

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	021 - PRJ013014			Issued on Date	08/02/2024
Assessment Reference	021	Prop Type Ref	E		
Property	4 Deeble way, Netley Abbey, Southampton, SO31 5JP				
SAP Rating	85 B	DER	15.65	TER	18.87
Environmental	88 B	% DER<TER	17.07		
CO ₂ Emissions (t/year)	1.03	DFEE	46.83	TFEE	52.76
General Requirements Compliance	Pass	% DFEE<TFEE	11.24		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	U903-0001
Client					

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS BUILT

Semi-Detached House, total floor area 79 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.87 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.65 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)52.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)46.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	OK
Roof	0.08 (max. 0.20)	0.08 (max. 0.35)	OK
Openings	1.36 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.75 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from database

Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)

Combi boiler

Efficiency: 89.3% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading:

Average

Windows facing South East: 2.55 m², No overhang

Windows facing North West: 7.24 m², No overhang

Air change rate: 4.71 ach

Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.08 W/m²K

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					4.7500
Infiltration rate					0.4417 (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) =	0.4086 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.5209	0.5107	0.5005	0.4494	0.4392	0.3881	0.3881	0.3779	0.4086	0.4392	0.4596	0.4800 (22b)
	0.6357	0.6304	0.6252	0.6010	0.5964	0.5753	0.5753	0.5714	0.5835	0.5964	0.6056	0.6152 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (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	41.0957	40.7552	40.4213	38.8533	38.5599	37.1941	37.1941	36.9412	37.7202	38.5599	39.1534	39.7739 (38)
Heat transfer coeff	97.8033	97.4628	97.1289	95.5608	95.2675	93.9017	93.9017	93.6488	94.4278	95.2675	95.8610	96.4815 (39)
Average = Sum(39)m / 12 =												95.5594 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2456	1.2412	1.2370	1.2170	1.2133	1.1959	1.1959	1.1927	1.2026	1.2133	1.2208	1.2288 (40)
HLP (average)												1.2170 (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												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.2129	97.5325	93.8520	90.1715	86.4911	82.8106	82.8106	86.4911	90.1715	93.8520	97.5325	101.2129 (44)
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Energy content (annual)												Total = Sum(45)m = 1447.7033 (45)
Distribution loss (46)m = 0.15 x (45)m												

	22.5144	19.6912	20.3196	17.7151	16.9981	14.6680	13.5921	15.5971	15.7834	18.3940	20.0785	21.8040 (46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Combi loss	0.6693	0.5762	0.5721	0.4792	0.4411	0.3644	0.3377	0.4047	0.4270	0.5179	0.5875	0.6482 (61)	
Total heat required for water heating calculated for each month	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081 (62)	
WWHRS	-48.4321	-42.6122	-43.4923	-35.7971	-33.2450	-27.4302	-23.2236	-28.1156	-28.9319	-35.7563	-41.4062	-46.8089 eq. (G10)	
Total of WWHRS savings												-435.2513	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)	
Output from w/h								Solar input (sum of months) = Sum(63)m =					0.0000 (63)
	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991 (64)	
								Total per year (kWh/year) = Sum(64)m =					1018.4772 (64)
Heat gains from water heating, kWh/month													
	50.0742	43.7929	45.1848	39.3883	37.7893	32.6052	30.2135	34.6748	35.0933	40.9029	44.6543	48.4942 (65)	

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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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3397.5847 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	544.6520	450.3676	410.6275	278.0031	170.4207	0.0000	0.0000	0.0000	0.0000	257.9819	403.6118	548.9567	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	603.8271	499.2989	455.2411	308.2075	188.9364	0.0000	0.0000	0.0000	0.0000	286.0110	447.4632	608.5994	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater (217)m	87.6946	87.5837	87.2998	86.6104	85.2587	76.4000	76.4000	76.4000	76.4000	86.2577	87.2478	76.4000	(216)
Fuel for water heating, kWh/month	116.6926	101.8897	106.0068	95.5807	94.4378	92.5669	88.6492	99.8298	100.4158	101.3109	106.6367	113.0171	(219)
Water heating fuel used												1217.0340	(219)
Annual totals kWh/year													
Space heating fuel - main system												3397.5847	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												372.4349	(232)
Total delivered energy for all uses												5062.0536	(238)

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	3397.5847	0.2160	733.8783 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1217.0340	0.2160	262.8793 (264)
Space and water heating			996.7576 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.4349	0.5190	193.2937 (268)
Total CO2, kg/year			1228.9764 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.6500 (273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.6500 ZC1
Total Floor Area	TFA	78.5200
Assumed number of occupants	N	2.4342
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.3253 ZC2
CO2 emissions from cooking, equation (L16)		2.2596 ZC3
Total CO2 emissions		34.2349 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.2349 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
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) =	0.1531 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4031 (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) =					0.3729 (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	0.4754	0.4661	0.4568	0.4102	0.4009	0.3543	0.3543	0.3449	0.3729	0.4009	0.4195	0.4382 (22b)					
Effective ac	0.6130	0.6086	0.6043	0.5841	0.5803	0.5627	0.5627	0.5595	0.5695	0.5803	0.5880	0.5960 (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					
TER Opaque door			2.0900	1.0000	2.0900		(26)					
TER Opening Type (Uw = 1.40)			9.8000	1.3258	12.9792		(27)					
Flr - Ground			39.2630	0.1300	5.1042		(28a)					
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.1800	13.8195		(29a)					
Rf - Ins Joist	39.2630		39.2630	0.1300	5.1042		(30)					
Total net area of external elements Aum(A, m2)			167.1810				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.0970		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7265 (36)					
Total fabric heat loss						(33) + (36) =	47.8235 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.6317	Feb 39.3479	Mar 39.0698	Apr 37.7635	May 37.5191	Jun 36.3813	Jul 36.3813	Aug 36.1706	Sep 36.8196	Oct 37.5191	Nov 38.0135	Dec 38.5304 (38)
Heat transfer coeff	87.4552	87.1715	86.8934	85.5870	85.3426	84.2049	84.2049	83.9942	84.6431	85.3426	85.8371	86.3540 (39)
Average = Sum(39)m / 12 =												85.5859 (39)
HLP	Jan 1.1138	Feb 1.1102	Mar 1.1066	Apr 1.0900	May 1.0869	Jun 1.0724	Jul 1.0724	Aug 1.0697	Sep 1.0780	Oct 1.0869	Nov 1.0932	Dec 1.0998 (40)
HLP (average)												1.0900 (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												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
Daily hot water use	Jan 101.2129	Feb 97.5325	Mar 93.8520	Apr 90.1715	May 86.4911	Jun 82.8106	Jul 82.8106	Aug 86.4911	Sep 90.1715	Oct 93.8520	Nov 97.5325	Dec 101.2129 (44)
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Energy content (annual)										Total = Sum(45)m =		1447.7033 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	22.5144	19.6912	20.3196	17.7151	16.9981	14.6680	13.5921	15.5971	15.7834	18.3940	20.0785	21.8040 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Combi 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 (57)
Total heat required for water heating calculated for each month	50.9589	44.8917	47.8259	44.4681	44.0749	40.8381	42.1994	44.0749	44.4681	47.8259	48.0982	50.9589 (61)
Solar input	201.0548	176.1665	183.2898	162.5688	157.3953	138.6250	132.8133	148.0557	149.6908	170.4528	181.9550	196.3187 (62)
Output from w/h	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)
Heat gains from water heating, kWh/month	201.0548	176.1665	183.2898	162.5688	157.3953	138.6250	132.8133	148.0557	149.6908	170.4528	181.9550	196.3187 (64)
	62.6466	54.8718	56.9982	50.3855	48.6978	42.7237	40.6790	45.5923	46.1036	52.7299	56.5319	61.0719 (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	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.2210	18.8483	15.3285	11.6046	8.6746	7.3235	7.9133	10.2860	13.8058	17.5296	20.4597	21.8108	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.3196	218.5643	212.9077	200.8654	185.6642	171.3772	161.8326	159.5879	165.2445	177.2868	192.4880	206.7750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	(71)
Water heating gains (Table 5)	84.2024	81.6544	76.6105	69.9799	65.4540	59.3384	54.6760	61.2800	64.0327	70.8735	78.5166	82.0858	(72)
Total internal gains	384.2557	381.5797	367.3593	344.9626	322.3054	300.5517	286.9346	293.6665	305.5957	328.2026	353.9769	373.1843	(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					2.5540	36.7938	0.6300	0.7000				0.7700	28.7189
Northwest					7.2440	11.2829	0.6300	0.7000				0.7700	24.9789
Solar gains	53.6978	99.7641	158.5398	233.3780	295.1194	307.8161	290.5956	242.2664	184.0987	116.2027	65.8285	44.9764	(83)
Total gains	437.9534	481.3438	525.8992	578.3406	617.4248	608.3678	577.5302	535.9329	489.6943	444.4053	419.8054	418.1607	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	62.3494	62.5523	62.7525	63.7103	63.8928	64.7561	64.7561	64.9185	64.4208	63.8928	63.5247	63.1445	
alpha	5.1566	5.1702	5.1835	5.2474	5.2595	5.3171	5.3171	5.3279	5.2947	5.2595	5.2350	5.2096	
util living area	0.9986	0.9974	0.9937	0.9787	0.9252	0.7866	0.6184	0.6807	0.9052	0.9867	0.9973	0.9989	(86)
MIT	19.7681	19.8875	20.1110	20.4321	20.7308	20.9268	20.9838	20.9738	20.8294	20.4566	20.0640	19.7530	(87)
Th 2	19.9896	19.9925	19.9954	20.0090	20.0116	20.0234	20.0234	20.0256	20.0189	20.0116	20.0064	20.0010	(88)
util rest of house	0.9981	0.9965	0.9913	0.9698	0.8924	0.7020	0.4929	0.5558	0.8506	0.9796	0.9961	0.9985	(89)
MIT 2	18.3407	18.5173	18.8453	19.3184	19.7310	19.9708	20.0170	20.0138	19.8689	19.3596	18.7856	18.3268	(90)
Living area fraction	18.6301	18.7951	19.1019	19.5442	19.9337	20.1646	20.2130	20.2084	20.0636	19.5821	19.0448	18.6160	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6301	18.7951	19.1019	19.5442	19.9337	20.1646	20.2130	20.2084	20.0636	19.5821	19.0448	18.6160	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	436.6921	478.8786	519.7287	557.6701	549.0624	435.3123	299.3820	311.3112	418.0111	433.4256	417.4836	417.2148	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1253.2448	1211.2593	1095.0237	911.0064	702.6843	468.5686	304.2326	319.8872	504.7814	766.5527	1025.3051	1244.8784	(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	607.5152	492.1598	428.0195	254.4021	114.2947	0.0000	0.0000	0.0000	0.0000	247.8466	437.6314	615.7817	(98)
Space heating												3197.6509	(98)
Space heating per m2												40.7240	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3423.6091 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	607.5152	492.1598	428.0195	254.4021	114.2947	0.0000	0.0000	0.0000	0.0000	247.8466	437.6314	615.7817	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	650.4445	526.9377	458.2650	272.3791	122.3712	0.0000	0.0000	0.0000	0.0000	265.3603	468.5562	659.2952	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	201.0548	176.1665	183.2898	162.5688	157.3953	138.6250	132.8133	148.0557	149.6908	170.4528	181.9550	196.3187	(64)
Efficiency of water heater	87.6584	87.4990	87.1147	86.1741	84.2603	80.3000	80.3000	80.3000	80.3000	85.9926	87.1798	87.7324	(217)
Fuel for water heating, kWh/month	229.3615	201.3353	210.4005	188.6515	186.7965	172.6338	165.3964	184.3782	186.4144	198.2180	208.7124	223.7699	(219)
Water heating fuel used												2356.0684	(219)
Annual totals kWh/year													
Space heating fuel - main system												3423.6091	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												374.7696	(232)
Total delivered energy for all uses												6229.4472	(238)

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	3423.6091	0.2160	739.4996 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2356.0684	0.2160	508.9108 (264)
Space and water heating			1248.4104 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	374.7696	0.5190	194.5054 (268)
Total CO2, kg/m2/year			1481.8408 (272)
Emissions per m2 for space and water heating			15.8993 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4771 (272b)
Emissions per m2 for pumps and fans			0.4957 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8993 * 1.00) + 2.4771 + 0.4957, rounded to 2 d.p.			18.8700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	021 - PRJ013014	Issued on Date	08/02/2024
Assessment Reference	021	Prop Type Ref	E
Property	4 Deeble way, Netley Abbey, Southampton, SO31 5JP		

SAP Rating	85 B	DER	15.65	TER	18.87
Environmental	88 B	% DER<TER	17.07		
CO ₂ Emissions (t/year)	1.03	DFEE	46.83	TFEE	52.76
General Requirements Compliance	Pass	% DFEE<TFEE	11.24		

Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk	Assessor ID	U903-0001
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Client	
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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (5)

2. Ventilation rate

	main heating		secondary heating	other		total	m3 per hour					
Number of chimneys		0	+	0	+	0 * 40 =	0.0000 (6a)					
Number of open flues		0	+	0	+	0 * 20 =	0.0000 (6b)					
Number of intermittent fans						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) =	0.1531 (8)					
Pressure test						Yes						
Measured/design AP50							4.7500					
Infiltration rate							0.3906 (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) =	0.3613 (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 infiltr rate	0.4607	0.4517	0.4426	0.3975	0.3884	0.3433	0.3433	0.3342	0.3613	0.3884	0.4065	0.4246 (22b)
Effective ac	0.6061	0.6020	0.5980	0.5790	0.5754	0.5589	0.5589	0.5559	0.5653	0.5754	0.5826	0.5901 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)
Fir - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (37)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

(38)m	Jan 39.1856	Feb 38.9192	Mar 38.6580	Apr 37.4314	May 37.2020	Jun 36.1337	Jul 36.1337	Aug 35.9358	Sep 36.5452	Oct 37.2020	Nov 37.6662	Dec 38.1516 (38)
Heat transfer coeff	95.8932	95.6267	95.3656	94.1390	93.9096	92.8413	92.8413	92.6434	93.2528	93.9096	94.3738	94.8592 (39)
Average = Sum(39)m / 12 =												94.1379 (39)
HLP	Jan 1.2213	Feb 1.2179	Mar 1.2145	Apr 1.1989	May 1.1960	Jun 1.1824	Jul 1.1824	Aug 1.1799	Sep 1.1876	Oct 1.1960	Nov 1.2019	Dec 1.2081 (40)
HLP (average)												1.1989 (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												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
Daily hot water use	Jan 101.2129	Feb 97.5325	Mar 93.8520	Apr 90.1715	May 86.4911	Jun 82.8106	Jul 82.8106	Aug 86.4911	Sep 90.1715	Oct 93.8520	Nov 97.5325	Dec 101.2129 (44)
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Energy content (annual)										Total = Sum(45)m =		1447.7033 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
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)
Heat gains from water heating, kWh/month	31.8954	27.8959	28.7861	25.0964	24.0806	20.7797	19.2555	22.0959	22.3598	26.0582	28.4446	30.8890 (65)

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

Metabolic gains (Table 5), Watts	Jan 121.7090	Feb 121.7090	Mar 121.7090	Apr 121.7090	May 121.7090	Jun 121.7090	Jul 121.7090	Aug 121.7090	Sep 121.7090	Oct 121.7090	Nov 121.7090	Dec 121.7090 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0888	18.7309	15.2330	11.5323	8.6206	7.2778	7.8640	10.2219	13.7198	17.4204	20.3322	21.6749 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.3196	218.5643	212.9077	200.8654	185.6642	171.3772	161.8326	159.5879	165.2445	177.2868	192.4880	206.7750 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709 (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)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672 (71)
Water heating gains (Table 5)	42.8701	41.5117	38.6909	34.8561	32.3664	28.8607	25.8810	29.6988	31.0553	35.0245	39.5063	41.5174 (72)
Total internal gains	339.7912	338.3196	326.3443	306.7665	286.1638	267.0284	255.0902	259.0212	269.5323	289.2443	311.8392	329.4800 (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				2.5540	36.7938	0.7300	0.7200	0.7700	34.2282 (77)			
Northwest				7.2440	11.2829	0.7300	0.7200	0.7700	29.7707 (81)			
Solar gains	63.9990	118.9025	188.9536	278.1485	351.7341	366.8665	346.3425	288.7420	219.4155	138.4946	78.4568	53.6045 (83)
Total gains	403.7901	457.2221	515.2979	584.9150	637.8979	633.8949	601.4328	547.7632	488.9478	427.7389	390.2960	383.0845 (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)												
tau	Jan 15.2683	Feb 15.3108	Mar 15.3527	Apr 15.5528	May 15.5908	Jun 15.7702	Jul 15.7702	Aug 15.8038	Sep 15.7006	Oct 15.5908	Nov 15.5141	Dec 15.4347
alpha	2.0179	2.0207	2.0235	2.0369	2.0394	2.0513	2.0513	2.0536	2.0467	2.0394	2.0343	2.0290
util living area	0.9529	0.9380	0.9103	0.8558	0.7691	0.6503	0.5370	0.5853	0.7585	0.8864	0.9388	0.9573 (86)
MIT	17.6536	17.9404	18.4796	19.2268	19.9357	20.4911	20.7607	20.7045	20.2393	19.3386	18.3779	17.6062 (87)
Th 2	19.9030	19.9057	19.9084	19.9209	19.9232	19.9341	19.9341	19.9361	19.9299	19.9232	19.9185	19.9135 (88)
util rest of house	0.9470	0.9302	0.8986	0.8354	0.7326	0.5866	0.4410	0.4924	0.7067	0.8662	0.9299	0.9520 (89)
MIT 2	16.8394	17.1247	17.6584	18.3966	19.0754	19.5890	19.8102	19.7741	19.3770	18.5189	17.5699	16.7992 (90)
Living area fraction									fLA = Living area / (4) =			0.2028 (91)
MIT	17.0045	17.2901	17.8249	18.5649	19.2498	19.7719	20.0029	19.9628	19.5518	18.6851	17.7337	16.9628 (92)
Temperature adjustment												0.0000
adjusted MIT	17.0045	17.2901	17.8249	18.5649	19.2498	19.7719	20.0029	19.9628	19.5518	18.6851	17.7337	16.9628 (93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9253	0.9050	0.8690	0.8034	0.7057	0.5757	0.4479	0.4951	0.6848	0.8358	0.9051	0.9317	(94)
Useful gains	373.6376	413.7778	447.8160	469.9180	450.1804	364.9143	269.3643	271.1726	334.8256	357.5126	353.2604	356.9236	(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													
Month fracti	1218.2753	1184.8223	1080.0064	909.8437	708.9981	480.1685	315.9333	330.0675	508.4000	759.2641	1003.5441	1210.6713	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	628.4104	518.1419	470.3496	316.7465	192.5603	0.0000	0.0000	0.0000	0.0000	298.9031	468.2043	635.1883	(98)
Space heating per m2												3528.5045	(98)
											(98) / (4) =	44.9377	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	872.7079	687.0253	704.0901	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6562	0.7190	0.6853	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.7080	493.9504	482.5417	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	832.3700	792.6209	731.6578	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	186.9566	222.2108	185.3424	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												594.5098 (104)
Cooled fraction												1.0000 (105)
									FC = cooled area / (4) =			
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	46.7391	55.5527	46.3356	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												148.6275 (107)
Space cooling per m2												1.8929 (108)
Energy for space heating												44.9377 (99)
Energy for space cooling												1.8929 (108)
Total												46.8305 (109)
Dwelling Fabric Energy Efficiency (DFEE)												46.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
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) =	0.1531 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4031 (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) =					0.3729 (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	0.4754	0.4661	0.4568	0.4102	0.4009	0.3543	0.3543	0.3449	0.3729	0.4009	0.4195	0.4382	(22b)				
Effective ac	0.6130	0.6086	0.6043	0.5841	0.5803	0.5627	0.5627	0.5595	0.5695	0.5803	0.5880	0.5960	(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					
TER Opaque door			2.0900	1.0000	2.0900		(26)					
TER Opening Type (Uw = 1.40)			9.8000	1.3258	12.9792		(27)					
Flr - Ground			39.2630	0.1300	5.1042		(28a)					
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.1800	13.8195		(29a)					
Rf - Ins Joist	39.2630		39.2630	0.1300	5.1042		(30)					
Total net area of external elements Aum(A, m2)			167.1810				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.0970		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7265 (36)					
Total fabric heat loss						(33) + (36) =	47.8235 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.6317	Feb 39.3479	Mar 39.0698	Apr 37.7635	May 37.5191	Jun 36.3813	Jul 36.3813	Aug 36.1706	Sep 36.8196	Oct 37.5191	Nov 38.0135	Dec 38.5304 (38)
Heat transfer coeff	87.4552	87.1715	86.8934	85.5870	85.3426	84.2049	84.2049	83.9942	84.6431	85.3426	85.8371	86.3540 (39)
Average = Sum(39)m / 12 =												85.5859 (39)
HLP	Jan 1.1138	Feb 1.1102	Mar 1.1066	Apr 1.0900	May 1.0869	Jun 1.0724	Jul 1.0724	Aug 1.0697	Sep 1.0780	Oct 1.0869	Nov 1.0932	Dec 1.0998 (40)
HLP (average)												1.0900 (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												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
Daily hot water use	Jan 101.2129	Feb 97.5325	Mar 93.8520	Apr 90.1715	May 86.4911	Jun 82.8106	Jul 82.8106	Aug 86.4911	Sep 90.1715	Oct 93.8520	Nov 97.5325	Dec 101.2129 (44)
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Energy content (annual)										Total = Sum(45)m =		1447.7033 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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 (57)
Heat gains from water heating, kWh/month	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)
	31.8954	27.8959	28.7861	25.0964	24.0806	20.7797	19.2555	22.0959	22.3598	26.0582	28.4446	30.8890 (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	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.2210	18.8483	15.3285	11.6046	8.6746	7.3235	7.9133	10.2860	13.8058	17.5296	20.4597	21.8108	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.3196	218.5643	212.9077	200.8654	185.6642	171.3772	161.8326	159.5879	165.2445	177.2868	192.4880	206.7750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	(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)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	(71)
Water heating gains (Table 5)	42.8701	41.5117	38.6909	34.8561	32.3664	28.8607	25.8810	29.6988	31.0553	35.0245	39.5063	41.5174	(72)
Total internal gains	339.9234	338.4370	326.4398	306.8388	286.2178	267.0740	255.1395	259.0853	269.6183	289.3535	311.9667	329.6159	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W		
Southeast				2.5540	36.7938	0.6300	0.7000		0.7700	28.7189 (77)		
Northwest				7.2440	11.2829	0.6300	0.7000		0.7700	24.9789 (81)		

Solar gains	53.6978	99.7641	158.5398	233.3780	295.1194	307.8161	290.5956	242.2664	184.0987	116.2027	65.8285	44.9764 (83)
Total gains	393.6211	438.2011	484.9796	540.2168	581.3372	574.8901	545.7351	501.3517	453.7169	405.5562	377.7952	374.5923 (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	62.3494	62.5523	62.7525	63.7103	63.8928	64.7561	64.7561	64.9185	64.4208	63.8928	63.5247	63.1445	
alpha	5.1566	5.1702	5.1835	5.2474	5.2595	5.3171	5.3171	5.3279	5.2947	5.2595	5.2350	5.2096	
util living area	0.9992	0.9983	0.9956	0.9840	0.9393	0.8133	0.6485	0.7160	0.9264	0.9911	0.9983	0.9994	(86)
MIT	19.7151	19.8362	20.0631	20.3905	20.7004	20.9134	20.9798	20.9668	20.8016	20.4124	20.0138	19.7007	(87)
Th 2	19.9896	19.9925	19.9954	20.0090	20.0116	20.0234	20.0234	20.0256	20.0189	20.0116	20.0064	20.0010	(88)
util rest of house	0.9989	0.9977	0.9939	0.9771	0.9110	0.7317	0.5197	0.5899	0.8797	0.9862	0.9976	0.9991	(89)
MIT 2	18.8109	18.9342	19.1628	19.4975	19.7941	19.9797	20.0178	20.0150	19.8954	19.5236	19.1230	18.8057	(90)
Living area fraction									fLA = Living area / (4) =			0.2028	(91)
MIT	18.9942	19.1171	19.3453	19.6786	19.9779	20.1690	20.2129	20.2080	20.0791	19.7038	19.3036	18.9872	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9942	19.1171	19.3453	19.6786	19.9779	20.1690	20.2129	20.2080	20.0791	19.7038	19.3036	18.9872	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9984	0.9970	0.9924	0.9741	0.9099	0.7454	0.5461	0.6156	0.8833	0.9841	0.9969	0.9988	(94)
Ext temp.	393.0091	436.8873	481.3136	526.2171	528.9366	428.5198	298.0442	308.6343	400.7633	399.0996	376.6334	374.1473	(95)
Heat loss rate W	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)
Month fracti	1285.0857	1239.3219	1116.1753	922.5075	706.4543	468.9398	304.2196	319.8471	506.0929	776.9451	1047.5223	1276.9307	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	663.7051	539.2360	472.3371	285.3290	132.0731	0.0000	0.0000	0.0000	0.0000	281.1171	483.0400	671.6708	(98)
Space heating per m2										(98) / (4) =		3528.5082	(98)
												44.9377	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	791.5259	623.1161	638.3558	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8261	0.8991	0.8659	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	653.8972	560.2645	552.7590	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	763.4640	727.5854	677.4959	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	78.8882	124.4868	92.8043	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												296.1792	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	19.7220	31.1217	23.2011	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											74.0448 (107)
Space cooling per m2											0.9430 (108)
Energy for space heating											44.9377 (99)
Energy for space cooling											0.9430 (108)
Total											45.8807 (109)
Target Fabric Energy Efficiency (TFEE)											52.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	021 - PRJ013014	Issued on Date	08/02/2024
Assessment Reference	021	Prop Type Ref	E
Property	4 Deeble way, Netley Abbey, Southampton, SO31 5JP		

SAP Rating	85 B	DER	15.65	TER	18.87
Environmental	88 B	% DER<TER	17.07		
CO ₂ Emissions (t/year)	1.03	DFEE	46.83	TFEE	52.76
General Requirements Compliance	Pass	% DFEE<TFEE	11.24		

Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk	Assessor ID	U903-0001
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Client	
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CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF HEAT DEMAND 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (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) =	0.2042 (8)			
Pressure test								Yes				
Measured/design AP50								4.7500				
Infiltration rate								0.4417 (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) =	0.4086 (21)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infiltr rate	0.5005	0.4698	0.4596	0.4290	0.4290	0.4188	0.4188	0.4086	0.4086	0.4392	0.4392	0.4494 (22b)
Effective ac	0.6252	0.6104	0.6056	0.5920	0.5920	0.5877	0.5877	0.5835	0.5835	0.5964	0.5964	0.6010 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)
Fir - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (37)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

(38)m	Jan 40.4213	Feb 39.4602	Mar 39.1534	Apr 38.2732	May 38.2732	Jun 37.9933	Jul 37.9933	Aug 37.7202	Sep 37.7202	Oct 38.5599	Nov 38.5599	Dec 38.8533	(38)
Heat transfer coeff	97.1289	96.1678	95.8610	94.9808	94.9808	94.7009	94.7009	94.4278	94.4278	95.2675	95.2675	95.5608	(39)
Average = Sum(39)m / 12 =												95.2894	(39)
HLP	Jan 1.2370	Feb 1.2248	Mar 1.2208	Apr 1.2096	May 1.2096	Jun 1.2061	Jul 1.2061	Aug 1.2026	Sep 1.2026	Oct 1.2133	Nov 1.2133	Dec 1.2170	(40)
HLP (average)												1.2136	(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													2.4342	(42)
Average daily hot water use (litres/day)													92.0118	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	101.2129	97.5325	93.8520	90.1715	86.4911	82.8106	82.8106	86.4911	90.1715	93.8520	97.5325	101.2129	(44)	
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598	(45)	
Energy content (annual)										Total = Sum	(45)m =	1447.7033	(45)	
Distribution loss (46)m = 0.15 x (45)m	22.5144	19.6912	20.3196	17.7151	16.9981	14.6680	13.5921	15.5971	15.7834	18.3940	20.0785	21.8040	(46)	
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Combi loss	0.6693	0.5762	0.5721	0.4792	0.4411	0.3644	0.3377	0.4047	0.4270	0.5179	0.5875	0.6482	(61)	
Total heat required for water heating calculated for each month	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081	(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	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081	(64)	
								Total per year (kWh/year) = Sum(64)m =				1453.7285	(64)	
RHI water heating demand												1454	(64)	
Heat gains from water heating, kWh/month	50.0742	43.7929	45.1848	39.3883	37.7893	32.6052	30.2135	34.6748	35.0933	40.9029	44.6543	48.4942	(65)	

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

Metabolic gains (Table 5), Watts	Jan 146.0508	Feb 146.0508	Mar 146.0508	Apr 146.0508	May 146.0508	Jun 146.0508	Jul 146.0508	Aug 146.0508	Sep 146.0508	Oct 146.0508	Nov 146.0508	Dec 146.0508	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7220	46.8272	38.0825	28.8309	21.5514	18.1946	19.6599	25.5547	34.2995	43.5511	50.8305	54.1873	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.8650	326.2153	317.7726	299.7991	277.1107	255.7868	241.5411	238.1908	246.6335	264.6071	287.2955	308.6193	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	(71)
Water heating gains (Table 5)	67.3040	65.1680	60.7322	54.7059	50.7921	45.2851	40.6096	46.6059	48.7407	54.9770	62.0198	65.1804	(72)
Total internal gains	546.6139	541.9334	520.3101	487.0587	453.1770	422.9893	405.5335	414.0743	433.3965	466.8580	503.8686	531.7099	(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					2.5540	45.0642	0.7300	0.7200	0.7700		41.9219 (77)	
Northwest					7.2440	14.6130	0.7300	0.7200	0.7700		38.5574 (81)	
Solar gains	80.4793	128.0337	208.6875	311.4907	372.0258	428.3579	390.9133	339.2685	256.1250	163.4515	98.5093	66.1538 (83)
Total gains	627.0932	669.9671	728.9976	798.5494	825.2028	851.3472	796.4468	753.3428	689.5215	630.3095	602.3780	597.8637 (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	
au	15.0740	15.2247	15.2734	15.4149	15.4149	15.4605	15.4605	15.5052	15.5052	15.3685	15.3685	15.3214	
alpha	2.0049	2.0150	2.0182	2.0277	2.0277	2.0307	2.0307	2.0337	2.0337	2.0246	2.0246	2.0214	
util living area	0.8892	0.8720	0.8300	0.7519	0.6374	0.4727	0.3545	0.3611	0.5721	0.7557	0.8525	0.8950 (86)	
MIT	18.4635	18.6691	19.1571	19.7979	20.3798	20.7770	20.9164	20.9165	20.6537	20.0270	19.2094	18.4720 (87)	
Th 2	19.8905	19.9002	19.9034	19.9123	19.9123	19.9151	19.9151	19.9179	19.9179	19.9094	19.9094	19.9064 (88)	
util rest of house	0.8760	0.8569	0.8091	0.7199	0.5857	0.3940	0.2502	0.2521	0.4951	0.7149	0.8318	0.8823 (89)	
MIT 2	16.6076	16.9005	17.5887	18.4794	19.2555	19.7349	19.8730	19.8773	19.6127	18.8107	17.6771	16.6259 (90)	
Living area fraction									fLA = Living area / (4) =			0.2028 (91)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	16.9839	17.2591	17.9067	18.7467	19.4835	19.9462	20.0846	20.0880	19.8238	19.0573	17.9878	17.0002 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8339	17.1091	17.7567	18.5967	19.3335	19.7962	19.9346	19.9380	19.6738	18.9073	17.8378	16.8502 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8251	0.8048	0.7566	0.6732	0.5544	0.3846	0.2522	0.2543	0.4755	0.6689	0.7794	0.8326 (94)	
Useful gains	517.4129	539.2220	551.5340	537.6169	457.4958	327.4006	200.8925	191.5456	327.8400	421.6290	469.4711	497.7857 (95)	
Ext temp.	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000 (96)	
Heat loss rate W													
1081.4226	1058.7178	964.0466	807.0271	592.0587	368.9728	211.6186	201.8894	394.1213	629.4615	861.0064	1055.9656 (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													
419.6233	349.1012	306.9094	193.9753	100.1148	0.0000	0.0000	0.0000	0.0000	154.6274	281.9054	415.2859 (98)		
Space heating													
RHI space heating demand												2221.5426 (98)	
												2222 (98)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					4.7500
Infiltration rate					0.4417 (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) =	0.4086 (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	0.5209	0.5107	0.5005	0.4494	0.4392	0.3881	0.3881	0.3779	0.4086	0.4392	0.4596	0.4800 (22b)
Effective ac	0.6357	0.6304	0.6252	0.6010	0.5964	0.5753	0.5753	0.5714	0.5835	0.5964	0.6056	0.6152 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (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	41.0957	40.7552	40.4213	38.8533	38.5599	37.1941	37.1941	36.9412	37.7202	38.5599	39.1534	39.7739 (38)
Heat transfer coeff	97.8033	97.4628	97.1289	95.5608	95.2675	93.9017	93.9017	93.6488	94.4278	95.2675	95.8610	96.4815 (39)
Average = Sum(39)m / 12 =												95.5594 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2456	1.2412	1.2370	1.2170	1.2133	1.1959	1.1959	1.1927	1.2026	1.2133	1.2208	1.2288 (40)
HLP (average)												1.2170 (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												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.2129	97.5325	93.8520	90.1715	86.4911	82.8106	82.8106	86.4911	90.1715	93.8520	97.5325	101.2129 (44)
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Energy content (annual)												Total = Sum(45)m = 1447.7033 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

	22.5144	19.6912	20.3196	17.7151	16.9981	14.6680	13.5921	15.5971	15.7834	18.3940	20.0785	21.8040 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6693	0.5762	0.5721	0.4792	0.4411	0.3644	0.3377	0.4047	0.4270	0.5179	0.5875	0.6482 (61)
Total heat required for water heating calculated for each month	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081 (62)
WWHRS	-48.4321	-42.6122	-43.4923	-35.7971	-33.2450	-27.4302	-23.2236	-28.1156	-28.9319	-35.7563	-41.4062	-46.8089 eq. (G10)
Total of WWHRS savings												-435.2513
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991 (64)
Heat gains from water heating, kWh/month	50.0742	43.7929	45.1848	39.3883	37.7893	32.6052	30.2135	34.6748	35.0933	40.9029	44.6543	48.4942 (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	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7220	46.8272	38.0825	28.8309	21.5514	18.1946	19.6599	25.5547	34.2995	43.5511	50.8305	54.1873 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.8650	326.2153	317.7726	299.7991	277.1107	255.7868	241.5411	238.1908	246.6335	264.6071	287.2955	308.6193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672 (71)
Water heating gains (Table 5)	67.3040	65.1680	60.7322	54.7059	50.7921	45.2851	40.6096	46.6059	48.7407	54.9770	62.0198	65.1804 (72)
Total internal gains	546.6139	541.9334	520.3101	487.0587	453.1770	422.9893	405.5335	414.0743	433.3965	466.8580	503.8686	531.7099 (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					2.5540	36.7938	0.7300	0.7200	0.7700	34.2282 (77)		
Northwest					7.2440	11.2829	0.7300	0.7200	0.7700	29.7707 (81)		
Solar gains	63.9990	118.9025	188.9536	278.1485	351.7341	366.8665	346.3425	288.7420	219.4155	138.4946	78.4568	53.6045 (83)
Total gains	610.6129	660.8359	709.2637	765.2072	804.9112	789.8558	751.8761	702.8163	652.8121	605.3526	582.3255	585.3144 (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	14.9701	15.0224	15.0740	15.3214	15.3685	15.5921	15.5921	15.6342	15.5052	15.3685	15.2734	15.1752
alpha	1.9980	2.0015	2.0049	2.0214	2.0246	2.0395	2.0395	2.0423	2.0337	2.0246	2.0182	2.0117
util living area	0.9075	0.8892	0.8562	0.7940	0.7009	0.5762	0.4624	0.5002	0.6697	0.8148	0.8846	0.9137 (86)
MIT	18.0626	18.3234	18.8115	19.4880	20.1118	20.5944	20.8178	20.7794	20.4057	19.6268	18.7515	18.0222 (87)
Th 2	19.8837	19.8871	19.8905	19.9064	19.9094	19.9233	19.9233	19.9259	19.9179	19.9094	19.9034	19.8971 (88)
util rest of house	0.8970	0.8766	0.8392	0.7680	0.6597	0.5112	0.3717	0.4106	0.6111	0.7861	0.8695	0.9039 (89)
MIT 2	16.0328	16.4039	17.0970	18.0510	18.9037	19.5351	19.7915	19.7576	19.3123	18.2632	17.0260	15.9792 (90)
Living area fraction									fLA = Living area / (4) =			0.2028 (91)
MIT	16.4443	16.7931	17.4446	18.3423	19.1486	19.7499	19.9996	19.9647	19.5340	18.5396	17.3758	16.3935 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.2943	16.6431	17.2946	18.1923	18.9986	19.5999	19.8496	19.8147	19.3840	18.3896	17.2258	16.2435 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8485	0.8257	0.7862	0.7174	0.6194	0.4893	0.3649	0.4004	0.5773	0.7347	0.8185	0.8569 (94)
Useful gains	518.1234	545.6527	557.5990	548.9364	498.5217	386.5090	274.3385	281.3875	376.8494	444.7657	476.6479	501.5796 (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	1173.0827	1144.5107	1048.4712	887.9837	695.3235	469.4974	305.1436	319.7866	498.9582	742.0985	970.6734	1161.9698 (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	487.2897	402.4326	365.2089	244.1141	146.4205	0.0000	0.0000	0.0000	0.0000	221.2156	355.6984	491.3303 (98)
Space heating												2713.7100 (98)
Space heating per m2												(98) / (4) = 34.5607 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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 %)													90.2000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													3008.5477	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	487.2897	402.4326	365.2089	244.1141	146.4205	0.0000	0.0000	0.0000	0.0000	221.2156	355.6984	491.3303	(98)	
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)	
Space heating fuel (main heating system)	540.2325	446.1559	404.8879	270.6364	162.3287	0.0000	0.0000	0.0000	0.0000	245.2501	394.3441	544.7121	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)	
Efficiency of water heater (217)m	87.4582	87.3367	87.0222	86.2545	84.7676	76.4000	76.4000	76.4000	76.4000	85.8109	86.9439	76.4000	(216)	
Fuel for water heating, kWh/month	117.0080	102.1779	106.3449	95.9750	94.9850	92.5669	88.6492	99.8298	100.4158	101.8384	107.0094	113.3138	(219)	
Water heating fuel used												1220.1140	(219)	
Annual totals kWh/year														
Space heating fuel - main system												3008.5477	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
central heating pump												30.0000	(230c)	
main heating flue fan												45.0000	(230e)	
Total electricity for the above, kWh/year												75.0000	(231)	
Electricity for lighting (calculated in Appendix L)												372.4349	(232)	
Total delivered energy for all uses												4676.0966	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	3008.5477	3.4800	104.6975 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1220.1140	3.4800	42.4600 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	372.4349	13.1900	49.1242 (250)
Additional standing charges			120.0000 (251)
Total energy cost			326.1741 (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] = 1.1091 (257)
SAP value	84.5284
SAP rating (Section 12)	85 (258)
SAP band	B

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	3008.5477	0.2160	649.8463 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1220.1140	0.2160	263.5446 (264)
Space and water heating			913.3909 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.4349	0.5190	193.2937 (268)
Total kg/year			1145.6096 (272)
CO2 emissions per m2			14.5900 (273)
EI value			87.5719
EI rating			88 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8323 = 4.181$, stars = 5
Water heating environmental impact	$0.216 / 0.8323 = 0.2595$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					4.7500
Infiltration rate					0.4417 (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) =	0.4086 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate												
Effective ac	0.5005	0.4698	0.4596	0.4290	0.4290	0.4188	0.4188	0.4086	0.4086	0.4392	0.4392	0.4494 (22b)
	0.6252	0.6104	0.6056	0.5920	0.5920	0.5877	0.5877	0.5835	0.5835	0.5964	0.5964	0.6010 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (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	40.4213	39.4602	39.1534	38.2732	38.2732	37.9933	37.9933	37.7202	37.7202	38.5599	38.5599	38.8533 (38)
Heat transfer coeff	97.1289	96.1678	95.8610	94.9808	94.9808	94.7009	94.7009	94.4278	94.4278	95.2675	95.2675	95.5608 (39)
Average = Sum(39)m / 12 =												95.2894 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2370	1.2248	1.2208	1.2096	1.2096	1.2061	1.2061	1.2026	1.2026	1.2133	1.2133	1.2170 (40)
HLP (average)												1.2136 (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												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	101.2129	97.5325	93.8520	90.1715	86.4911	82.8106	82.8106	86.4911	90.1715	93.8520	97.5325	101.2129 (44)
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Energy content (annual)												Total = Sum(45)m = 1447.7033 (45)
Distribution loss (46)m = 0.15 x (45)m												

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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 %)												90.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2462.9076 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	419.6233	349.1012	306.9094	193.9753	100.1148	0.0000	0.0000	0.0000	0.0000	154.6274	281.9054	415.2859 (98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000 (210)
Space heating fuel (main heating system)	465.2142	387.0301	340.2543	215.0503	110.9920	0.0000	0.0000	0.0000	0.0000	171.4273	312.5337	460.4056 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991 (64)
Efficiency of water heater (217)m	87.1150	87.0007	86.5770	85.5764	83.4787	76.4000	76.4000	76.4000	76.4000	84.6772	86.3306	76.4000 (216)
Fuel for water heating, kWh/month	117.4690	102.5725	106.8918	96.7356	96.4515	92.5669	88.6492	99.8298	100.4158	103.2019	107.7696	113.8070 (219)
Water heating fuel used												1226.3605 (219)
Annual totals kWh/year												
Space heating fuel - main system												2462.9076 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												372.4349 (232)
Total delivered energy for all uses												4136.7030 (238)

10a. Fuel costs - using BEDF prices (536)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2462.9076	7.6100	187.4273 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1226.3605	7.6100	93.3260 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	372.4349	31.0800	115.7528 (250)
Additional standing charges			105.0000 (251)
Total energy cost			524.8161 (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	2462.9076	0.2160	531.9880 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1226.3605	0.2160	264.8939 (264)
Space and water heating			796.8819 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.4349	0.5190	193.2937 (268)
Total kg/year			1029.1006 (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	2462.9076	1.2200	3004.7472 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1226.3605	1.2200	1496.1598 (264)
Space and water heating			4500.9070 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	372.4349	3.0700	1143.3752 (268)
Primary energy kWh/year			5874.5322 (272)
Primary energy kWh/m2/year			74.8157 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: B 88

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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
F	Already installed
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N	Solar water heating
O	SAP increase too small
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
A2	Recommended
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
L2	Not applicable
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 10.8	-£ 605	-1010 kg (98.2%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.9	-£ 43	-141 kg (13.7%)
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Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£605 12.87 kg/m²	A 95	A 97
Total Savings	£605 12.87 kg/m²		
Potential energy efficiency rating:		A 95	
Potential environmental impact rating:			A 97

Fuel prices for cost data on this page from database revision number 536 TEST (31 Jan 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£139	£139	£0
Mains gas	£386	£386	£0
Space heating	£316	£316	£0
Water heating	£93	£93	£0
Lighting	£116	£116	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£525	-£80	£605
Total cost of uses	£525	-£80	£605
Delivered energy	53 kWh/m²	28 kWh/m²	25 kWh/m²
Carbon dioxide emissions	1.0 tonnes	0.0 tonnes	1.0 tonnes
CO2 emissions per m²	13 kg/m²	0 kg/m²	13 kg/m²
Primary energy	75 kWh/m²	-1 kWh/m²	76 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.2042 (8)
Pressure test					Yes
Measured/design AP50					4.7500
Infiltration rate					0.4417 (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) =		0.4086 (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	0.5209	0.5107	0.5005	0.4494	0.4392	0.3881	0.3881	0.3779	0.4086	0.4392	0.4596	0.4800 (22b)
Effective ac	0.6357	0.6304	0.6252	0.6010	0.5964	0.5753	0.5753	0.5714	0.5835	0.5964	0.6056	0.6152 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.8893 (36)
Total fabric heat loss (33) + (36) = 56.7076 (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	41.0957	40.7552	40.4213	38.8533	38.5599	37.1941	37.1941	36.9412	37.7202	38.5599	39.1534	39.7739 (38)
Heat transfer coeff	97.8033	97.4628	97.1289	95.5608	95.2675	93.9017	93.9017	93.6488	94.4278	95.2675	95.8610	96.4815 (39)
Average = Sum(39)m / 12 =												95.5594 (39)
HLP	Jan 1.2456	Feb 1.2412	Mar 1.2370	Apr 1.2170	May 1.2133	Jun 1.1959	Jul 1.1959	Aug 1.1927	Sep 1.2026	Oct 1.2133	Nov 1.2208	Dec 1.2288 (40)
HLP (average)												1.2170 (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												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
Daily hot water use	Jan 101.2129	Feb 97.5325	Mar 93.8520	Apr 90.1715	May 86.4911	Jun 82.8106	Jul 82.8106	Aug 86.4911	Sep 90.1715	Oct 93.8520	Nov 97.5325	Dec 101.2129 (44)
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Energy content (annual)												Total = Sum(45)m = 1447.7033 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	22.5144	19.6912	20.3196	17.7151	16.9981	14.6680	13.5921	15.5971	15.7834	18.3940	20.0785	21.8040 (46)
Total storage loss												
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi 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 (57)
Total heat required for water heating calculated for each month	0.6693	0.5762	0.5721	0.4792	0.4411	0.3644	0.3377	0.4047	0.4270	0.5179	0.5875	0.6482 (61)
WWHRS	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081 (62)
Total of WWHRS savings	-48.4321	-42.6122	-43.4923	-35.7971	-33.2450	-27.4302	-23.2236	-28.1156	-28.9319	-35.7563	-41.4062	-46.8089 eq. (G10)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-435.2513
Output from w/h								Solar input	(sum of months) =	Sum (63)m =		0.0000 (63)
	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991 (64)
Heat gains from water heating, kWh/month								Total per year (kWh/year) =	Sum (64)m =			1018.4772 (64)
	50.0742	43.7929	45.1848	39.3883	37.7893	32.6052	30.2135	34.6748	35.0933	40.9029	44.6543	48.4942 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 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 %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3008.5477	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	487.2897	402.4326	365.2089	244.1141	146.4205	0.0000	0.0000	0.0000	0.0000	221.2156	355.6984	491.3303	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	540.2325	446.1559	404.8879	270.6364	162.3287	0.0000	0.0000	0.0000	0.0000	245.2501	394.3441	544.7121	(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	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater													
(217)m	87.4582	87.3367	87.0222	86.2545	84.7676	76.4000	76.4000	76.4000	76.4000	85.8109	86.9439	76.4000	(216)
Fuel for water heating, kWh/month													
	117.0080	102.1779	106.3449	95.9750	94.9850	92.5669	88.6492	99.8298	100.4158	101.8384	107.0094	113.3138	(219)
Water heating fuel used												1220.1140	(219)
Annual totals kWh/year													
Space heating fuel - main system												3008.5477	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												372.4349	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1080 * 0.80) =										-1727.2394		-1727.2394	(233)
Total delivered energy for all uses												2948.8572	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3008.5477	3.4800	104.6975 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1220.1140	3.4800	42.4600 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	372.4349	13.1900	49.1242 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			98.3512 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3344 (257)
SAP value	95.3348	
SAP rating (Section 12)	95	(258)
SAP band	A	

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	3008.5477	0.2160	649.8463	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1220.1140	0.2160	263.5446	(264)
Space and water heating			913.3909	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	372.4349	0.5190	193.2937	(268)
Energy saving/generation technologies				
PV Unit	-1727.2394	0.5190	-896.4372	(269)
Total kg/year			249.1724	(272)
CO2 emissions per m2			3.1700	(273)
EI value			97.2969	
EI rating			97	(274)
EI band			A	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					4.7500
Infiltration rate					0.4417 (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) =	0.4086 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate												
Effective ac	0.5005	0.4698	0.4596	0.4290	0.4290	0.4188	0.4188	0.4086	0.4086	0.4392	0.4392	0.4494 (22b)
	0.6252	0.6104	0.6056	0.5920	0.5920	0.5877	0.5877	0.5835	0.5835	0.5964	0.5964	0.6010 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (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	40.4213	39.4602	39.1534	38.2732	38.2732	37.9933	37.9933	37.7202	37.7202	38.5599	38.5599	38.8533 (38)
Heat transfer coeff	97.1289	96.1678	95.8610	94.9808	94.9808	94.7009	94.7009	94.4278	94.4278	95.2675	95.2675	95.5608 (39)
Average = Sum(39)m / 12 =												95.2894 (39)
HLP	1.2370	1.2248	1.2208	1.2096	1.2096	1.2061	1.2061	1.2026	1.2026	1.2133	1.2133	1.2170 (40)
HLP (average)												1.2136 (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												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	101.2129	97.5325	93.8520	90.1715	86.4911	82.8106	82.8106	86.4911	90.1715	93.8520	97.5325	101.2129 (44)
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Energy content (annual)												Total = Sum(45)m = 1447.7033 (45)
Distribution loss (46)m = 0.15 x (45)m												

[illegible]

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7220	46.8272	38.0825	28.8309	21.5514	18.1946	19.6599	25.5547	34.2995	43.5511	50.8305	54.1873 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.8650	326.2153	317.7726	299.7991	277.1107	255.7868	241.5411	238.1908	246.6335	264.6071	287.2955	308.6193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672 (71)
Water heating gains (Table 5)	67.3040	65.1680	60.7322	54.7059	50.7921	45.2851	40.6096	46.6059	48.7407	54.9770	62.0198	65.1804 (72)
Total internal gains	546.6139	541.9334	520.3101	487.0587	453.1770	422.9893	405.5335	414.0743	433.3965	466.8580	503.8686	531.7099 (73)

[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				2.5540	45.0642	0.7300		0.7200	0.7700		41.9219 (77)	
Northwest				7.2440	14.6130	0.7300		0.7200	0.7700		68.5574 (81)	

Solar gains	80.4793	128.0337	208.6875	311.4907	372.0258	428.3579	390.9133	339.2685	256.1250	163.4515	98.5093	66.1538 (83)
Total gains	627.0932	669.9671	728.9976	798.5494	825.2028	851.3472	796.4468	753.3428	689.5215	630.3095	602.3780	597.8637 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{li} m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.0740	15.2247	15.2734	15.4149	15.4149	15.4605	15.4605	15.5052	15.5052	15.3685	15.3685	15.3214
alpha	2.0049	2.0150	2.0182	2.0277	2.0277	2.0307	2.0307	2.0337	2.0337	2.0246	2.0246	2.0214
util living area	0.8892	0.8720	0.8300	0.7519	0.6374	0.4727	0.3545	0.3611	0.5721	0.7557	0.8525	0.8950 (86)
MIT	18.4635	18.6691	19.1571	19.7979	20.3798	20.7770	20.9164	20.9165	20.6537	20.0270	19.2094	18.4720 (87)
Th 2	19.8905	19.9002	19.9034	19.9123	19.9123	19.9151	19.9151	19.9179	19.9179	19.9094	19.9094	19.9064 (88)
util rest of house	0.8760	0.8569	0.8091	0.7199	0.5857	0.3940	0.2502	0.2521	0.4951	0.7149	0.8318	0.8823 (89)
MIT 2	16.6076	16.9005	17.5887	18.4794	19.2555	19.7349	19.8730	19.8773	19.6127	18.8107	17.6771	16.6259 (90)
Living area fraction										f _{LA} = Living area / (4) =		0.2028 (91)
MIT	16.9839	17.2591	17.9067	18.7467	19.4835	19.9462	20.0846	20.0880	19.8238	19.0573	17.9878	17.0002 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8339	17.1091	17.7567	18.5967	19.3335	19.7962	19.9346	19.9380	19.6738	18.9073	17.8378	16.8502 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8251	0.8048	0.7566	0.6732	0.5544	0.3846	0.2522	0.2543	0.4755	0.6689	0.7794	0.8326 (94)
Useful gains	517.4129	539.2220	551.5340	537.6169	457.4958	327.4006	200.8925	191.5456	327.8400	421.6290	469.4711	497.7857 (95)
Ext temp.	5.7000	6.1000	7.7000	10.1000	13.1000	15.9000	17.7000	17.8000	15.5000	12.3000	8.8000	5.8000 (96)
Heat loss rate W	1081.4226	1058.7178	964.0466	807.0271	592.0587	368.9728	211.6186	201.8894	394.1213	629.4615	861.0064	1055.9656 (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	419.6233	349.1012	306.9094	193.9753	100.1148	0.0000	0.0000	0.0000	0.0000	154.6274	281.9054	415.2859 (98)
Space heating												2221.5426 (99)
Space heating per m2												28.2927 (99)
										(98) / (4) =		

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 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 %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2462.9076	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	419.6233	349.1012	306.9094	193.9753	100.1148	0.0000	0.0000	0.0000	0.0000	154.6274	281.9054	415.2859	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	465.2142	387.0301	340.2543	215.0503	110.9920	0.0000	0.0000	0.0000	0.0000	171.4273	312.5337	460.4056	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater (217)m	87.1150	87.0007	86.5770	85.5764	83.4787	76.4000	76.4000	76.4000	76.4000	84.6772	86.3306	87.1643	(216)
Fuel for water heating, kWh/month	117.4690	102.5725	106.8918	96.7356	96.4515	92.5669	88.6492	99.8298	100.4158	103.2019	107.7696	113.8070	(219)
Water heating fuel used												1226.3605	(219)
Annual totals kWh/year													
Space heating fuel - main system												2462.9076	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												372.4349	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1217 * 0.80) =										-1946.4459		-1946.4459	(233)
Total delivered energy for all uses												2190.2570	(238)

10a. Fuel costs - using BEDF prices (536)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2462.9076	7.6100	187.4273 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1226.3605	7.6100	93.3260 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	372.4349	31.0800	115.7528 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	31.0800	-604.9554 (252)
Total energy cost			-80.1393 (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	2462.9076	0.2160	531.9880 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1226.3605	0.2160	264.8939 (264)
Space and water heating			796.8819 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.4349	0.5190	193.2937 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			18.8952 (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	2462.9076	1.2200	3004.7472 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1226.3605	1.2200	1496.1598 (264)
Space and water heating			4500.9070 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	372.4349	3.0700	1143.3752 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			-101.0568 (272)
Primary energy kWh/m2/year			-1.2870 (273)