0.0 tonnes
CO2 emissions per m²	41 kg/m²	41 kg/m²	0 kg/m²
Primary energy	245 kWh/m²	245 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
```

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-23	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 3.02, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	59 D	**DER**	N/A	**TER**	N/A
Environmental	63 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.96	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	24.39 m	71.40 m²	2.90 m

7.0 Living Area	38.83	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall - dwarf	Timber Frame	Timber framed wall (one layer of plasterboard)	0.28	19.49	19.49
External Wall - lobby	Solid Wall	Other	0.28	12.50	10.40
External Wall -dormer	Timber Frame	Timber framed wall (one layer of plasterboard)	0.28	10.18	6.07

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	43.50

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof	External Flat Roof	Plasterboard, insulated flat roof	0.18	47.70	47.70
External Roof - slope	External Slope Roof	Plasterboard, insulated slope	0.18	27.01	23.56
External Roof - dormer	External Flat Roof	Plasterboard, insulated flat roof	0.18	5.92	5.92

11.1 Party Floors

Description	Construction	Area (m²)
Party Floor 1	Other	71.40

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

HIBEC

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.60
roof light	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.60

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	North East							2.10	
windows	Window	[3] External Wall - dormer	South East	None	0.00					4.11	
roof lights	Roof Window	[2] External Roof - slope	South East	None						3.45	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate
Night Ventilation	No
Air change rate	2.00

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 3.03, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

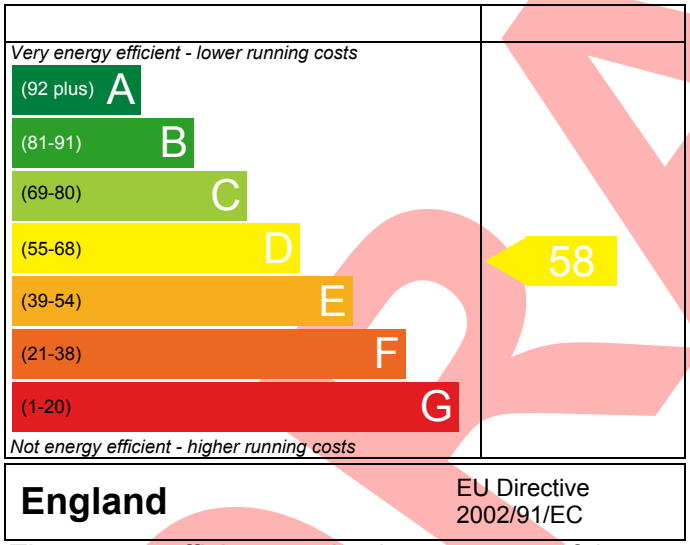
Unit 3.03, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	44.97 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

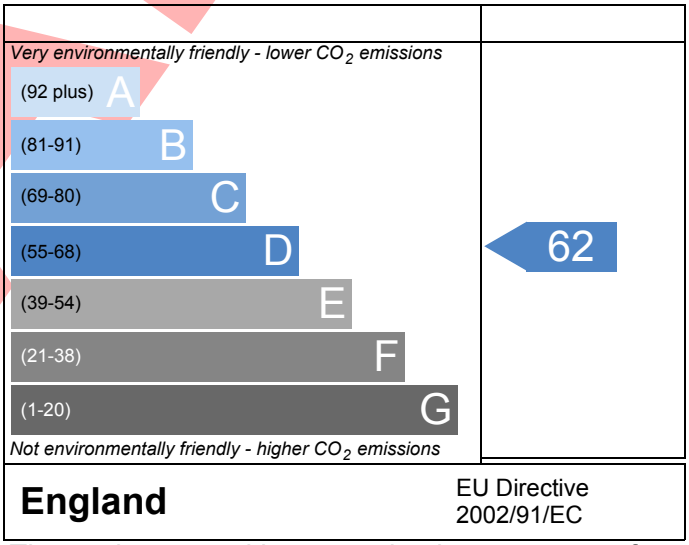
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-24	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 3.03, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	58 D	**DER**	N/A	**TER**	N/A
Environmental	62 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.39	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9700 (1b)	x	2.8200 (2b)	=	126.8154	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.9700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.8154	(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) =	0.1577	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9077	(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) =	0.7716	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8873	0.8487	0.8680	0.7716	0.7716	0.6751	0.6944	0.6944	0.7330	0.7716	0.7523	0.8294	(22b)
Effective ac	0.8936	0.8602	0.8767	0.7976	0.7976	0.7279	0.7411	0.7411	0.7686	0.7976	0.7830	0.8440	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			4.1100	1.5038	6.1805			(27)
roof light (Uw = 1.60)			3.4500	1.5038	5.1880			(27a)
External Wall - dwarf	16.2000		16.2000	0.2456	3.9789			(29a)
External Wall - lobby	15.2900	2.1000	13.1900	0.2499	3.2963			(29a)
External Wall -dormer	10.1800	4.1100	6.0700	0.2800	1.6996			(29a)
External Roof	18.2500		18.2500	0.1800	3.2850			(30)
External Roof - slope	31.2100	3.4500	27.7600	0.1800	4.9968			(30)
External Roof - dormer	5.9200		5.9200	0.1800	1.0656			(30)
Total net area of external elements Aum(A, m2)			97.0500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.4707			(33)
Party Wall 1			30.9500	0.0000	0.0000			(32)
Party Floor 1			44.9700					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	14.5575	(36)
Total fabric heat loss	(33) + (36) = 48.0282	(37)

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

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	37.3979	35.9966	36.6895	33.3808	33.3808	30.4614	31.0141	31.0141	32.1663	33.3808	32.7658	35.3193	(38)
Heat transfer coeff													
	85.4261	84.0248	84.7177	81.4090	81.4090	78.4896	79.0423	79.0423	80.1945	81.4090	80.7940	83.3475	(39)
Average = Sum(39)m / 12 =												81.6088	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8996	1.8685	1.8839	1.8103	1.8103	1.7454	1.7577	1.7577	1.7833	1.8103	1.7966	1.8534	(40)
HLP (average)												1.8147	(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												1.5438	(42)
Average daily hot water use (litres/day)												70.8651	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	77.9516	75.1170	72.2824	69.4478	66.6132	63.7786	63.7786	66.6132	69.4478	72.2824	75.1170	77.9516	(44)
Energy conte	115.5999	101.1044	104.3307	90.9581	87.2764	75.3129	69.7885	80.0833	81.0398	94.4440	103.0930	111.9524	(45)
Energy content (annual)										Total = Sum(45)m =		1114.9835	(45)
Distribution loss (46)m = 0.15 x (45)m													
	17.3400	15.1657	15.6496	13.6437	13.0915	11.2969	10.4683	12.0125	12.1560	14.1666	15.4640	16.7929	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	144.9879	127.6484	133.7187	119.3981	116.6644	103.7529	99.1765	109.4713	109.4798	123.8320	131.5330	141.3404	(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													
	144.9879	127.6484	133.7187	119.3981	116.6644	103.7529	99.1765	109.4713	109.4798	123.8320	131.5330	141.3404	(64)
								Total per year (kWh/year) = Sum(64)m =				1461.0035	(64)
RHI water heating demand												1461	(64)
Heat gains from water heating, kWh/month													
	61.9474	54.8524	58.2004	52.9956	52.5298	47.7935	46.7151	50.1381	49.6977	54.9130	57.0304	60.7346	(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	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.4502	27.0456	21.9949	16.6516	12.4472	10.5085	11.3548	14.7594	19.8100	25.1534	29.3577	31.2965	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.3039	202.3824	197.1446	185.9939	171.9181	158.6889	149.8509	147.7724	153.0102	164.1609	178.2367	191.4659	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	(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)													
	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	(71)
Water heating gains (Table 5)													
	83.2626	81.6256	78.2263	73.6049	70.6046	66.3799	62.7891	67.3899	69.0246	73.8078	79.2089	81.6325	(72)
Total internal gains													
	390.6990	387.7360	374.0482	352.9328	331.6523	312.2597	300.6772	306.6041	318.5273	339.8046	363.4857	381.0773	(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	
Northwest	4.1100	12.9280	0.6300	0.7000	0.7700	16.2385	(81)
Northwest	3.4500	18.7893	0.6300	0.7000	1.0000	25.7283	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	41.9668	79.2313	142.5440	244.0932	321.7501	367.7727	338.4412	272.8528	187.6753	102.2807	54.2841	33.8334	(83)
Total gains	432.6658	466.9673	516.5922	597.0259	653.4024	680.0324	639.1184	579.4570	506.2025	442.0852	417.7698	414.9107	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5569	37.1666	36.8626	38.3608	38.3608	39.7877	39.5094	39.5094	38.9418	38.3608	38.6528	37.4686	
alpha	3.4371	3.4778	3.4575	3.5574	3.5574	3.6525	3.6340	3.6340	3.5961	3.5574	3.5769	3.4979	
util living area													
	0.9880	0.9834	0.9680	0.9196	0.8150	0.6010	0.4427	0.4830	0.7878	0.9430	0.9803	0.9894	(86)
MIT	19.1954	19.3653	19.7206	20.2479	20.6572	20.9271	20.9821	20.9763	20.7857	20.2747	19.7122	19.2141	(87)
Th 2	19.4011	19.4225	19.4119	19.4628	19.4628	19.5085	19.4998	19.4998	19.4817	19.4628	19.4724	19.4329	(88)

CALCULATION OF HEAT DEMAND 09 Jan 2014

util rest of house													
	0.9837	0.9774	0.9555	0.8873	0.7400	0.4672	0.2703	0.2974	0.6730	0.9123	0.9719	0.9856	(89)
MIT 2	17.1206	17.3791	17.8837	18.6502	19.1687	19.4737	19.4967	19.4955	19.3424	18.7051	17.9143	17.1670	(90)
Living area fraction										fLA = Living area / (4) =		0.6271	(91)
MIT	18.4217	18.6246	19.0356	19.6521	20.1021	20.3851	20.4282	20.4241	20.2475	19.6894	19.0417	18.4507	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4217	18.6246	19.0356	19.6521	20.1021	20.3851	20.4282	20.4241	20.2475	19.6894	19.0417	18.4507	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9801	0.9733	0.9517	0.8920	0.7745	0.5491	0.3793	0.4149	0.7370	0.9179	0.9687	0.9823	(94)
Useful gains	424.0497	454.5168	491.6319	532.5547	506.0322	373.4314	242.3910	240.4254	373.0565	405.7709	404.7110	407.5811	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1189.2776	1144.8042	1028.1013	842.7527	643.3040	399.1301	247.2585	246.9365	452.8951	699.2516	940.5821	1162.7542	(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													
	569.3295	463.8731	399.1332	223.3426	102.1303	0.0000	0.0000	0.0000	0.0000	218.3497	385.8272	561.8488	(98)
Space heating												2923.8343	(98)
RHI space heating demand												2924	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9700 (1b)	x	2.8200 (2b)	=	126.8154	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.9700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.8154	(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) =	0.1577	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9077	(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) =	0.7716	(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	0.9837	0.9644	0.9452	0.8487	0.8294	0.7330	0.7330	0.7137	0.7716	0.8294	0.8680	0.9066	(22b)
Effective ac	0.9839	0.9651	0.9467	0.8602	0.8440	0.7686	0.7686	0.7547	0.7976	0.8440	0.8767	0.9109	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			4.1100	1.5038	6.1805			(27)
roof light (Uw = 1.60)			3.4500	1.5038	5.1880			(27a)
External Wall - dwarf	16.2000		16.2000	0.2456	3.9789			(29a)
External Wall - lobby	15.2900	2.1000	13.1900	0.2499	3.2963			(29a)
External Wall -dormer	10.1800	4.1100	6.0700	0.2800	1.6996			(29a)
External Roof	18.2500		18.2500	0.1800	3.2850			(30)
External Roof - slope	31.2100	3.4500	27.7600	0.1800	4.9968			(30)
External Roof - dormer	5.9200		5.9200	0.1800	1.0656			(30)
Total net area of external elements Aum(A, m2)			97.0500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.4707			(33)
Party Wall 1			30.9500	0.0000	0.0000			(32)
Party Floor 1			44.9700					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	14.5575	(36)
Total fabric heat loss	(33) + (36) = 48.0282	(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	41.1737	40.3874	39.6167	35.9966	35.3193	32.1663	32.1663	31.5824	33.3808	35.3193	36.6895	38.1220	(38)
Heat transfer coeff	89.2019	88.4156	87.6449	84.0248	83.3475	80.1945	80.1945	79.6106	81.4090	83.3475	84.7177	86.1502	(39)
Average = Sum(39)m / 12 =												84.0216	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9836	1.9661	1.9490	1.8685	1.8534	1.7833	1.7833	1.7703	1.8103	1.8534	1.8839	1.9157	(40)
HLP (average)												1.8684	(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	1.5438 (42)
Average daily hot water use (litres/day)	70.8651 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	77.9516	75.1170	72.2824	69.4478	66.6132	63.7786	63.7786	66.6132	69.4478	72.2824	75.1170	77.9516	(44)
Energy conte	115.5999	101.1044	104.3307	90.9581	87.2764	75.3129	69.7885	80.0833	81.0398	94.4440	103.0930	111.9524	(45)
Energy content (annual)										Total = Sum(45)m =		1114.9835	(45)

Distribution loss (46)m = 0.15 x (45)m

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	17.3400	15.1657	15.6496	13.6437	13.0915	11.2969	10.4683	12.0125	12.1560	14.1666	15.4640	16.7929	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	144.9879	127.6484	133.7187	119.3981	116.6644	103.7529	99.1765	109.4713	109.4798	123.8320	131.5330	141.3404	(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													
	144.9879	127.6484	133.7187	119.3981	116.6644	103.7529	99.1765	109.4713	109.4798	123.8320	131.5330	141.3404	(64)
								Total per year (kWh/year) = Sum(64)m =				1461.0035	(64)
Heat gains from water heating, kWh/month													
	61.9474	54.8524	58.2004	52.9956	52.5298	47.7935	46.7151	50.1381	49.6977	54.9130	57.0304	60.7346	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.4502	27.0456	21.9949	16.6516	12.4472	10.5085	11.3548	14.7594	19.8100	25.1534	29.3577	31.2965	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.3039	202.3824	197.1446	185.9939	171.9181	158.6889	149.8509	147.7724	153.0102	164.1609	178.2367	191.4659	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	(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)													
	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	(71)
Water heating gains (Table 5)													
	83.2626	81.6256	78.2263	73.6049	70.6046	66.3799	62.7891	67.3899	69.0246	73.8078	79.2089	81.6325	(72)
Total internal gains													
	390.6990	387.7360	374.0482	352.9328	331.6523	312.2597	300.6772	306.6041	318.5273	339.8046	363.4857	381.0773	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	4.1100	11.2829	0.6300	0.7000	0.7700	14.1722	(81)
Northwest	3.4500	16.3666	0.6300	0.7000	1.0000	22.4108	(82)

Solar gains	36.5830	74.9724	137.0477	228.9616	311.4472	333.6506	311.4778	246.0245	168.1662	92.0721	46.1027	29.8402	(83)
Total gains	427.2820	462.7084	511.0959	581.8943	643.0996	645.9103	612.1550	552.6286	486.6935	431.8767	409.5884	410.9174	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	35.0095	35.3209	35.6315	37.1666	37.4686	38.9418	38.9418	39.2274	38.3608	37.4686	36.8626	36.2497	
alpha	3.3340	3.3547	3.3754	3.4778	3.4979	3.5961	3.5961	3.6152	3.5574	3.4979	3.4575	3.4166	
util living area													
	0.9889	0.9843	0.9719	0.9331	0.8440	0.6852	0.5398	0.6033	0.8328	0.9541	0.9829	0.9903	(86)
MIT	19.0651	19.2400	19.5887	20.1251	20.5699	20.8676	20.9581	20.9384	20.7084	20.1582	19.5723	19.0931	(87)
Th 2	19.3443	19.3560	19.3676	19.4225	19.4329	19.4817	19.4817	19.4909	19.4628	19.4329	19.4119	19.3901	(88)
util rest of house													
	0.9849	0.9786	0.9610	0.9057	0.7785	0.5623	0.3704	0.4317	0.7364	0.9296	0.9756	0.9868	(89)
MIT 2	16.8981	17.1582	17.6676	18.4565	19.0428	19.4041	19.4697	19.4702	19.2493	18.5253	17.6758	16.9657	(90)
Living area fraction									fLA = Living area / (4) =			0.6271	(91)
MIT	18.2570	18.4637	18.8723	19.5029	20.0004	20.3219	20.4030	20.3909	20.1643	19.5492	18.8651	18.2998	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2570	18.4637	18.8723	19.5029	20.0004	20.3219	20.4030	20.3909	20.1643	19.5492	18.8651	18.2998	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9744	0.9567	0.9074	0.8052	0.6345	0.4769	0.5391	0.7861	0.9319	0.9723	0.9836	(94)
Useful gains	419.2668	450.8779	488.9400	528.0118	517.8008	409.8153	291.9604	297.9215	382.5954	402.4738	398.2261	404.1598	(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													
	1244.9912	1199.2393	1084.3670	890.9043	691.8188	458.8617	304.9828	317.7185	493.6887	745.8969	996.7126	1214.7005	(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													
	614.3389	502.8989	442.9977	261.2827	129.4694	0.0000	0.0000	0.0000	0.0000	255.5068	430.9103	603.0423	(98)
Space heating												3240.4470	(98)
Space heating per m2											(98) / (4) =	72.0580	(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 %)												100.0000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3240.4470	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	614.3389	502.8989	442.9977	261.2827	129.4694	0.0000	0.0000	0.0000	0.0000	255.5068	430.9103	603.0423	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	614.3389	502.8989	442.9977	261.2827	129.4694	0.0000	0.0000	0.0000	0.0000	255.5068	430.9103	603.0423	(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													
	144.9879	127.6484	133.7187	119.3981	116.6644	103.7529	99.1765	109.4713	109.4798	123.8320	131.5330	141.3404	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	144.9879	127.6484	133.7187	119.3981	116.6644	103.7529	99.1765	109.4713	109.4798	123.8320	131.5330	141.3404	(219)
Water heating fuel used												1461.0035	(219)
Annual totals kWh/year													
Space heating fuel - main system												3240.4470	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												215.1037	(232)
Total delivered energy for all uses												4916.5542	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3240.4470	13.1900	427.4150	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1461.0035	13.1900	192.7064	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	215.1037	13.1900	28.3722	(250)
Additional standing charges			0.0000	(251)
Total energy cost			648.4935	(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] =	3.0273	(257)
SAP value		57.7690	
SAP rating (Section 12)		58	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3240.4470	0.5190	1681.7920	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1461.0035	0.5190	758.2608	(264)
Space and water heating			2440.0528	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	215.1037	0.5190	111.6388	(268)
Total kg/year			2551.6916	(272)
CO2 emissions per m2			56.7400	(273)
EI value			61.9906	
EI rating			62	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9700 (1b)	x	2.8200 (2b)	=	126.8154	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	44.9700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126.8154	(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) =	0.1577	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.9077	(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) =	0.7716	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8873	0.8487	0.8680	0.7716	0.7716	0.6751	0.6944	0.6944	0.7330	0.7716	0.7523	0.8294	(22b)
Effective ac	0.8936	0.8602	0.8767	0.7976	0.7976	0.7279	0.7411	0.7411	0.7686	0.7976	0.7830	0.8440	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			4.1100	1.5038	6.1805			(27)
roof light (Uw = 1.60)			3.4500	1.5038	5.1880			(27a)
External Wall - dwarf	16.2000		16.2000	0.2456	3.9789			(29a)
External Wall - lobby	15.2900	2.1000	13.1900	0.2499	3.2963			(29a)
External Wall -dormer	10.1800	4.1100	6.0700	0.2800	1.6996			(29a)
External Roof	18.2500		18.2500	0.1800	3.2850			(30)
External Roof - slope	31.2100	3.4500	27.7600	0.1800	4.9968			(30)
External Roof - dormer	5.9200		5.9200	0.1800	1.0656			(30)
Total net area of external elements Aum(A, m2)			97.0500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.4707			(33)
Party Wall 1			30.9500	0.0000	0.0000			(32)
Party Floor 1			44.9700					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	14.5575	(36)
Total fabric heat loss (33) + (36) =	48.0282	(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	37.3979	35.9966	36.6895	33.3808	33.3808	30.4614	31.0141	31.0141	32.1663	33.3808	32.7658	35.3193	(38)
Heat transfer coeff	85.4261	84.0248	84.7177	81.4090	81.4090	78.4896	79.0423	79.0423	80.1945	81.4090	80.7940	83.3475	(39)
Average = Sum(39)m / 12 =												81.6088	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8996	1.8685	1.8839	1.8103	1.8103	1.7454	1.7577	1.7577	1.7833	1.8103	1.7966	1.8534	(40)
HLP (average)												1.8147	(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	1.5438 (42)
Average daily hot water use (litres/day)	70.8651 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	77.9516	75.1170	72.2824	69.4478	66.6132	63.7786	63.7786	66.6132	69.4478	72.2824	75.1170	77.9516	(44)
Energy conte	115.5999	101.1044	104.3307	90.9581	87.2764	75.3129	69.7885	80.0833	81.0398	94.4440	103.0930	111.9524	(45)
Energy content (annual)										Total = Sum(45)m =		1114.9835	(45)

Distribution loss (46)m = 0.15 x (45)m

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

	17.3400	15.1657	15.6496	13.6437	13.0915	11.2969	10.4683	12.0125	12.1560	14.1666	15.4640	16.7929	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	144.9879	127.6484	133.7187	119.3981	116.6644	103.7529	99.1765	109.4713	109.4798	123.8320	131.5330	141.3404	(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													
	144.9879	127.6484	133.7187	119.3981	116.6644	103.7529	99.1765	109.4713	109.4798	123.8320	131.5330	141.3404	(64)
								Total per year (kWh/year) = Sum(64)m =				1461.0035	(64)
Heat gains from water heating, kWh/month													
	61.9474	54.8524	58.2004	52.9956	52.5298	47.7935	46.7151	50.1381	49.6977	54.9130	57.0304	60.7346	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	92.6276	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	30.4502	27.0456	21.9949	16.6516	12.4472	10.5085	11.3548	14.7594	19.8100	25.1534	29.3577	31.2965	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	200.3039	202.3824	197.1446	185.9939	171.9181	158.6889	149.8509	147.7724	153.0102	164.1609	178.2367	191.4659	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	45.8065	(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)													
	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	-61.7517	(71)
Water heating gains (Table 5)													
	83.2626	81.6256	78.2263	73.6049	70.6046	66.3799	62.7891	67.3899	69.0246	73.8078	79.2089	81.6325	(72)
Total internal gains													
	390.6990	387.7360	374.0482	352.9328	331.6523	312.2597	300.6772	306.6041	318.5273	339.8046	363.4857	381.0773	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	4.1100	12.9280	0.6300	0.7000	0.7700	16.2385	(81)
Northwest	3.4500	18.7893	0.6300	0.7000	1.0000	25.7283	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	41.9668	79.2313	142.5440	244.0932	321.7501	367.7727	338.4412	272.8528	187.6753	102.2807	54.2841	33.8334	(83)
Total gains	432.6658	466.9673	516.5922	597.0259	653.4024	680.0324	639.1184	579.4570	506.2025	442.0852	417.7698	414.9107	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5569	37.1666	36.8626	38.3608	38.3608	39.7877	39.5094	39.5094	38.9418	38.3608	38.6528	37.4686	
alpha	3.4371	3.4778	3.4575	3.5574	3.5574	3.6525	3.6340	3.6340	3.5961	3.5574	3.5769	3.4979	
util living area													
	0.9880	0.9834	0.9680	0.9196	0.8150	0.6010	0.4427	0.4830	0.7878	0.9430	0.9803	0.9894	(86)
MIT	19.1954	19.3653	19.7206	20.2479	20.6572	20.9271	20.9821	20.9763	20.7857	20.2747	19.7122	19.2141	(87)
Th 2	19.4011	19.4225	19.4119	19.4628	19.4628	19.5085	19.4998	19.4998	19.4817	19.4628	19.4724	19.4329	(88)
util rest of house													
	0.9837	0.9774	0.9555	0.8873	0.7400	0.4672	0.2703	0.2974	0.6730	0.9123	0.9719	0.9856	(89)
MIT 2	17.1206	17.3791	17.8837	18.6502	19.1687	19.4737	19.4967	19.4955	19.3424	18.7051	17.9143	17.1670	(90)
Living area fraction									fLA = Living area / (4) =			0.6271	(91)
MIT	18.4217	18.6246	19.0356	19.6521	20.1021	20.3851	20.4282	20.4241	20.2475	19.6894	19.0417	18.4507	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4217	18.6246	19.0356	19.6521	20.1021	20.3851	20.4282	20.4241	20.2475	19.6894	19.0417	18.4507	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9801	0.9733	0.9517	0.8920	0.7745	0.5491	0.3793	0.4149	0.7370	0.9179	0.9687	0.9823	(94)
Useful gains	424.0497	454.5168	491.6319	532.5547	506.0322	373.4314	242.3910	240.4254	373.0565	405.7709	404.7110	407.5811	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1189.2776	1144.8042	1028.1013	842.7527	643.3040	399.1301	247.2585	246.9365	452.8951	699.2516	940.5821	1162.7542	(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													
	569.3295	463.8731	399.1332	223.3426	102.1303	0.0000	0.0000	0.0000	0.0000	218.3497	385.8272	561.8488	(98)
Space heating												2923.8343	(98)
Space heating per m2											(98) / (4) =	65.0174	(99)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)
Space heating requirement	2923.8343 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	569.3295	463.8731	399.1332	223.3426	102.1303	0.0000	0.0000	0.0000	0.0000	218.3497	385.8272	561.8488	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	569.3295	463.8731	399.1332	223.3426	102.1303	0.0000	0.0000	0.0000	0.0000	218.3497	385.8272	561.8488	(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													
	144.9879	127.6484	133.7187	119.3981	116.6644	103.7529	99.1765	109.4713	109.4798	123.8320	131.5330	141.3404	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	144.9879	127.6484	133.7187	119.3981	116.6644	103.7529	99.1765	109.4713	109.4798	123.8320	131.5330	141.3404	(219)
Water heating fuel used												1461.0035	(219)
Annual totals kWh/year													
Space heating fuel - main system												2923.8343	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												215.1037	(232)
Total delivered energy for all uses												4599.9416	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2923.8343	18.2700	534.1845	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1461.0035	18.2700	266.9253	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	215.1037	18.2700	39.2994	(250)
Additional standing charges			0.0000	(251)
Total energy cost			840.4093	(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	2923.8343	0.5190	1517.4700	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1461.0035	0.5190	758.2608	(264)
Space and water heating			2275.7309	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	215.1037	0.5190	111.6388	(268)
Total kg/year			2387.3697	(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	2923.8343	3.0700	8976.1714	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1461.0035	3.0700	4485.2808	(264)
Space and water heating			13461.4523	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	215.1037	3.0700	660.3684	(268)
Primary energy kWh/year			14121.8207	(272)
Primary energy kWh/m2/year			314.0276	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 58
Current environmental impact rating:	D 62

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

(For testing purposes):

A		Not considered
B		Not considered
C		Not considered
D		Not considered
E	Low energy lighting	Already installed
F		Not considered
G		Not considered
H		Not considered
I		Not considered
J		Not considered
K		Not considered
M		Not considered
N	Solar water heating	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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 58
Potential environmental impact rating: D 62

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£840	£840	£0
Space heating	£534	£534	£0
Water heating	£267	£267	£0
Lighting	£39	£39	£0
Total cost of fuels	£840	£840	£0
Total cost of uses	£840	£840	£0
Delivered energy	102 kWh/m²	102 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.4 tonnes	2.4 tonnes	0.0 tonnes
CO2 emissions per m²	53 kg/m²	53 kg/m²	0 kg/m²
Primary energy	314 kWh/m²	314 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-24	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 3.03, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	58 D	**DER**	N/A	**TER**	N/A
Environmental	62 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.39	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	South West
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	22.75 m	44.97 m²	2.82 m

7.0 Living Area	28.20	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall - dwarf	Timber Frame	Timber framed wall (one layer of plasterboard)	0.28	16.20	16.20
External Wall - lobby	Solid Wall	Other	0.28	15.29	13.19
External Wall -dormer	Timber Frame	Timber framed wall (one layer of plasterboard)	0.28	10.18	6.07

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	30.95

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof	External Flat Roof	Plasterboard, insulated flat roof	0.18	18.25	18.25
External Roof - slope	External Slope Roof	Plasterboard, insulated slope	0.18	31.21	27.76
External Roof - dormer	External Flat Roof	Plasterboard, insulated flat roof	0.18	5.92	5.92

11.1 Party Floors

Description	Construction	Area (m²)
Party Floor 1	Other	44.97

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

HIBEC

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.60
roof light	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.60

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	South West							2.10	
windows	Window	[3] External Wall - dormer	North West	None	0.00					4.11	
roof lights	Roof Window	[2] External Roof - slope	North West	None						3.45	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate
Night Ventilation	No
Air change rate	2.00

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: iTS Consultancy

Project: Unit 3.04, Salisbury Square
HATFIELD, AL9 5AF

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 25/02/2020

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

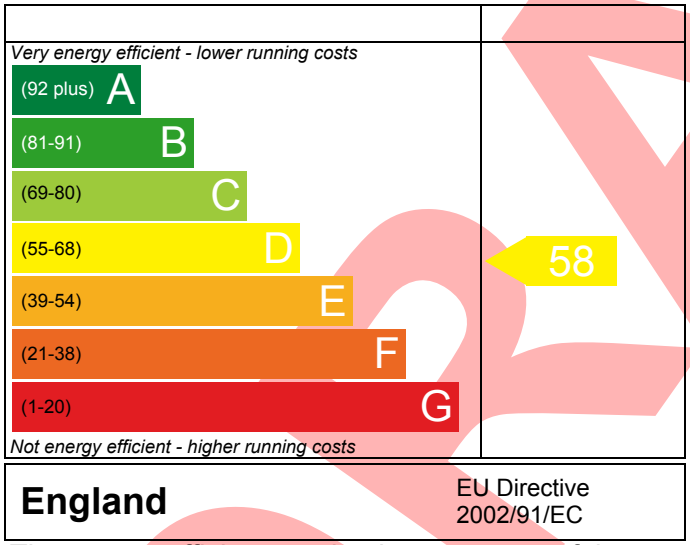
Unit 3.04, Salisbury Square,
HATFIELD,
AL9 5AF

Dwelling type:	Flat, End-Terrace
Date of assessment:	25/02/2020
Produced by:	Hibec Limited
Total floor area:	59.11 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

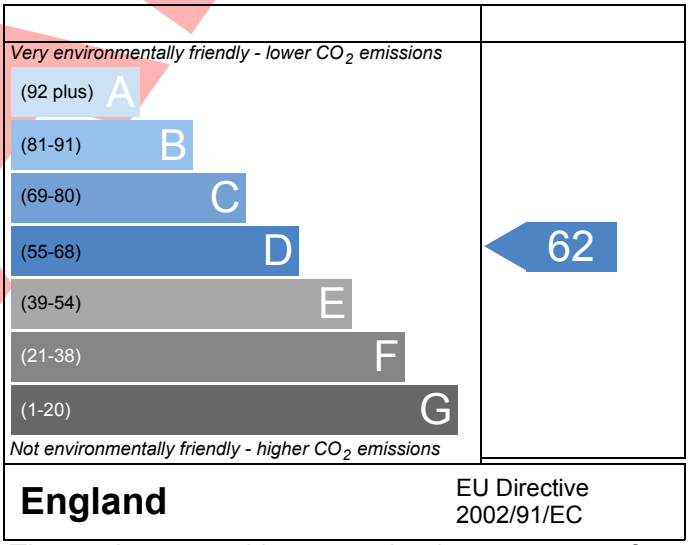
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-25	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 3.04, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	58 D	**DER**	N/A	**TER**	N/A
Environmental	62 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.76	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	59.1100 (1b)	x	2.5500 (2b)	=	150.7305	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.1100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	150.7305	(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) =	0.1327 (8)
Pressure test		No
Measured/design AP50		15.0000
Infiltration rate		0.8827 (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) =	0.7503 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8628	0.8253	0.8441	0.7503	0.7503	0.6565	0.6753	0.6753	0.7128	0.7503	0.7315	0.8066	(22b)
Effective ac	0.8722	0.8406	0.8562	0.7815	0.7815	0.7155	0.7280	0.7280	0.7540	0.7815	0.7676	0.8253	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			4.1100	1.5038	6.1805			(27)
roof light (Uw = 1.60)			3.4500	1.5038	5.1880			(27a)
External Wall - dwarf	20.1600		20.1600	0.2456	4.9516			(29a)
External Wall - lobby	18.2600	2.1000	16.1600	0.2499	4.0386			(29a)
External Wall -dormer	10.1800	4.1100	6.0700	0.2800	1.6996			(29a)
External Roof	29.0000		29.0000	0.1800	5.2200			(30)
External Roof - slope	35.9200	3.4500	32.4700	0.1800	5.8446			(30)
External Roof - dormer	5.9200		5.9200	0.1800	1.0656			(30)
Total net area of external elements Aum(A, m2)			119.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.9684			(33)
Party Wall 1			43.5000	0.0000	0.0000			(32)
Party Floor 1			59.1100					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	17.9160	(36)
Total fabric heat loss (33) + (36) =	55.8844	(37)

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

CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.3859	41.8109	42.5896	38.8708	38.8708	35.5895	36.2108	36.2108	37.5058	38.8708	38.1795	41.0496	(38)
Heat transfer coeff													
	99.2703	97.6952	98.4740	94.7552	94.7552	91.4739	92.0951	92.0951	93.3901	94.7552	94.0639	96.9340	(39)
Average = Sum(39)m / 12 =												94.9798	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6794	1.6528	1.6659	1.6030	1.6030	1.5475	1.5580	1.5580	1.5799	1.6030	1.5913	1.6399	(40)
HLP (average)												1.6068	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9564	(42)
Average daily hot water use (litres/day)												80.6636	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	88.7299	85.5034	82.2769	79.0503	75.8238	72.5972	72.5972	75.8238	79.0503	82.2769	85.5034	88.7299	(44)
Energy conte	131.5839	115.0842	118.7565	103.5348	99.3441	85.7264	79.4381	91.1564	92.2451	107.5028	117.3477	127.4320	(45)
Energy content (annual)										Total = Sum(45)m =		1269.1523	(45)
Distribution loss (46)m = 0.15 x (45)m													
	19.7376	17.2626	17.8135	15.5302	14.9016	12.8590	11.9157	13.6735	13.8368	16.1254	17.6022	19.1148	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	160.9719	141.6282	148.1445	131.9748	128.7321	114.1664	108.8261	120.5444	120.6851	136.8908	145.7877	156.8200	(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													
	160.9719	141.6282	148.1445	131.9748	128.7321	114.1664	108.8261	120.5444	120.6851	136.8908	145.7877	156.8200	(64)
								Total per year (kWh/year) = Sum(64)m =				1615.1723	(64)
RHI water heating demand												1615	(64)
Heat gains from water heating, kWh/month													
	67.2621	59.5007	62.9969	57.1773	56.5423	51.2560	49.9236	53.8199	53.4235	59.2551	61.7701	65.8815	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.8240	36.2595	29.4882	22.3245	16.6878	14.0886	15.2232	19.7877	26.5590	33.7227	39.3594	41.9587	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	254.7714	257.4152	250.7531	236.5702	218.6669	201.8403	190.5991	187.9554	194.6175	208.8004	226.7037	243.5303	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	(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)													
	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	(71)
Water heating gains (Table 5)													
	90.4060	88.5427	84.6733	79.4130	75.9977	71.1889	67.1016	72.3386	74.1993	79.6439	85.7918	88.5505	(72)
Total internal gains													
	473.8232	470.0392	452.7364	426.1294	399.1742	374.9396	360.7457	367.9034	383.1976	409.9888	439.6767	461.8611	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northwest	4.1100	12.9280	0.6300	0.7000	0.7700	16.2385	(81)
Northwest	3.4500	18.7893	0.6300	0.7000	1.0000	25.7283	(82)

Solar gains	41.9668	79.2313	142.5440	244.0932	321.7501	367.7727	338.4412	272.8528	187.6753	102.2807	54.2841	33.8334	(83)
Total gains	515.7900	549.2704	595.2804	670.2226	720.9243	742.7122	699.1868	640.7562	570.8728	512.2694	493.9607	495.6946	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.3504	42.0170	41.6847	43.3207	43.3207	44.8747	44.5720	44.5720	43.9539	43.3207	43.6391	42.3470	
alpha	3.7567	3.8011	3.7790	3.8880	3.8880	3.9916	3.9715	3.9715	3.9303	3.8880	3.9093	3.8231	
util living area													
	0.9910	0.9877	0.9763	0.9389	0.8489	0.6406	0.4726	0.5106	0.8151	0.9544	0.9850	0.9921	(86)
MIT	19.3672	19.5145	19.8275	20.2964	20.6744	20.9324	20.9847	20.9799	20.8049	20.3408	19.8342	19.3844	(87)
Th 2	19.5556	19.5749	19.5653	19.6111	19.6111	19.6520	19.6443	19.6443	19.6281	19.6111	19.6197	19.5842	(88)

CALCULATION OF HEAT DEMAND 09 Jan 2014

util rest of house

	0.9879	0.9834	0.9671	0.9138	0.7848	0.5144	0.3068	0.3340	0.7130	0.9299	0.9787	0.9894 (89)
MIT 2	17.4650	17.6908	18.1369	18.8274	19.3178	19.6172	19.6412	19.6401	19.4931	18.9015	18.1851	17.5081 (90)
Living area fraction									fLA = Living area / (4) =			0.5904 (91)
MIT	18.5881	18.7676	19.1351	19.6947	20.1188	20.3937	20.4344	20.4312	20.2676	19.7513	19.1588	18.6159 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5881	18.7676	19.1351	19.6947	20.1188	20.3937	20.4344	20.4312	20.2676	19.7513	19.1588	18.6159 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9850	0.9801	0.9635	0.9156	0.8110	0.5871	0.4055	0.4395	0.7660	0.9330	0.9759	0.9868	(94)
Useful gains	508.0447	538.3223	573.5602	613.6721	584.6788	436.0231	283.5532	281.5818	437.2778	477.9348	482.0343	489.1298	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1398.5266	1345.0260	1204.8373	984.9555	750.3445	465.9421	288.6663	288.3652	529.3005	819.7522	1106.0777	1368.3096	(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													
	662.5185	542.1049	469.6702	267.3240	123.2552	0.0000	0.0000	0.0000	0.0000	254.3121	449.3113	654.1097	(98)
Space heating												3422.6060	(98)
RHI space heating demand												3423	(98)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	59.1100 (1b)	x	2.5500 (2b)	=	150.7305	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.1100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	150.7305	(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) =	0.1327	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.8827	(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) =	0.7503	(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	0.9566	0.9379	0.9191	0.8253	0.8066	0.7128	0.7128	0.6940	0.7503	0.8066	0.8441	0.8816	(22b)
Effective ac	0.9576	0.9398	0.9224	0.8406	0.8253	0.7540	0.7540	0.7408	0.7815	0.8253	0.8562	0.8886	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			4.1100	1.5038	6.1805			(27)
roof light (Uw = 1.60)			3.4500	1.5038	5.1880			(27a)
External Wall - dwarf	20.1600		20.1600	0.2456	4.9516			(29a)
External Wall - lobby	18.2600	2.1000	16.1600	0.2499	4.0386			(29a)
External Wall -dormer	10.1800	4.1100	6.0700	0.2800	1.6996			(29a)
External Roof	29.0000		29.0000	0.1800	5.2200			(30)
External Roof - slope	35.9200	3.4500	32.4700	0.1800	5.8446			(30)
External Roof - dormer	5.9200		5.9200	0.1800	1.0656			(30)
Total net area of external elements Aum(A, m2)			119.4400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.9684			(33)
Party Wall 1			43.5000	0.0000	0.0000			(32)
Party Floor 1			59.1100					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	17.9160	(36)
Total fabric heat loss	(33) + (36) = 55.8844	(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	47.6297	46.7460	45.8797	41.8109	41.0496	37.5058	37.5058	36.8495	38.8708	41.0496	42.5896	44.1997	(38)
Heat transfer coeff	103.5141	102.6303	101.7641	97.6952	96.9340	93.3901	93.3901	92.7339	94.7552	96.9340	98.4740	100.0840	(39)
Average = Sum(39)m / 12 =												97.6916	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7512	1.7363	1.7216	1.6528	1.6399	1.5799	1.5799	1.5688	1.6030	1.6399	1.6659	1.6932	(40)
HLP (average)												1.6527	(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	1.9564 (42)
Average daily hot water use (litres/day)	80.6636 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.7299	85.5034	82.2769	79.0503	75.8238	72.5972	72.5972	75.8238	79.0503	82.2769	85.5034	88.7299	(44)
Energy conte	131.5839	115.0842	118.7565	103.5348	99.3441	85.7264	79.4381	91.1564	92.2451	107.5028	117.3477	127.4320	(45)
Energy content (annual)										Total = Sum(45)m =		1269.1523	(45)

Distribution loss (46)m = 0.15 x (45)m

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	19.7376	17.2626	17.8135	15.5302	14.9016	12.8590	11.9157	13.6735	13.8368	16.1254	17.6022	19.1148	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	160.9719	141.6282	148.1445	131.9748	128.7321	114.1664	108.8261	120.5444	120.6851	136.8908	145.7877	156.8200	(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													
	160.9719	141.6282	148.1445	131.9748	128.7321	114.1664	108.8261	120.5444	120.6851	136.8908	145.7877	156.8200	(64)
									Total per year (kWh/year) = Sum(64)m =			1615.1723	(64)
Heat gains from water heating, kWh/month													
	67.2621	59.5007	62.9969	57.1773	56.5423	51.2560	49.9236	53.8199	53.4235	59.2551	61.7701	65.8815	(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	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.8240	36.2595	29.4882	22.3245	16.6878	14.0886	15.2232	19.7877	26.5590	33.7227	39.3594	41.9587	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	254.7714	257.4152	250.7531	236.5702	218.6669	201.8403	190.5991	187.9554	194.6175	208.8004	226.7037	243.5303	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	(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)													
	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	(71)
Water heating gains (Table 5)													
	90.4060	88.5427	84.6733	79.4130	75.9977	71.1889	67.1016	72.3386	74.1993	79.6439	85.7918	88.5505	(72)
Total internal gains													
	473.8232	470.0392	452.7364	426.1294	399.1742	374.9396	360.7457	367.9034	383.1976	409.9888	439.6767	461.8611	(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	
Northwest	4.1100	11.2829	0.6300	0.7000	0.7700	14.1722	(81)
Northwest	3.4500	16.3666	0.6300	0.7000	1.0000	22.4108	(82)

Solar gains	36.5830	74.9724	137.0477	228.9616	311.4472	333.6506	311.4778	246.0245	168.1662	92.0721	46.1027	29.8402	(83)
Total gains	510.4062	545.0116	589.7841	655.0910	710.6215	708.5902	672.2235	613.9279	551.3638	502.0609	485.7793	491.7013	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.6551	39.9966	40.3370	42.0170	42.3470	43.9539	43.9539	44.2650	43.3207	42.3470	41.6847	41.0142	
alpha	3.6437	3.6664	3.6891	3.8011	3.8231	3.9303	3.9303	3.9510	3.8880	3.8231	3.7790	3.7343	
util living area													
	0.9917	0.9885	0.9793	0.9498	0.8751	0.7244	0.5736	0.6346	0.8571	0.9638	0.9870	0.9928	(86)
MIT	19.2493	19.4013	19.7078	20.1850	20.5921	20.8757	20.9627	20.9454	20.7340	20.2353	19.7084	19.2748	(87)
Th 2	19.5044	19.5150	19.5254	19.5749	19.5842	19.6281	19.6281	19.6363	19.6111	19.5842	19.5653	19.5457	(88)
util rest of house													
	0.9888	0.9843	0.9714	0.9289	0.8205	0.6116	0.4125	0.4736	0.7733	0.9445	0.9816	0.9903	(89)
MIT 2	17.2618	17.4892	17.9391	18.6488	19.1971	19.5500	19.6161	19.6161	19.4051	18.7368	17.9685	17.3245	(90)
Living area fraction									fLA = Living area / (4) =			0.5904	(91)
MIT	18.4353	18.6182	18.9834	19.5558	20.0207	20.3327	20.4112	20.4009	20.1897	19.6216	18.9958	18.4760	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4353	18.6182	18.9834	19.5558	20.0207	20.3327	20.4112	20.4009	20.1897	19.6216	18.9958	18.4760	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9859	0.9809	0.9675	0.9285	0.8396	0.6736	0.5081	0.5687	0.8131	0.9452	0.9787	0.9877	(94)
Useful gains	503.1899	534.5927	570.6260	608.2687	596.6663	477.3063	341.5421	349.1436	448.3177	474.5421	475.4105	485.6573	(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													
	1463.2027	1407.8992	1270.3613	1041.0218	806.5618	535.3774	355.9270	371.0225	577.0300	874.4954	1171.4265	1428.8014	(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													
	714.2495	586.8620	520.6031	311.5823	156.1623	0.0000	0.0000	0.0000	0.0000	297.5653	501.1315	701.6992	(98)
Space heating												3789.8551	(98)
Space heating per m2											(98) / (4) =	64.1153	(99)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3789.8551	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	714.2495	586.8620	520.6031	311.5823	156.1623	0.0000	0.0000	0.0000	0.0000	297.5653	501.1315	701.6992	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	714.2495	586.8620	520.6031	311.5823	156.1623	0.0000	0.0000	0.0000	0.0000	297.5653	501.1315	701.6992	(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													
	160.9719	141.6282	148.1445	131.9748	128.7321	114.1664	108.8261	120.5444	120.6851	136.8908	145.7877	156.8200	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	160.9719	141.6282	148.1445	131.9748	128.7321	114.1664	108.8261	120.5444	120.6851	136.8908	145.7877	156.8200	(219)
Water heating fuel used												1615.1723	(219)
Annual totals kWh/year													
Space heating fuel - main system												3789.8551	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												288.3861	(232)
Total delivered energy for all uses												5693.4134	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3789.8551	13.1900	499.8819	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1615.1723	13.1900	213.0412	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	288.3861	13.1900	38.0381	(250)
Additional standing charges			0.0000	(251)
Total energy cost			750.9612	(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] =	3.0295	(257)
SAP value		57.7381	
SAP rating (Section 12)		58	(258)
SAP band		D	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3789.8551	0.5190	1966.9348	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1615.1723	0.5190	838.2744	(264)
Space and water heating			2805.2092	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	288.3861	0.5190	149.6724	(268)
Total kg/year			2954.8816	(272)
CO2 emissions per m2			49.9900	(273)
EI value			61.9605	
EI rating			62	(274)
EI band			D	

Calculation of stars for heating and DHW

Main heating energy efficiency	13.19 × (1 + 0.29 × 0.00) / 1.0000 = 13.190, stars = 1
Main heating environmental impact	0.519 × (1 + 0.29 × 0.00) / 1.0000 = 0.5190, stars = 2
Water heating energy efficiency	13.19 / 1.0000 = 13.190, stars = 1
Water heating environmental impact	0.519 / 1.0000 = 0.5190, stars = 2

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

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	59.1100 (1b)	x	2.5500 (2b)	=	150.7305	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.1100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	150.7305	(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) =	0.1327	(8)
Pressure test		No	
Measured/design AP50		15.0000	
Infiltration rate		0.8827	(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) =	0.7503	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.4000	4.5000	4.0000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1000	1.1250	1.0000	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.8628	0.8253	0.8441	0.7503	0.7503	0.6565	0.6753	0.6753	0.7128	0.7503	0.7315	0.8066	(22b)
Effective ac	0.8722	0.8406	0.8562	0.7815	0.7815	0.7155	0.7280	0.7280	0.7540	0.7815	0.7676	0.8253	(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	
door			2.1000	1.8000	3.7800			(26)
window (Uw = 1.60)			4.1100	1.5038	6.1805			(27)
roof light (Uw = 1.60)			3.4500	1.5038	5.1880			(27a)
External Wall - dwarf	20.1600		20.1600	0.2456	4.9516			(29a)
External Wall - lobby	18.2600	2.1000	16.1600	0.2499	4.0386			(29a)
External Wall -dormer	10.1800	4.1100	6.0700	0.2800	1.6996			(29a)
External Roof	29.0000		29.0000	0.1800	5.2200			(30)
External Roof - slope	35.9200	3.4500	32.4700	0.1800	5.8446			(30)
External Roof - dormer	5.9200		5.9200	0.1800	1.0656			(30)
Total net area of external elements Aum(A, m2)			119.4400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.9684			(33)
Party Wall 1			43.5000	0.0000	0.0000			(32)
Party Floor 1			59.1100					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	17.9160	(36)
Total fabric heat loss (33) + (36) =	55.8844	(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	43.3859	41.8109	42.5896	38.8708	38.8708	35.5895	36.2108	36.2108	37.5058	38.8708	38.1795	41.0496	(38)
Heat transfer coeff	99.2703	97.6952	98.4740	94.7552	94.7552	91.4739	92.0951	92.0951	93.3901	94.7552	94.0639	96.9340	(39)
Average = Sum(39)m / 12 =												94.9798	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6794	1.6528	1.6659	1.6030	1.6030	1.5475	1.5580	1.5580	1.5799	1.6030	1.5913	1.6399	(40)
HLP (average)												1.6068	(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	1.9564 (42)
Average daily hot water use (litres/day)	80.6636 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.7299	85.5034	82.2769	79.0503	75.8238	72.5972	72.5972	75.8238	79.0503	82.2769	85.5034	88.7299	(44)
Energy conte	131.5839	115.0842	118.7565	103.5348	99.3441	85.7264	79.4381	91.1564	92.2451	107.5028	117.3477	127.4320	(45)
Energy content (annual)										Total = Sum(45)m =		1269.1523	(45)

Distribution loss (46)m = 0.15 x (45)m

	19.7376	17.2626	17.8135	15.5302	14.9016	12.8590	11.9157	13.6735	13.8368	16.1254	17.6022	19.1148	(46)
Water storage loss:													
Store volume												110.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9480	(55)
Total storage loss													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(56)
If cylinder contains dedicated solar storage													
	29.3880	26.5440	29.3880	28.4400	29.3880	28.4400	29.3880	29.3880	28.4400	29.3880	28.4400	29.3880	(57)
Primary 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	(59)
Total heat required for water heating calculated for each month													
	160.9719	141.6282	148.1445	131.9748	128.7321	114.1664	108.8261	120.5444	120.6851	136.8908	145.7877	156.8200	(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													
	160.9719	141.6282	148.1445	131.9748	128.7321	114.1664	108.8261	120.5444	120.6851	136.8908	145.7877	156.8200	(64)
									Total per year (kWh/year) = Sum(64)m =			1615.1723	(64)
Heat gains from water heating, kWh/month													
	67.2621	59.5007	62.9969	57.1773	56.5423	51.2560	49.9236	53.8199	53.4235	59.2551	61.7701	65.8815	(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	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	117.3817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.8240	36.2595	29.4882	22.3245	16.6878	14.0886	15.2232	19.7877	26.5590	33.7227	39.3594	41.9587	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	254.7714	257.4152	250.7531	236.5702	218.6669	201.8403	190.5991	187.9554	194.6175	208.8004	226.7037	243.5303	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	48.6945	(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)													
	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	-78.2545	(71)
Water heating gains (Table 5)													
	90.4060	88.5427	84.6733	79.4130	75.9977	71.1889	67.1016	72.3386	74.1993	79.6439	85.7918	88.5505	(72)
Total internal gains													
	473.8232	470.0392	452.7364	426.1294	399.1742	374.9396	360.7457	367.9034	383.1976	409.9888	439.6767	461.8611	(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	
Northwest	4.1100	12.9280	0.6300	0.7000	0.7700	16.2385	(81)
Northwest	3.4500	18.7893	0.6300	0.7000	1.0000	25.7283	(82)

Solar gains	41.9668	79.2313	142.5440	244.0932	321.7501	367.7727	338.4412	272.8528	187.6753	102.2807	54.2841	33.8334	(83)
Total gains	515.7900	549.2704	595.2804	670.2226	720.9243	742.7122	699.1868	640.7562	570.8728	512.2694	493.9607	495.6946	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.3504	42.0170	41.6847	43.3207	43.3207	44.8747	44.5720	44.5720	43.9539	43.3207	43.6391	42.3470	
alpha	3.7567	3.8011	3.7790	3.8880	3.8880	3.9916	3.9715	3.9715	3.9303	3.8880	3.9093	3.8231	
util living area													
	0.9910	0.9877	0.9763	0.9389	0.8489	0.6406	0.4726	0.5106	0.8151	0.9544	0.9850	0.9921	(86)
MIT	19.3672	19.5145	19.8275	20.2964	20.6744	20.9324	20.9847	20.9799	20.8049	20.3408	19.8342	19.3844	(87)
Th 2	19.5556	19.5749	19.5653	19.6111	19.6111	19.6520	19.6443	19.6443	19.6281	19.6111	19.6197	19.5842	(88)
util rest of house													
	0.9879	0.9834	0.9671	0.9138	0.7848	0.5144	0.3068	0.3340	0.7130	0.9299	0.9787	0.9894	(89)
MIT 2	17.4650	17.6908	18.1369	18.8274	19.3178	19.6172	19.6412	19.6401	19.4931	18.9015	18.1851	17.5081	(90)
Living area fraction									fLA = Living area / (4) =			0.5904	(91)
MIT	18.5881	18.7676	19.1351	19.6947	20.1188	20.3937	20.4344	20.4312	20.2676	19.7513	19.1588	18.6159	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5881	18.7676	19.1351	19.6947	20.1188	20.3937	20.4344	20.4312	20.2676	19.7513	19.1588	18.6159	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9850	0.9801	0.9635	0.9156	0.8110	0.5871	0.4055	0.4395	0.7660	0.9330	0.9759	0.9868	(94)
Useful gains	508.0447	538.3223	573.5602	613.6721	584.6788	436.0231	283.5532	281.5818	437.2778	477.9348	482.0343	489.1298	(95)
Ext temp.	4.5000	5.0000	6.9000	9.3000	12.2000	15.3000	17.3000	17.3000	14.6000	11.1000	7.4000	4.5000	(96)
Heat loss rate W													
	1398.5266	1345.0260	1204.8373	984.9555	750.3445	465.9421	288.6663	288.3652	529.3005	819.7522	1106.0777	1368.3096	(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													
	662.5185	542.1049	469.6702	267.3240	123.2552	0.0000	0.0000	0.0000	0.0000	254.3121	449.3113	654.1097	(98)
Space heating												3422.6060	(98)
Space heating per m2											(98) / (4) =	57.9023	(99)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	3422.6060	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	662.5185	542.1049	469.6702	267.3240	123.2552	0.0000	0.0000	0.0000	0.0000	254.3121	449.3113	654.1097	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	662.5185	542.1049	469.6702	267.3240	123.2552	0.0000	0.0000	0.0000	0.0000	254.3121	449.3113	654.1097	(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													
	160.9719	141.6282	148.1445	131.9748	128.7321	114.1664	108.8261	120.5444	120.6851	136.8908	145.7877	156.8200	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	160.9719	141.6282	148.1445	131.9748	128.7321	114.1664	108.8261	120.5444	120.6851	136.8908	145.7877	156.8200	(219)
Water heating fuel used												1615.1723	(219)
Annual totals kWh/year													
Space heating fuel - main system												3422.6060	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												288.3861	(232)
Total delivered energy for all uses												5326.1643	(238)

10a. Fuel costs - using BEDF prices (455)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3422.6060	18.2700	625.3101	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1615.1723	18.2700	295.0920	(247)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	288.3861	18.2700	52.6881	(250)
Additional standing charges			0.0000	(251)
Total energy cost			973.0902	(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	3422.6060	0.5190	1776.3325	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1615.1723	0.5190	838.2744	(264)
Space and water heating			2614.6069	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	288.3861	0.5190	149.6724	(268)
Total kg/year			2764.2793	(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	3422.6060	3.0700	10507.4003	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1615.1723	3.0700	4958.5789	(264)
Space and water heating			15465.9792	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	288.3861	3.0700	885.3453	(268)
Primary energy kWh/year			16351.3244	(272)
Primary energy kWh/m2/year			276.6253	(273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	D 58
Current environmental impact rating:	D 62

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

(For testing purposes):

A		Not considered
B		Not considered
C		Not considered
D		Not considered
E	Low energy lighting	Already installed
F		Not considered
G		Not considered
H		Not considered
I		Not considered
J		Not considered
K		Not considered
M		Not considered
N	Solar water heating	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:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating: D 58
Potential environmental impact rating: D 62

Fuel prices for cost data on this page from database revision number 455 TEST (23 Jan 2020)
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	£973	£973	£0
Space heating	£625	£625	£0
Water heating	£295	£295	£0
Lighting	£53	£53	£0
Total cost of fuels	£973	£973	£0
Total cost of uses	£973	£973	£0
Delivered energy	90 kWh/m²	90 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.8 tonnes	2.8 tonnes	0.0 tonnes
CO2 emissions per m²	47 kg/m²	47 kg/m²	0 kg/m²
Primary energy	277 kWh/m²	277 kWh/m²	0 kWh/m²

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

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SAP 2012 WORKSHEET FOR Conversion (As Designed)   (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING      09 Jan 2014
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No improvements selected / applicable
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SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Property Reference	C1920395-25	**Issued on Date**	25/02/2020
Assessment Reference	As Designed	**Prop Type Ref**	
Property	Unit 3.04, Salisbury Square, HATFIELD, AL9 5AF		

SAP Rating	58 D	**DER**	N/A	**TER**	N/A
Environmental	62 D	**% DER<TER**	N/A		
CO_2 Emissions (t/year)	2.76	**DFEE**	N/A	**TFEE**	N/A
General Requirements Compliance	N/A	**% DFEE<TFEE**	N/A		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	iTS Consultancy, 028		

SUMMARY FOR INPUT DATA FOR: Conversion (As Designed)

Orientation	North East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Urban
1.0 Property Type	Flat, End-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2020
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	26.98 m	59.11 m²	2.55 m

7.0 Living Area	34.90	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall - dwarf	Timber Frame	Timber framed wall (one layer of plasterboard)	0.28	20.16	20.16
External Wall - lobby	Solid Wall	Other	0.28	18.26	16.16
External Wall -dormer	Timber Frame	Timber framed wall (one layer of plasterboard)	0.28	10.18	6.07

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall	Other	0.00	43.50

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof	External Flat Roof	Plasterboard, insulated flat roof	0.18	29.00	29.00
External Roof - slope	External Slope Roof	Plasterboard, insulated slope	0.18	35.92	32.47
External Roof - dormer	External Flat Roof	Plasterboard, insulated flat roof	0.18	5.92	5.92

11.1 Party Floors

Description	Construction	Area (m²)
Party Floor 1	Other	59.11

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

HIBEC

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.80
window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.60
roof light	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.60

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall - lobby	South West							2.10	
windows	Window	[3] External Wall - dormer	North West	None	0.00					4.11	
roof lights	Roof Window	[2] External Roof - slope	North West	None						3.45	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Default	
Y-value	0.150	W/m²K
18.0 Pressure Testing	No	

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Calculated rate
Night Ventilation	No
Air change rate	2.00

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	

22.0 Lighting

Internal

Total number of light fittings	6	
Total number of L.E.L. fittings	6	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No	

23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	

SUMMARY FOR INPUT DATA
Calculation Type: Conversion (As Designed)

Description	electric panel	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRC Programmer and appliance thermostats	
Sap Code	2603	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HEI Immersion	
Water Heating	Independent	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	903	
Immersion Heater	Dual	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder In Heated Space	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	110.00	L
Loss	1.58	kWh/day

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None