

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	010 - PRJ013014			Issued on Date	11/01/2024
Assessment Reference	010	Prop Type Ref	E		
Property	10 Rashleigh Drive, Netley Abbey, Southampton, SO31 5JY				
SAP Rating	85 B	DER	15.19	TER	18.14
Environmental	88 B	% DER<TER	16.26		
CO ₂ Emissions (t/year)	1.00	DFEE	44.47	TFEE	48.83
General Requirements Compliance	Pass	% DFEE<TFEE	8.94		
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 78 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) 18.14 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.19 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.5 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: 4.58 (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 North: 2.55 m², No overhang
Windows facing East: 0.72 m², No overhang
Windows facing South: 6.53 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	39.1700 (1b)	x 2.3700 (2b)	= 92.8329 (1b) - (3b)
First floor	39.1700 (1c)	x 2.6200 (2c)	= 102.6254 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.4583 (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) = 0.2046 (8)
Pressure test					Yes
Measured/design AP50					4.5800
Infiltration rate					0.4336 (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) =	0.4011 (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	0.5114	0.5014	0.4914	0.4412	0.4312	0.3811	0.3811	0.3710	0.4011	0.4312	0.4513	0.4713 (22b)
Effective ac	0.6308	0.6257	0.6207	0.5973	0.5930	0.5726	0.5726	0.5688	0.5805	0.5930	0.6018	0.6111 (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	12.9924		(27)
Flr - Ground			39.1700	0.1800	7.0506	75.6000	2961.2520 (28a)
Wl - Brick (Timber Frame)	88.5560	11.8880	76.6680	0.2100	16.1003	7.4000	567.3432 (29a)
Rf - Ins Joist	39.1730		39.1730	0.0800	3.1338	7.4000	289.8802 (30)
Total net area of external elements Aum(A, m ²)			166.9010				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.7851		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			74.8493			7.4000	553.8851 (32c)
Internal Floor			39.1730			7.4000	289.8802 (32d)
Internal Ceiling			39.1730			7.4000	289.8802 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5260.7897 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1533 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0914 (36)
Total fabric heat loss							(33) + (36) = 56.8765 (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	40.6862	40.3586	40.0376	38.5295	38.2473	36.9338	36.9338	36.6906	37.4398	38.2473	38.8181	39.4149 (38)
Heat transfer coeff	97.5627	97.2352	96.9141	95.4060	95.1239	93.8104	93.8104	93.5671	94.3163	95.1239	95.6947	96.2914 (39)
Average = Sum(39)m / 12 =												95.4047 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2454	1.2412	1.2371	1.2178	1.2142	1.1975	1.1975	1.1944	1.2039	1.2142	1.2215	1.2291 (40)
HLP (average)												1.2178 (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												2.4306 (42)
Average daily hot water use (litres/day)												91.9270 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	101.1197	97.4426	93.7655	90.0884	86.4113	82.7343	82.7343	86.4113	90.0884	93.7655	97.4426	101.1197 (44)
Energy conte	149.9575	131.1538	135.3390	117.9918	113.2160	97.6968	90.5304	103.8850	105.1257	122.5139	133.7335	145.2259 (45)
Energy content (annual)												Total = Sum(45)m = 1446.3691 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	22.4936	19.6731	20.3008	17.6988	16.9824	14.6545	13.5796	15.5827	15.7689	18.3771	20.0600	21.7839 (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												
	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	0.5751	0.5711	0.4783	0.4402	0.3637	0.3370	0.4040	0.4262	0.5169	0.5864	0.6482 (61)
Total heat required for water heating calculated for each month												
	150.6268	131.7289	135.9101	118.4702	113.6562	98.0605	90.8675	104.2889	105.5519	123.0308	134.3199	145.8740 (62)
WWHRS	-48.3718	-42.5590	-43.4381	-35.7526	-33.2039	-27.3963	-23.1951	-28.0810	-28.8963	-35.7121	-41.3548	-46.7506 eq. (G10)
Total of WWHRS savings												-434.7114
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												
	102.2551	89.1699	92.4720	82.7175	80.4523	70.6642	67.6724	76.2080	76.6556	87.3187	92.9651	99.1235 (64)
								Total per year	(kWh/year)	= Sum(64)m	=	1017.6742 (64)
Heat gains from water heating, kWh/month												
	50.0282	43.7524	45.1430	39.3519	37.7544	32.5751	30.1856	34.6427	35.0608	40.8651	44.6130	48.4496 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8840	0.8517	0.8113	0.7523	0.6686	0.5479	0.4168	0.4433	0.6077	0.7618	0.8528	0.8937 (94)
Useful gains	435.6842	490.0628	512.2124	501.7147	454.1477	358.0816	261.5073	269.4366	358.4680	413.2407	415.4529	414.7767 (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	1137.5185	1119.8538	1028.2888	868.1910	677.7501	459.1835	300.6339	315.5132	491.6977	728.6448	944.6534	1125.3412 (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	522.1647	423.2196	383.9609	263.8629	166.3602	0.0000	0.0000	0.0000	0.0000	234.6606	381.0244	528.6599 (98)
Space heating												2903.9132 (98)
Space heating per m2												37.0681 (99)
										(98) / (4) =		

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3219.4160 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	522.1647	423.2196	383.9609	263.8629	166.3602	0.0000	0.0000	0.0000	0.0000	234.6606	381.0244	528.6599	(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)	578.8966	469.2013	425.6773	292.5310	184.4348	0.0000	0.0000	0.0000	0.0000	260.1559	422.4217	586.0975	(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	102.2551	89.1699	92.4720	82.7175	80.4523	70.6642	67.6724	76.2080	76.6556	87.3187	92.9651	99.1235	(64)
Efficiency of water heater (217)m	87.6086	87.4510	87.1448	86.4722	85.1845	76.4000	76.4000	76.4000	76.4000	85.9879	87.1138	87.6988	(216)
Fuel for water heating, kWh/month	116.7181	101.9655	106.1130	95.6579	94.4449	92.4924	88.5764	99.7486	100.3346	101.5477	106.7169	113.0272	(219)
Water heating fuel used												1217.3432	(219)
Annual totals kWh/year													
Space heating fuel - main system												3219.4160	(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)												371.5858	(232)
Total delivered energy for all uses												4883.3449	(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	3219.4160	0.2160	695.3939 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1217.3432	0.2160	262.9461 (264)
Space and water heating			958.3400 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	371.5858	0.5190	192.8530 (268)
Total CO2, kg/year			1190.1180 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.1900 (273)

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

DER		15.1900	ZC1
Total Floor Area	TFA	78.3400	
Assumed number of occupants	N	2.4306	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.3338	ZC2
CO2 emissions from cooking, equation (L16)		2.2637	ZC3
Total CO2 emissions		33.7875	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		33.7875	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.1700 (1b)	x 2.3700 (2b)	= 92.8329 (1b) - (3b)
First floor	39.1700 (1c)	x 2.6200 (2c)	= 102.6254 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.4583 (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) = 0.1535 (8)				
Pressure test										Yes				
Measured/design AP50										5.0000				
Infiltration rate										0.4035 (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) = 0.3732 (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	0.4759	0.4665	0.4572	0.4105	0.4012	0.3546	0.3546	0.3452	0.3732	0.4012	0.4199	0.4385 (22b)		
Effective ac	0.6132	0.6088	0.6045	0.5843	0.5805	0.5629	0.5629	0.5596	0.5696	0.5805	0.5881	0.5962 (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	12.9924		(27)					
Flr - Ground			39.1700	0.1300	5.0921		(28a)					
Wl - Brick (Timber Frame)	88.5560	11.8880	76.6680	0.1800	13.8002		(29a)					
Rf - Ins Joist	39.1730		39.1730	0.1300	5.0925		(30)					
Total net area of external elements Aum(A, m2)			166.9010				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	39.0673		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7221 (36)					
Total fabric heat loss						(33) + (36) =	47.7894 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.5536	Feb 39.2700	Mar 38.9920	Apr 37.6864	May 37.4421	Jun 36.3050	Jul 36.3050	Aug 36.0944	Sep 36.7430	Oct 37.4421	Nov 37.9363	Dec 38.4529 (38)
Heat transfer coeff	87.3429	87.0593	86.7814	85.4758	85.2315	84.0944	84.0944	83.8838	84.5324	85.2315	85.7257	86.2423 (39)
Average = Sum(39)m / 12 =												85.4746 (39)
HLP	Jan 1.1149	Feb 1.1113	Mar 1.1078	Apr 1.0911	May 1.0880	Jun 1.0735	Jul 1.0735	Aug 1.0708	Sep 1.0790	Oct 1.0880	Nov 1.0943	Dec 1.1009 (40)
HLP (average)												1.0911 (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												2.4306 (42)
Average daily hot water use (litres/day)												91.9270 (43)
Daily hot water use	Jan 101.1197	Feb 97.4426	Mar 93.7655	Apr 90.0884	May 86.4113	Jun 82.7343	Jul 82.7343	Aug 86.4113	Sep 90.0884	Oct 93.7655	Nov 97.4426	Dec 101.1197 (44)
Energy conte	149.9575	131.1538	135.3390	117.9918	113.2160	97.6968	90.5304	103.8850	105.1257	122.5139	133.7335	145.2259 (45)
Energy content (annual)												Total = Sum(45)m = 1446.3691 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.4936	19.6731	20.3008	17.6988	16.9824	14.6545	13.5796	15.5827	15.7689	18.3771	20.0600	21.7839 (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												

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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	44.8503	47.7819	44.4272	44.0343	40.8005	42.1605	44.0343	44.4272	47.7819	48.0539	50.9589 (61)
Solar input	200.9164	176.0041	183.1209	162.4190	157.2502	138.4972	132.6909	147.9192	149.5529	170.2957	181.7873	196.1848 (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	200.9164	176.0041	183.1209	162.4190	157.2502	138.4972	132.6909	147.9192	149.5529	170.2957	181.7873	196.1848 (64)
	62.6006	54.8212	56.9457	50.3391	48.6529	42.6843	40.6415	45.5503	46.0611	52.6813	56.4798	61.0273 (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	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.1726	18.8053	15.2935	11.5782	8.6548	7.3068	7.8952	10.2625	13.7743	17.4897	20.4130	21.7611	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.9362	218.1769	212.5303	200.5094	185.3351	171.0734	161.5458	159.3050	164.9516	176.9726	192.1468	206.4085	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	(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)	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	(71)
Water heating gains (Table 5)	84.1406	81.5792	76.5399	69.9154	65.3936	59.2837	54.6256	61.2236	63.9737	70.8082	78.4442	82.0260	(72)
Total internal gains	383.7085	381.0206	366.8229	344.4621	321.8427	300.1231	286.5258	293.2502	305.1588	327.7296	353.4632	372.6547	(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
North				2.5540	10.6334		0.6300	0.7000		0.7700		8.2997 (74)
East				0.7190	19.6403		0.6300	0.7000		0.7700		4.3157 (76)
South				6.5250	46.7521		0.6300	0.7000		0.7700		93.2295 (78)
Solar gains	105.8449	176.9894	235.3501	283.3904	312.2361	308.3164	297.8959	276.2203	251.7480	193.5843	126.1286	91.0269 (83)
Total gains	489.5534	558.0100	602.1730	627.8525	634.0788	608.4395	584.4216	569.4706	556.9068	521.3139	479.5918	463.6816 (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	62.2864	62.4893	62.6895	63.6470	63.8294	64.6925	64.6925	64.8549	64.3573	63.8294	63.4615	63.0813	
alpha	5.1524	5.1660	5.1793	5.2431	5.2553	5.3128	5.3128	5.3237	5.2905	5.2553	5.2308	5.2054	
util living area	0.9976	0.9948	0.9884	0.9700	0.9177	0.7858	0.6114	0.6475	0.8598	0.9737	0.9949	0.9982	(86)
MIT	19.8294	19.9779	20.1989	20.4847	20.7445	20.9270	20.9846	20.9792	20.8732	20.5407	20.1347	19.8073	(87)
Th 2	19.9887	19.9916	19.9945	20.0081	20.0107	20.0226	20.0226	20.0248	20.0180	20.0107	20.0055	20.0001	(88)
util rest of house	0.9968	0.9931	0.9842	0.9581	0.8828	0.7011	0.4866	0.5250	0.7927	0.9610	0.9928	0.9976	(89)
MIT 2	18.4295	18.6482	18.9711	19.3906	19.7468	19.9701	20.0165	20.0157	19.9134	19.4759	18.8876	18.4054	(90)
Living area fraction	18.7122	18.9167	19.2190	19.6115	19.9483	20.1633	20.2120	20.2102	20.1072	19.6910	19.1395	18.6885	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7122	18.9167	19.2190	19.6115	19.9483	20.1633	20.2120	20.2102	20.1072	19.6910	19.1395	18.6885	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	487.2418	552.6492	590.0218	597.6938	558.0812	434.7866	299.1643	312.9663	445.4246	498.1165	474.8916	462.0040	(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	1258.8024	1220.2856	1103.7725	915.5753	703.0139	467.8461	303.7460	319.6168	507.8048	774.8356	1032.0918	1249.5236	(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	574.0410	448.6517	382.2305	228.8746	107.8299	0.0000	0.0000	0.0000	0.0000	205.8790	401.1842	585.9146	(98)
Space heating												2934.6055	(98)
Space heating per m2												37.4599	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3141.9759 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	574.0410	448.6517	382.2305	228.8746	107.8299	0.0000	0.0000	0.0000	0.0000	205.8790	401.1842	585.9146 (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)	614.6049	480.3551	409.2404	245.0478	115.4496	0.0000	0.0000	0.0000	0.0000	220.4272	429.5334	627.3175 (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	200.9164	176.0041	183.1209	162.4190	157.2502	138.4972	132.6909	147.9192	149.5529	170.2957	181.7873	196.1848 (64)
Efficiency of water heater (217)m	87.5452	87.3059	86.8612	85.9145	84.1232	80.3000	80.3000	80.3000	80.3000	85.5299	86.9882	80.3000 (216)
Fuel for water heating, kWh/month	229.5002	201.5947	210.8200	189.0471	186.9284	172.4748	165.2439	184.2083	186.2427	199.1067	208.9793	223.8656 (219)
Water heating fuel used												2358.0117 (219)
Annual totals kWh/year												
Space heating fuel - main system												3141.9759 (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)												373.9150 (232)
Total delivered energy for all uses												5948.9026 (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	3141.9759	0.2160	678.6668 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2358.0117	0.2160	509.3305 (264)
Space and water heating			1187.9973 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	373.9150	0.5190	194.0619 (268)
Total CO2, kg/m2/year			1420.9842 (272)
Emissions per m2 for space and water heating			15.1646 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4772 (272b)
Emissions per m2 for pumps and fans			0.4969 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.1646 * 1.00) + 2.4772 + 0.4969, rounded to 2 d.p.			18.1400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	39.1700 (1b)	x 2.3700 (2b)	= 92.8329 (1b) - (3b)
First floor	39.1700 (1c)	x 2.6200 (2c)	= 102.6254 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.4583 (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					3 * 10 = 30.0000 (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)					30.0000 / (5) = 0.1535 (8)
Pressure test					Yes
Measured/design AP50					4.5800
Infiltration rate					0.3825 (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) =	0.3538 (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	0.4511	0.4422	0.4334	0.3892	0.3803	0.3361	0.3361	0.3273	0.3538	0.3803	0.3980	0.4157 (22b)
Effective ac	0.6017	0.5978	0.5939	0.5757	0.5723	0.5565	0.5565	0.5536	0.5626	0.5723	0.5792	0.5864 (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	12.9924		(27)
Flr - Ground			39.1700	0.1800	7.0506	75.6000	2961.2520 (28a)
Wl - Brick (Timber Frame)	88.5560	11.8880	76.6680	0.2100	16.1003	7.4000	567.3432 (29a)
Rf - Ins Joist	39.1730		39.1730	0.0800	3.1338	7.4000	289.8802 (30)
Total net area of external elements Aum(A, m ²)			166.9010				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.7851		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			74.8493			7.4000	553.8851 (32c)
Internal Floor			39.1730			7.4000	289.8802 (32d)
Internal Ceiling			39.1730			7.4000	289.8802 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5260.7897 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1533 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0914 (36)
Total fabric heat loss							(33) + (36) = 56.8765 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.8132	38.5583	38.3085	37.1353	36.9158	35.8939	35.8939	35.7047	36.2876	36.9158	37.3599	37.8241 (38)
Heat transfer coeff	95.6897	95.4349	95.1851	94.0119	93.7923	92.7705	92.7705	92.5813	93.1641	93.7923	94.2364	94.7007 (39)
Average = Sum(39)m / 12 =												94.0108 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2215	1.2182	1.2150	1.2000	1.1972	1.1842	1.1842	1.1818	1.1892	1.1972	1.2029	1.2088 (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												2.4306 (42)
Average daily hot water use (litres/day)												91.9270 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.1197	97.4426	93.7655	90.0884	86.4113	82.7343	82.7343	86.4113	90.0884	93.7655	97.4426	101.1197 (44)
Energy conte	149.9575	131.1538	135.3390	117.9918	113.2160	97.6968	90.5304	103.8850	105.1257	122.5139	133.7335	145.2259 (45)
Energy content (annual)												Total = Sum(45)m = 1446.3691 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Water 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 (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	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	31.8660	27.8702	28.7595	25.0733	24.0584	20.7606	19.2377	22.0756	22.3392	26.0342	28.4184	30.8605 (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	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0407	18.6982	15.1983	11.5061	8.6009	7.2613	7.8460	10.1986	13.6885	17.3807	20.2859	21.6255	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.9362	218.1769	212.5303	200.5094	185.3351	171.0734	161.5458	159.3050	164.9516	176.9726	192.1468	206.4085	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	(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)	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	(71)
Water heating gains (Table 5)	42.8306	41.4735	38.6553	34.8240	32.3365	28.8341	25.8571	29.6714	31.0267	34.9922	39.4699	41.4792	(72)
Total internal gains	339.2667	337.7977	325.8430	306.2986	285.7317	266.6279	254.7081	258.6342	269.1259	288.8046	311.3618	328.9723	(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		
North				2.5540	10.6334	0.7300	0.7200	0.7700		9.8919 (74)		
East				0.7190	19.6403	0.7300	0.7200	0.7700		5.1436 (76)		
South				6.5250	46.7521	0.7300	0.7200	0.7700		111.1143 (78)		

Solar gains	126.1498	210.9425	280.4989	337.7551	372.1344	367.4629	355.0432	329.2095	300.0425	230.7209	150.3247	108.4892 (83)
Total gains	465.4165	548.7402	606.3419	644.0537	657.8661	634.0908	609.7513	587.8437	569.1684	519.5255	461.6865	437.4615 (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	15.2716	15.3123	15.3525	15.5441	15.5805	15.7521	15.7521	15.7843	15.6856	15.5805	15.5071	15.4310	
alpha	2.0181	2.0208	2.0235	2.0363	2.0387	2.0501	2.0501	2.0523	2.0457	2.0387	2.0338	2.0287	
util living area	0.9398	0.9160	0.8842	0.8343	0.7598	0.6498	0.5318	0.5599	0.7116	0.8482	0.9189	0.9461	(86)
MIT	17.8012	18.1466	18.6673	19.3305	19.9627	20.4911	20.7649	20.7288	20.3354	19.5107	18.5395	17.7382	(87)
Th 2	19.9029	19.9055	19.9080	19.9200	19.9222	19.9327	19.9327	19.9346	19.9286	19.9222	19.9177	19.9129	(88)
util rest of house	0.9325	0.9060	0.8699	0.8119	0.7225	0.5860	0.4360	0.4676	0.6558	0.8232	0.9076	0.9396	(89)
MIT 2	16.9841	17.3253	17.8385	18.4926	19.0983	19.5878	19.8113	19.7878	19.4541	18.6783	17.7261	16.9285	(90)
Living area fraction									fLA = Living area / (4) =			0.2019	(91)
MIT	17.1491	17.4911	18.0059	18.6618	19.2728	19.7703	20.0039	19.9778	19.6321	18.8464	17.8904	17.0920	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1491	17.4911	18.0059	18.6618	19.2728	19.7703	20.0039	19.9778	19.6321	18.8464	17.8904	17.0920	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	422.4020	481.2467	508.0838	502.2965	458.0449	364.6460	270.1388	277.3262	363.0265	411.5144	406.0189	400.8321	(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	1229.5256	1201.6336	1095.1856	917.7278	710.2753	479.6475	315.7789	331.2407	515.3932	773.4474	1016.8463	1220.8810	(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	600.5000	484.1000	436.8038	299.1106	187.6594	0.0000	0.0000	0.0000	0.0000	269.2781	439.7957	610.1164	(98)
Space heating												3327.3640	(98)
Space heating per m2										(98) / (4) =		42.4734	(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	872.0426	686.5017	703.6176	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6564	0.7229	0.7057	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.4167	496.2409	496.5115	0.0000	0.0000	0.0000	0.0000	(102)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	832.4492	802.1974	778.3534	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	187.2234	227.6316	209.6904	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												624.5455 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	46.8059	56.9079	52.4226	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												156.1364 (107)
Space cooling per m2												1.9931 (108)
Energy for space heating												42.4734 (99)
Energy for space cooling												1.9931 (108)
Total												44.4664 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.5 (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	39.1700 (1b)	x 2.3700 (2b)	= 92.8329 (1b) - (3b)
First floor	39.1700 (1c)	x 2.6200 (2c)	= 102.6254 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.4583 (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) =	0.1535 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4035 (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) =					0.3732 (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	0.4759	0.4665	0.4572	0.4105	0.4012	0.3546	0.3546	0.3452	0.3732	0.4012	0.4199	0.4385	(22b)				
Effective ac	0.6132	0.6088	0.6045	0.5843	0.5805	0.5629	0.5629	0.5596	0.5696	0.5805	0.5881	0.5962	(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	12.9924		(27)		
Flr - Ground						39.1700	0.1300	5.0921		(28a)		
Wl - Brick (Timber Frame)	88.5560	11.8880				76.6680	0.1800	13.8002		(29a)		
Rf - Ins Joist	39.1730					39.1730	0.1300	5.0925		(30)		
Total net area of external elements Aum(A, m2)						166.9010				(31)		
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) =		39.0673		(33)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												8.7221 (36)
Total fabric heat loss									(33) + (36) =		47.7894 (37)	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.5536	Feb 39.2700	Mar 38.9920	Apr 37.6864	May 37.4421	Jun 36.3050	Jul 36.3050	Aug 36.0944	Sep 36.7430	Oct 37.4421	Nov 37.9363	Dec 38.4529 (38)
Heat transfer coeff	87.3429	87.0593	86.7814	85.4758	85.2315	84.0944	84.0944	83.8838	84.5324	85.2315	85.7257	86.2423 (39)
Average = Sum(39)m / 12 =												85.4746 (39)
HLP	Jan 1.1149	Feb 1.1113	Mar 1.1078	Apr 1.0911	May 1.0880	Jun 1.0735	Jul 1.0735	Aug 1.0708	Sep 1.0790	Oct 1.0880	Nov 1.0943	Dec 1.1009 (40)
HLP (average)												1.0911 (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												2.4306 (42)
Average daily hot water use (litres/day)												91.9270 (43)
Daily hot water use	Jan 101.1197	Feb 97.4426	Mar 93.7655	Apr 90.0884	May 86.4113	Jun 82.7343	Jul 82.7343	Aug 86.4113	Sep 90.0884	Oct 93.7655	Nov 97.4426	Dec 101.1197 (44)
Energy conte	149.9575	131.1538	135.3390	117.9918	113.2160	97.6968	90.5304	103.8850	105.1257	122.5139	133.7335	145.2259 (45)
Energy content (annual)										Total = Sum(45)m =		1446.3691 (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 (46)
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)
	31.8660	27.8702	28.7595	25.0733	24.0584	20.7606	19.2377	22.0756	22.3392	26.0342	28.4184	30.8605 (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	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305	121.5305 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.1726	18.8053	15.2935	11.5782	8.6548	7.3068	7.8952	10.2625	13.7743	17.4897	20.4130	21.7611 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.9362	218.1769	212.5303	200.5094	185.3351	171.0734	161.5458	159.3050	164.9516	176.9726	192.1468	206.4085 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530	35.1530 (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)	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244 (71)
Water heating gains (Table 5)	42.8306	41.4735	38.6553	34.8240	32.3365	28.8341	25.8571	29.6714	31.0267	34.9922	39.4699	41.4792 (72)
Total internal gains	339.3986	337.9149	325.9383	306.3707	285.7856	266.6735	254.7573	258.6981	269.2118	288.9135	311.4889	329.1079 (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
North				2.5540	10.6334	0.6300	0.7000		0.7700			8.2997 (74)
East				0.7190	19.6403	0.6300	0.7000		0.7700			4.3157 (76)
South				6.5250	46.7521	0.6300	0.7000		0.7700			93.2295 (78)

Solar gains	105.8449	176.9894	235.3501	283.3904	312.2361	308.3164	297.8959	276.2203	251.7480	193.5843	126.1286	91.0269 (83)
Total gains	445.2434	514.9043	561.2884	589.7611	598.0217	574.9899	552.6531	534.9184	520.9597	482.4978	437.6176	420.1348 (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	62.2864	62.4893	62.6895	63.6470	63.8294	64.6925	64.6925	64.8549	64.3573	63.8294	63.4615	63.0813
alpha	5.1524	5.1660	5.1793	5.2431	5.2553	5.3128	5.3128	5.3237	5.2905	5.2553	5.2308	5.2054
util living area	0.9985	0.9964	0.9915	0.9767	0.9326	0.8125	0.6410	0.6809	0.8845	0.9809	0.9966	0.9989 (86)
MIT	19.7765	19.9272	20.1521	20.4447	20.7151	20.9137	20.9808	20.9737	20.8512	20.4991	20.0851	19.7550 (87)
Th 2	19.9887	19.9916	19.9945	20.0081	20.0107	20.0226	20.0226	20.0248	20.0180	20.0107	20.0055	20.0001 (88)
util rest of house	0.9979	0.9952	0.9883	0.9671	0.9021	0.7308	0.5129	0.5559	0.8235	0.9712	0.9953	0.9985 (89)
MIT 2	18.8715	19.0240	19.2499	19.5487	19.8059	19.9790	20.0172	20.0167	19.9314	19.6063	19.1931	18.8593 (90)
Living area fraction									fLA = Living area / (4) =			0.2019 (91)
MIT	19.0542	19.2064	19.4321	19.7296	19.9895	20.1678	20.2118	20.2099	20.1172	19.7866	19.3732	19.0401 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0542	19.2064	19.4321	19.7296	19.9895	20.1678	20.2118	20.2099	20.1172	19.7866	19.3732	19.0401 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9973	0.9939	0.9860	0.9637	0.9013	0.7444	0.5391	0.5813	0.8308	0.9683	0.9940	0.9980 (94)
Ext temp.	444.0215	511.7407	553.4255	568.3430	538.9756	428.0395	297.9135	310.9691	432.8147	467.2175	435.0078	419.2782 (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	1288.6763	1245.5042	1122.2648	925.6720	706.5268	468.2172	303.7349	319.5907	508.6472	782.9892	1052.1305	1279.8477 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	628.4232	493.0890	423.2164	257.2769	124.6580	0.0000	0.0000	0.0000	0.0000	234.9341	444.3284	640.2638 (98)
Space heating												3246.1898 (98)
Space heating per m2										(98) / (4) =		41.4372 (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	790.4869	622.2982	637.5167	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8266	0.9028	0.8867	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	653.4000	561.8395	565.2765	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	763.4308	735.5247	716.5778	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	79.2222	129.2218	112.5682	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												321.0122 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
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	19.8056	32.3055	28.1420	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												80.2531 (107)
Space cooling per m2												1.0244 (108)
Energy for space heating												41.4372 (99)
Energy for space cooling												1.0244 (108)
Total												42.4616 (109)
Target Fabric Energy Efficiency (TFEE)												48.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	39.1700 (1b)	x 2.3700 (2b)	= 92.8329 (1b) - (3b)
First floor	39.1700 (1c)	x 2.6200 (2c)	= 102.6254 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.4583 (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) = 0.2046 (8)
Pressure test					Yes
Measured/design AP50					4.5800
Infiltration rate					0.4336 (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) =				0.4011 (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	0.4914	0.4613	0.4513	0.4212	0.4212	0.4112	0.4112	0.4011	0.4011	0.4312	0.4312	0.4412 (22b)
Effective ac	0.6207	0.6064	0.6018	0.5887	0.5887	0.5845	0.5845	0.5805	0.5805	0.5930	0.5930	0.5973 (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	12.9924		(27)
Flr - Ground			39.1700	0.1800	7.0506	75.6000	2961.2520 (28a)
Wl - Brick (Timber Frame)	88.5560	11.8880	76.6680	0.2100	16.1003	7.4000	567.3432 (29a)
Rf - Ins Joist	39.1730		39.1730	0.0800	3.1338	7.4000	289.8802 (30)
Total net area of external elements Aum(A, m ²)			166.9010				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.7851		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			74.8493			7.4000	553.8851 (32c)
Internal Floor			39.1730			7.4000	289.8802 (32d)
Internal Ceiling			39.1730			7.4000	289.8802 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5260.7897 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1533 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0914 (36)
Total fabric heat loss							(33) + (36) = 56.8765 (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	40.0376	39.1132	38.8181	37.9716	37.9716	37.7025	37.7025	37.4398	37.4398	38.2473	38.2473	38.5295 (38)
Heat transfer coeff	96.9141	95.9898	95.6947	94.8482	94.8482	94.5790	94.5790	94.3163	94.3163	95.1239	95.1239	95.4060 (39)
Average = Sum(39)m / 12 =												95.1449 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2371	1.2253	1.2215	1.2107	1.2107	1.2073	1.2073	1.2039	1.2039	1.2142	1.2142	1.2178 (40)
HLP (average)												1.2145 (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												2.4306 (42)
Average daily hot water use (litres/day)												91.9270 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.1197	97.4426	93.7655	90.0884	86.4113	82.7343	82.7343	86.4113	90.0884	93.7655	97.4426	101.1197 (44)
Energy conte	149.9575	131.1538	135.3390	117.9918	113.2160	97.6968	90.5304	103.8850	105.1257	122.5139	133.7335	145.2259 (45)
Energy content (annual)												Total = Sum(45)m = 1446.3691 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	22.4936	19.6731	20.3008	17.6988	16.9824	14.6545	13.5796	15.5827	15.7689	18.3771	20.0600	21.7839 (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	0.5751	0.5711	0.4783	0.4402	0.3637	0.3370	0.4040	0.4262	0.5169	0.5864	0.6482 (61)
Total heat required for water heating calculated for each month	150.6268	131.7289	135.9101	118.4702	113.6562	98.0605	90.8675	104.2889	105.5519	123.0308	134.3199	145.8740 (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)
Output from w/h	150.6268	131.7289	135.9101	118.4702	113.6562	98.0605	90.8675	104.2889	105.5519	123.0308	134.3199	145.8740 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	50.0282	43.7524	45.1430	39.3519	37.7544	32.5751	30.1856	34.6427	35.0608	40.8651	44.6130	48.4496 (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	145.8365	145.8365	145.8365	145.8365	145.8365	145.8365	145.8365	145.8365	145.8365	145.8365	145.8365	145.8365 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.6018	46.7205	37.9956	28.7651	21.5023	18.1531	19.6151	25.4964	34.2213	43.4518	50.7146	54.0638 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.2928	325.6372	317.2095	299.2678	276.6196	255.3335	241.1131	237.7687	246.1965	264.1382	286.7863	308.0724 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0143	52.0143	52.0143	52.0143	52.0143	52.0143	52.0143	52.0143	52.0143	52.0143	52.0143	52.0143 (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)	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244	-97.2244 (71)
Water heating gains (Table 5)	67.2422	65.1078	60.6760	54.6554	50.7451	45.2432	40.5721	46.5628	48.6956	54.9262	61.9625	65.1205 (72)
Total internal gains	545.7633	541.0919	519.5076	486.3147	452.4934	422.3563	404.9267	413.4544	432.7398	466.1426	503.0899	530.8831 (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
North			2.5540		13.4684		0.7300		0.7200		0.7700		12.5293 (74)
East			0.7190		25.1733		0.7300		0.7200		0.7700		6.5926 (76)
South			6.5250		56.5862		0.7300		0.7200		0.7700		134.4868 (78)
Solar gains	153.6087	218.3866	296.0736	362.5103	380.4129	416.7678	388.3788	371.8923	334.6902	261.0188	182.3695	129.9301	(83)
Total gains	699.3720	759.4785	815.5812	848.8250	832.9064	839.1241	793.3055	785.3467	767.4299	727.1614	685.4593	660.8132	(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	15.0786	15.2238	15.2708	15.4070	15.4070	15.4509	15.4509	15.4939	15.4939	15.3624	15.3624	15.3170
alpha	2.0052	2.0149	2.0181	2.0271	2.0271	2.0301	2.0301	2.0329	2.0329	2.0242	2.0242	2.0211
util living area	0.8693	0.8462	0.8020	0.7330	0.6337	0.4772	0.3553	0.3485	0.5338	0.7115	0.8230	0.8774 (86)
MIT	18.6050	18.8329	19.2950	19.8603	20.3866	20.7727	20.9160	20.9219	20.6971	20.1425	19.3512	18.5975 (87)
Th 2	19.8904	19.8998	19.9028	19.9114	19.9114	19.9142	19.9142	19.9169	19.9169	19.9086	19.9086	19.9058 (88)
util rest of house	0.8543	0.8289	0.7791	0.6999	0.5819	0.3980	0.2507	0.2423	0.4578	0.6678	0.7996	0.8632 (89)
MIT 2	16.8037	17.1258	17.7744	18.5592	19.2628	19.7303	19.8719	19.8792	19.6539	18.9530	17.8680	16.8002 (90)
Living area fraction									fLA = Living area / (4) =			0.2019 (91)
MIT	17.1675	17.4705	18.0815	18.8219	19.4897	19.9408	20.0827	20.0897	19.8645	19.1932	18.1675	17.1631 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.0175	17.3205	17.9315	18.6719	19.3397	19.7908	19.9327	19.9397	19.7145	19.0432	18.0175	17.0131 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8017	0.7760	0.7275	0.6551	0.5509	0.3882	0.2526	0.2447	0.4421	0.6266	0.7475	0.8117 (94)
Useful gains	560.7145	589.3809	593.3624	556.0881	458.8830	325.7503	200.4237	192.1867	339.2783	455.6151	512.3680	536.3652 (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	1096.8233	1077.0568	979.0959	813.0300	591.8258	367.9872	211.1702	201.8116	397.5000	641.4384	876.8048	1069.8013 (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	398.8650	327.7182	286.9857	184.9982	98.9094	0.0000	0.0000	0.0000	0.0000	138.2525	262.3945	396.8765 (98)
Space heating												2094.9999 (98)
RHI space heating demand												2095 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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	39.1700 (1b)	x 2.3700 (2b)	= 92.8329 (1b) - (3b)
First floor	39.1700 (1c)	x 2.6200 (2c)	= 102.6254 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.4583 (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) = 0.2046 (8)
Pressure test					Yes
Measured/design AP50					4.5800
Infiltration rate					0.4336 (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) =	0.4011 (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	0.5114	0.5014	0.4914	0.4412	0.4312	0.3811	0.3811	0.3710	0.4011	0.4312	0.4513	0.4713 (22b)
Effective ac	0.6308	0.6257	0.6207	0.5973	0.5930	0.5726	0.5726	0.5688	0.5805	0.5930	0.6018	0.6111 (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	12.9924		(27)
Flr - Ground			39.1700	0.1800	7.0506	75.6000	2961.2520 (28a)
Wl - Brick (Timber Frame)	88.5560	11.8880	76.6680	0.2100	16.1003	7.4000	567.3432 (29a)
Rf - Ins Joist	39.1730		39.1730	0.0800	3.1338	7.4000	289.8802 (30)
Total net area of external elements Aum(A, m ²)			166.9010				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.7851		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			74.8493			7.4000	553.8851 (32c)
Internal Floor			39.1730			7.4000	289.8802 (32d)
Internal Ceiling			39.1730			7.4000	289.8802 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5260.7897 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1533 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0914 (36)
Total fabric heat loss							(33) + (36) = 56.8765 (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	40.6862	40.3586	40.0376	38.5295	38.2473	36.9338	36.9338	36.6906	37.4398	38.2473	38.8181	39.4149 (38)
Heat transfer coeff	97.5627	97.2352	96.9141	95.4060	95.1239	93.8104	93.8104	93.5671	94.3163	95.1239	95.6947	96.2914 (39)
Average = Sum(39)m / 12 =												95.4047 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2454	1.2412	1.2371	1.2178	1.2142	1.1975	1.1975	1.1944	1.2039	1.2142	1.2215	1.2291 (40)
HLP (average)												1.2178 (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												2.4306 (42)
Average daily hot water use (litres/day)												91.9270 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.1197	97.4426	93.7655	90.0884	86.4113	82.7343	82.7343	86.4113	90.0884	93.7655	97.4426	101.1197 (44)
Energy conte	149.9575	131.1538	135.3390	117.9918	113.2160	97.6968	90.5304	103.8850	105.1257	122.5139	133.7335	145.2259 (45)
Energy content (annual)												Total = Sum(45)m = 1446.3691 (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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2857.0058 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	467.9508	379.0780	342.3013	232.1048	143.0624	0.0000	0.0000	0.0000	0.0000	202.0079	336.6243	473.8898	(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)	518.7925	420.2639	379.4914	257.3224	158.6058	0.0000	0.0000	0.0000	0.0000	223.9555	373.1977	525.3767	(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	102.2551	89.1699	92.4720	82.7175	80.4523	70.6642	67.6724	76.2080	76.6556	87.3187	92.9651	99.1235	(64)
Efficiency of water heater (217)m	87.3699	87.2005	86.8629	86.1132	84.6936	76.4000	76.4000	76.4000	76.4000	85.5371	86.8068	87.4670	(216)
Fuel for water heating, kWh/month	117.0370	102.2585	106.4574	96.0567	94.9922	92.4924	88.5764	99.7486	100.3346	102.0829	107.0942	113.3267	(219)
Water heating fuel used												1220.4576	(219)
Annual totals kWh/year													
Space heating fuel - main system												2857.0058	(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)												371.5858	(232)
Total delivered energy for all uses												4524.0493	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2857.0058	3.4800	99.4238 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1220.4576	3.4800	42.4719 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	371.5858	13.1900	49.0122 (250)
Additional standing charges			120.0000 (251)
Total energy cost			320.8004 (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] =	1.0924 (257)
SAP value		84.7611
SAP rating (Section 12)		85 (258)
SAP band		B

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	2857.0058	0.2160	617.1133 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1220.4576	0.2160	263.6188 (264)
Space and water heating			880.7321 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	371.5858	0.5190	192.8530 (268)
Total kg/year			1112.5101 (272)
CO2 emissions per m2			14.2000 (273)
EI value			87.9134
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	$3.48 / 0.8314 = 4.186$, stars = 5
Water heating environmental impact	$0.216 / 0.8314 = 0.2598$, 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	39.1700 (1b)	x 2.3700 (2b)	= 92.8329 (1b) - (3b)
First floor	39.1700 (1c)	x 2.6200 (2c)	= 102.6254 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.4583 (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) = 0.2046 (8)
Pressure test					Yes
Measured/design AP50					4.5800
Infiltration rate					0.4336 (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) =				0.4011 (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	0.4914	0.4613	0.4513	0.4212	0.4212	0.4112	0.4112	0.4011	0.4011	0.4312	0.4312	0.4412 (22b)
Effective ac	0.6207	0.6064	0.6018	0.5887	0.5887	0.5845	0.5845	0.5805	0.5805	0.5930	0.5930	0.5973 (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	12.9924		(27)
Flr - Ground			39.1700	0.1800	7.0506	75.6000	2961.2520 (28a)
Wl - Brick (Timber Frame)	88.5560	11.8880	76.6680	0.2100	16.1003	7.4000	567.3432 (29a)
Rf - Ins Joist	39.1730		39.1730	0.0800	3.1338	7.4000	289.8802 (30)
Total net area of external elements Aum(A, m ²)			166.9010				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.7851		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			74.8493			7.4000	553.8851 (32c)
Internal Floor			39.1730			7.4000	289.8802 (32d)
Internal Ceiling			39.1730			7.4000	289.8802 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5260.7897 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1533 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0914 (36)
Total fabric heat loss							(33) + (36) = 56.8765 (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	40.0376	39.1132	38.8181	37.9716	37.9716	37.7025	37.7025	37.4398	37.4398	38.2473	38.2473	38.5295 (38)
Heat transfer coeff	96.9141	95.9898	95.6947	94.8482	94.8482	94.5790	94.5790	94.3163	94.3163	95.1239	95.1239	95.4060 (39)
Average = Sum(39)m / 12 =												95.1449 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2371	1.2253	1.2215	1.2107	1.2107	1.2073	1.2073	1.2039	1.2039	1.2142	1.2142	1.2178 (40)
HLP (average)												1.2145 (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												2.4306 (42)
Average daily hot water use (litres/day)												91.9270 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	101.1197	97.4426	93.7655	90.0884	86.4113	82.7343	82.7343	86.4113	90.0884	93.7655	97.4426	101.1197 (44)
Energy conte	149.9575	131.1538	135.3390	117.9918	113.2160	97.6968	90.5304	103.8850	105.1257	122.5139	133.7335	145.2259 (45)
Energy content (annual)												Total = Sum(45)m = 1446.3691 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	22.4936	19.6731	20.3008	17.6988	16.9824	14.6545	13.5796	15.5827	15.7689	18.3771	20.0600	21.7839 (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												
	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	0.5751	0.5711	0.4783	0.4402	0.3637	0.3370	0.4040	0.4262	0.5169	0.5864	0.6482 (61)
Total heat required for water heating calculated for each month												
	150.6268	131.7289	135.9101	118.4702	113.6562	98.0605	90.8675	104.2889	105.5519	123.0308	134.3199	145.8740 (62)
WWHRS	-48.3718	-42.5590	-43.4381	-35.7526	-33.2039	-27.3963	-23.1951	-28.0810	-28.8963	-35.7121	-41.3548	-46.7506 eq. (G10)
Total of WWHRS savings												-434.7114
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												
	102.2551	89.1699	92.4720	82.7175	80.4523	70.6642	67.6724	76.2080	76.6556	87.3187	92.9651	99.1235 (64)
								Total per year	(kWh/year) =	Sum(64)m =		1017.6742 (64)
Heat gains from water heating, kWh/month												
	50.0282	43.7524	45.1430	39.3519	37.7544	32.5751	30.1856	34.6427	35.0608	40.8651	44.6130	48.4496 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8017	0.7760	0.7275	0.6551	0.5509	0.3882	0.2526	0.2447	0.4421	0.6266	0.7475	0.8117 (94)
Useful gains	560.7145	589.3809	593.3624	556.0881	458.8830	325.7503	200.4237	192.1867	339.2783	455.6151	512.3680	536.3652 (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	1096.8233	1077.0568	979.0959	813.0300	591.8258	367.9872	211.1702	201.8116	397.5000	641.4384	876.8048	1069.8013 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	398.8650	327.7182	286.9857	184.9982	98.9094	0.0000	0.0000	0.0000	0.0000	138.2525	262.3945	396.8765 (98)
Space heating												2094.9999 (98)
Space heating per m2												26.7424 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2322.6164 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	398.8650	327.7182	286.9857	184.9982	98.9094	0.0000	0.0000	0.0000	0.0000	138.2525	262.3945	396.8765	(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)	442.2006	363.3239	318.1660	205.0977	109.6557	0.0000	0.0000	0.0000	0.0000	153.2733	290.9030	439.9961	(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	102.2551	89.1699	92.4720	82.7175	80.4523	70.6642	67.6724	76.2080	76.6556	87.3187	92.9651	99.1235	(64)
Efficiency of water heater (217)m	86.9936	86.8447	86.3970	85.4321	83.4397	76.4000	76.4000	76.4000	76.4000	84.3053	86.1300	87.0574	(216)
Fuel for water heating, kWh/month	117.5432	102.6774	107.0315	96.8226	96.4198	92.4924	88.5764	99.7486	100.3346	103.5744	107.9358	113.8599	(219)
Water heating fuel used												1227.0165	(219)
Annual totals kWh/year													
Space heating fuel - main system												2322.6164	(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)												371.5858	(232)
Total delivered energy for all uses												3996.2187	(238)

10a. Fuel costs - using BEDF prices (535)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2322.6164	7.6100	176.7511 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1227.0165	7.6100	93.3760 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	371.5858	31.0800	115.4889 (250)
Additional standing charges			105.0000 (251)
Total energy cost			513.9259 (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	2322.6164	0.2160	501.6851 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1227.0165	0.2160	265.0356 (264)
Space and water heating			766.7207 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	371.5858	0.5190	192.8530 (268)
Total kg/year			998.4987 (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	2322.6164	1.2200	2833.5919 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1227.0165	1.2200	1496.9602 (264)
Space and water heating			4330.5521 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	371.5858	3.0700	1140.7684 (268)
Primary energy kWh/year			5701.5705 (272)
Primary energy kWh/m2/year			72.7798 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:
Current environmental impact rating:

B 85
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	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	SAP increase too small
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Recommended
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 10.8	-£ 605	-1010 kg (101.2%)

Measures omitted - SAP change or cost saving too small:	SAP change	Cost change	CO2 change
N Solar water heating	+ 0.9	-£ 43	-141 kg (14.1%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar photovoltaic panels	£605	12.90 kg/m²	A 96	A 98
Total Savings	£605	12.90 kg/m²		
Potential energy efficiency rating:			A 96	
Potential environmental impact rating:				A 98

Fuel prices for cost data on this page from database revision number 535 TEST (04 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	£375	£375	£0
Space heating	£305	£305	£0
Water heating	£93	£93	£0
Lighting	£115	£115	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£514	-£91	£605
Total cost of uses	£513	-£92	£605
Delivered energy	51 kWh/m²	26 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	73 kWh/m²	-3 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	39.1700 (1b)	x 2.3700 (2b)	= 92.8329 (1b) - (3b)
First floor	39.1700 (1c)	x 2.6200 (2c)	= 102.6254 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.4583 (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) = 0.2046 (8)
Pressure test					Yes
Measured/design AP50					4.5800
Infiltration rate					0.4336 (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) =	0.4011 (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	0.5114	0.5014	0.4914	0.4412	0.4312	0.3811	0.3811	0.3710	0.4011	0.4312	0.4513	0.4713 (22b)
Effective ac	0.6308	0.6257	0.6207	0.5973	0.5930	0.5726	0.5726	0.5688	0.5805	0.5930	0.6018	0.6111 (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	12.9924		(27)
Flr - Ground			39.1700	0.1800	7.0506	75.6000	2961.2520 (28a)
Wl - Brick (Timber Frame)	88.5560	11.8880	76.6680	0.2100	16.1003	7.4000	567.3432 (29a)
Rf - Ins Joist	39.1730		39.1730	0.0800	3.1338	7.4000	289.8802 (30)
Total net area of external elements Aum(A, m ²)			166.9010				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.7851		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			74.8493			7.4000	553.8851 (32c)
Internal Floor			39.1730			7.4000	289.8802 (32d)
Internal Ceiling			39.1730			7.4000	289.8802 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5260.7897 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1533 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0914 (36)
Total fabric heat loss							(33) + (36) = 56.8765 (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	40.6862	40.3586	40.0376	38.5295	38.2473	36.9338	36.9338	36.6906	37.4398	38.2473	38.8181	39.4149 (38)
Heat transfer coeff	97.5627	97.2352	96.9141	95.4060	95.1239	93.8104	93.8104	93.5671	94.3163	95.1239	95.6947	96.2914 (39)
Average = Sum(39)m / 12 =												95.4047 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2454	1.2412	1.2371	1.2178	1.2142	1.1975	1.1975	1.1944	1.2039	1.2142	1.2215	1.2291 (40)
HLP (average)												1.2178 (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												2.4306 (42)
Average daily hot water use (litres/day)												91.9270 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	101.1197	97.4426	93.7655	90.0884	86.4113	82.7343	82.7343	86.4113	90.0884	93.7655	97.4426	101.1197 (44)
Energy conte	149.9575	131.1538	135.3390	117.9918	113.2160	97.6968	90.5304	103.8850	105.1257	122.5139	133.7335	145.2259 (45)
Energy content (annual)												Total = Sum(45)m = 1446.3691 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	22.4936	19.6731	20.3008	17.6988	16.9824	14.6545	13.5796	15.5827	15.7689	18.3771	20.0600	21.7839 (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	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	0.5751	0.5711	0.4783	0.4402	0.3637	0.3370	0.4040	0.4262	0.5169	0.5864	0.6482 (61)
Total heat required for water heating calculated for each month	150.6268	131.7289	135.9101	118.4702	113.6562	98.0605	90.8675	104.2889	105.5519	123.0308	134.3199	145.8740 (62)
WWHRS	-48.3718	-42.5590	-43.4381	-35.7526	-33.2039	-27.3963	-23.1951	-28.0810	-28.8963	-35.7121	-41.3548	-46.7506 eq. (G10)
Total of WWHRS savings												-434.7114
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	102.2551	89.1699	92.4720	82.7175	80.4523	70.6642	67.6724	76.2080	76.6556	87.3187	92.9651	99.1235 (64)
Heat gains from water heating, kWh/month	50.0282	43.7524	45.1430	39.3519	37.7544	32.5751	30.1856	34.6427	35.0608	40.8651	44.6130	48.4496 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8299	0.7980	0.7572	0.6968	0.6115	0.4888	0.3614	0.3838	0.5409	0.6966	0.7932	0.8403 (94)
Useful gains	557.6181	600.1206	605.7294	574.1757	504.2511	386.0966	274.6421	285.0694	396.3400	485.4226	518.2777	537.2752 (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												
	1186.5843	1164.2248	1065.8117	896.5434	696.5393	468.8895	304.9008	320.6445	505.3369	756.9385	985.8115	1174.2238 (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												
	467.9508	379.0780	342.3013	232.1048	143.0624	0.0000	0.0000	0.0000	0.0000	202.0079	336.6243	473.8898 (98)
Space heating												2577.0193 (98)
Space heating per m2												32.8953 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2857.0058 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	467.9508	379.0780	342.3013	232.1048	143.0624	0.0000	0.0000	0.0000	0.0000	202.0079	336.6243	473.8898	(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)	518.7925	420.2639	379.4914	257.3224	158.6058	0.0000	0.0000	0.0000	0.0000	223.9555	373.1977	525.3767	(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	102.2551	89.1699	92.4720	82.7175	80.4523	70.6642	67.6724	76.2080	76.6556	87.3187	92.9651	99.1235	(64)
Efficiency of water heater (217)m	87.3699	87.2005	86.8629	86.1132	84.6936	76.4000	76.4000	76.4000	76.4000	85.5371	86.8068	87.4670	(216)
Fuel for water heating, kWh/month	117.0370	102.2585	106.4574	96.0567	94.9922	92.4924	88.5764	99.7486	100.3346	102.0829	107.0942	113.3267	(219)
Water heating fuel used												1220.4576	(219)
Annual totals kWh/year													
Space heating fuel - main system												2857.0058	(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)												371.5858	(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												2796.8099	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2857.0058	3.4800	99.4238 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1220.4576	3.4800	42.4719 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	371.5858	13.1900	49.0122 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			92.9775 (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] =	0.3166 (257)
SAP value		95.5833
SAP rating (Section 12)		96 (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	2857.0058	0.2160	617.1133 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1220.4576	0.2160	263.6188 (264)
Space and water heating			880.7321 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	371.5858	0.5190	192.8530 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			216.0729 (272)
CO2 emissions per m2			2.7600 (273)
EI value			97.6525
EI rating			98 (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	39.1700 (1b)	x 2.3700 (2b)	= 92.8329 (1b) - (3b)
First floor	39.1700 (1c)	x 2.6200 (2c)	= 102.6254 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.4583 (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) = 0.2046 (8)
Pressure test					Yes
Measured/design AP50					4.5800
Infiltration rate					0.4336 (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) =	0.4011 (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	0.4914	0.4613	0.4513	0.4212	0.4212	0.4112	0.4112	0.4011	0.4011	0.4312	0.4312	0.4412 (22b)
Effective ac	0.6207	0.6064	0.6018	0.5887	0.5887	0.5845	0.5845	0.5805	0.5805	0.5930	0.5930	0.5973 (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	12.9924		(27)
Flr - Ground			39.1700	0.1800	7.0506	75.6000	2961.2520 (28a)
Wl - Brick (Timber Frame)	88.5560	11.8880	76.6680	0.2100	16.1003	7.4000	567.3432 (29a)
Rf - Ins Joist	39.1730		39.1730	0.0800	3.1338	7.4000	289.8802 (30)
Total net area of external elements Aum(A, m ²)			166.9010				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.7851		(33)
Party Wall			41.7120	0.0000	0.0000	7.4000	308.6688 (32)
Stud			74.8493			7.4000	553.8851 (32c)
Internal Floor			39.1730			7.4000	289.8802 (32d)
Internal Ceiling			39.1730			7.4000	289.8802 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 5260.7897 (34)
(33) + (36) = 56.8765 (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	40.0376	39.1132	38.8181	37.9716	37.9716	37.7025	37.7025	37.4398	37.4398	38.2473	38.2473	38.5295 (38)
Heat transfer coeff	96.9141	95.9898	95.6947	94.8482	94.8482	94.5790	94.5790	94.3163	94.3163	95.1239	95.1239	95.4060 (39)
Average = Sum(39)m / 12 =												95.1449 (39)
HLP	1.2371	1.2253	1.2215	1.2107	1.2107	1.2073	1.2073	1.2039	1.2039	1.2142	1.2142	1.2178 (40)
HLP (average)												1.2145 (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												2.4306 (42)
Average daily hot water use (litres/day)												91.9270 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	101.1197	97.4426	93.7655	90.0884	86.4113	82.7343	82.7343	86.4113	90.0884	93.7655	97.4426	101.1197 (44)
Energy content (annual)	149.9575	131.1538	135.3390	117.9918	113.2160	97.6968	90.5304	103.8850	105.1257	122.5139	133.7335	145.2259 (45)
Distribution loss (46)m = 0.15 x (45)m												1446.3691 (45)

Water storage loss:	22.4936	19.6731	20.3008	17.6988	16.9824	14.6545	13.5796	15.5827	15.7689	18.3771	20.0600	21.7839 (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												
	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	0.5751	0.5711	0.4783	0.4402	0.3637	0.3370	0.4040	0.4262	0.5169	0.5864	0.6482 (61)
Total heat required for water heating calculated for each month												
	150.6268	131.7289	135.9101	118.4702	113.6562	98.0605	90.8675	104.2889	105.5519	123.0308	134.3199	145.8740 (62)
WWHRS	-48.3718	-42.5590	-43.4381	-35.7526	-33.2039	-27.3963	-23.1951	-28.0810	-28.8963	-35.7121	-41.3548	-46.7506 eq. (G10)
Total of WWHRS savings												-434.7114
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												
	102.2551	89.1699	92.4720	82.7175	80.4523	70.6642	67.6724	76.2080	76.6556	87.3187	92.9651	99.1235 (64)
								Total per year	(kWh/year) =	Sum(64)m =		1017.6742 (64)
Heat gains from water heating, kWh/month												
	50.0282	43.7524	45.1430	39.3519	37.7544	32.5751	30.1856	34.6427	35.0608	40.8651	44.6130	48.4496 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8017	0.7760	0.7275	0.6551	0.5509	0.3882	0.2526	0.2447	0.4421	0.6266	0.7475	0.8117 (94)
Useful gains	560.7145	589.3809	593.3624	556.0881	458.8830	325.7503	200.4237	192.1867	339.2783	455.6151	512.3680	536.3652 (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	1096.8233	1077.0568	979.0959	813.0300	591.8258	367.9872	211.1702	201.8116	397.5000	641.4384	876.8048	1069.8013 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	398.8650	327.7182	286.9857	184.9982	98.9094	0.0000	0.0000	0.0000	0.0000	138.2525	262.3945	396.8765 (98)
Space heating												2094.9999 (98)
Space heating per m2												26.7424 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2322.6164 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	398.8650	327.7182	286.9857	184.9982	98.9094	0.0000	0.0000	0.0000	0.0000	138.2525	262.3945	396.8765	(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)	442.2006	363.3239	318.1660	205.0977	109.6557	0.0000	0.0000	0.0000	0.0000	153.2733	290.9030	439.9961	(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	102.2551	89.1699	92.4720	82.7175	80.4523	70.6642	67.6724	76.2080	76.6556	87.3187	92.9651	99.1235	(64)
Efficiency of water heater (217)m	86.9936	86.8447	86.3970	85.4321	83.4397	76.4000	76.4000	76.4000	76.4000	84.3053	86.1300	87.0574	(216)
Fuel for water heating, kWh/month	117.5432	102.6774	107.0315	96.8226	96.4198	92.4924	88.5764	99.7486	100.3346	103.5744	107.9358	113.8599	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2322.6164 (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)													371.5858 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1217 * 0.80) =													
Total delivered energy for all uses										-1946.4459			-1946.4459 (233)
													2049.7727 (238)

10a. Fuel costs - using BEDF prices (535)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2322.6164	7.6100	176.7511 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1227.0165	7.6100	93.3760 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	371.5858	31.0800	115.4889 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	31.0800	-604.9554 (252)
Total energy cost			-91.0295 (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	2322.6164	0.2160	501.6851 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1227.0165	0.2160	265.0356 (264)
Space and water heating			766.7207 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	371.5858	0.5190	192.8530 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			-11.7067 (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	2322.6164	1.2200	2833.5919 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1227.0165	1.2200	1496.9602 (264)
Space and water heating			4330.5521 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	371.5858	3.0700	1140.7684 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			-274.0186 (272)
Primary energy kWh/m2/year			-3.4978 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	010 - PRJ013014	Issued on Date	11/01/2024
Assessment Reference	010	Prop Type Ref	E
Property	10 Rashleigh Drive, Netley Abbey, Southampton, SO31 5JY		
SAP Rating	85 B	DER	15.19
Environmental	88 B	TER	18.14
CO ₂ Emissions (t/year)	1.00	% DER<TER	16.26
General Requirements Compliance	Pass	DFEE	44.47
		TFEE	48.83
		% DFEE<TFEE	8.94
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk		Assessor ID
			U903-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.14	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.19	kgCO ₂ /m ²	Pass
	-2.95 (-16.3%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.83	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	44.47	kWh/m ² /yr	
	-4.3 (-8.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.58 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

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%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

2.55 m², No overhang

Windows facing East

0.72 m², No overhang

Windows facing South

6.53 m², No overhang

Air change rate

4.71 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.58 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.08

W/m²K