

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	004 - PRJ013014			Issued on Date	30/11/2023
Assessment Reference	004	Prop Type Ref	E		
Property	2 Rashleigh Drive, Netley Abbey, Southampton, SO31 5JY				
SAP Rating	85 B	DER	15.25	TER	18.14
Environmental	88 B	% DER<TER	15.93		
CO ₂ Emissions (t/year)	1.00	DFEE	44.72	TFEE	48.83
General Requirements Compliance	Pass	% DFEE<TFEE	8.42		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	4299-0004
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) 15.25 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 48.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 44.7 kWh/m²/yr OK

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: 4.88 (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 South: 6.53 m², No overhang
Windows facing West: 0.72 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					4.8800
Infiltration rate					0.4486 (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) =	0.4150 (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	0.5291	0.5187	0.5084	0.4565	0.4461	0.3942	0.3942	0.3839	0.4150	0.4461	0.4669	0.4876 (22b)
Effective ac	0.6400	0.6345	0.6292	0.6042	0.5995	0.5777	0.5777	0.5737	0.5861	0.5995	0.6090	0.6189 (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	41.2799	40.9293	40.5856	38.9714	38.6693	37.2634	37.2634	37.0030	37.8049	38.6693	39.2803	39.9191 (38)
Heat transfer coeff	98.1564	97.8058	97.4621	95.8479	95.5459	94.1399	94.1399	93.8796	94.6815	95.5459	96.1569	96.7956 (39)
Average = Sum(39)m / 12 =												95.8465 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2530	1.2485	1.2441	1.2235	1.2196	1.2017	1.2017	1.1984	1.2086	1.2196	1.2274	1.2356 (40)
HLP (average)												1.2235 (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)
								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	0.8841	0.8519	0.8115	0.7527	0.6691	0.5485	0.4173	0.4439	0.6082	0.7621	0.8529	0.8938 (94)
Useful gains	435.7201	490.1517	512.3731	501.9406	454.4782	358.4214	261.8460	269.7488	358.7585	413.3975	415.5103	414.7960 (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	1142.1888	1124.2612	1032.1596	870.8546	679.7414	460.2533	301.3088	316.1880	492.9349	730.7456	947.6777	1129.3229 (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	525.6127	426.1216	386.7212	265.6181	167.5958	0.0000	0.0000	0.0000	0.0000	236.1070	383.1606	531.6081 (98)
Space heating												2922.5451 (98)
Space heating per m2												37.3059 (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													3240.0722 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	525.6127	426.1216	386.7212	265.6181	167.5958	0.0000	0.0000	0.0000	0.0000	236.1070	383.1606	531.6081	(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)	582.7192	472.4186	428.7374	294.4769	185.8047	0.0000	0.0000	0.0000	0.0000	261.7594	424.7900	589.3659	(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	87.6224	87.4661	87.1618	86.4902	85.2081	76.4000	76.4000	76.4000	76.4000	86.0058	87.1272	87.7102	(216)
Fuel for water heating, kWh/month	116.6997	101.9480	106.0923	95.6380	94.4187	92.4924	88.5764	99.7486	100.3346	101.5265	106.7005	113.0125	(219)
Water heating fuel used												1217.1882	(219)
Annual totals kWh/year													
Space heating fuel - main system												3240.0722	(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												4903.8462	(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	3240.0722	0.2160	699.8556 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1217.1882	0.2160	262.9127 (264)
Space and water heating			962.7682 (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			1194.5463 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2500 (273)

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

DER		15.2500	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		33.8475	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		33.8475	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												
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												

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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)
South					6.5250	46.7521	0.6300	0.7000			0.7700			93.2295 (78)
West					0.7190	19.6403	0.6300	0.7000			0.7700			4.3157 (80)
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	87.6351	(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					4.8800
Infiltration rate					0.3975 (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) =	0.3677 (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	0.4688	0.4596	0.4504	0.4044	0.3952	0.3493	0.3493	0.3401	0.3677	0.3952	0.4136	0.4320 (22b)
Effective ac	0.6099	0.6056	0.6014	0.5818	0.5781	0.5610	0.5610	0.5578	0.5676	0.5781	0.5855	0.5933 (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	39.3380	39.0628	38.7930	37.5259	37.2889	36.1853	36.1853	35.9810	36.6104	37.2889	37.7685	38.2698 (38)
Heat transfer coeff	96.2145	95.9393	95.6695	94.4025	94.1654	93.0619	93.0619	92.8575	93.4869	94.1654	94.6450	95.1464 (39)
Average = Sum(39)m / 12 =												94.4014 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2282	1.2247	1.2212	1.2050	1.2020	1.1879	1.1879	1.1853	1.1933	1.2020	1.2081	1.2145 (40)
HLP (average)												1.2050 (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)		
South				6.5250	46.7521	0.7300	0.7200	0.7700		111.1143 (78)		
West				0.7190	19.6403	0.7300	0.7200	0.7700		5.1436 (80)		

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	15.1883	15.2318	15.2748	15.4798	15.5188	15.7028	15.7028	15.7373	15.6314	15.5188	15.4401	15.3588	
alpha	2.0126	2.0155	2.0183	2.0320	2.0346	2.0469	2.0469	2.0492	2.0421	2.0346	2.0293	2.0239	
util living area	0.9399	0.9162	0.8846	0.8348	0.7604	0.6505	0.5326	0.5607	0.7123	0.8486	0.9191	0.9462 (86)	
MIT	17.7865	18.1325	18.6547	19.3218	19.9564	20.4880	20.7631	20.7270	20.3314	19.5035	18.5295	17.7255 (87)	
Th 2	19.8975	19.9003	19.9031	19.9160	19.9184	19.9297	19.9297	19.9318	19.9253	19.9184	19.9135	19.9084 (88)	
util rest of house	0.9326	0.9063	0.8702	0.8123	0.7232	0.5866	0.4365	0.4682	0.6564	0.8236	0.9078	0.9397 (89)	
MIT 2	16.9662	17.3081	17.8230	18.4816	19.0898	19.5829	19.8075	19.7841	19.4483	18.6689	17.7136	16.9132 (90)	
Living area fraction									fLA = Living area / (4) =				0.2019 (91)
MIT	17.1319	17.4746	17.9910	18.6513	19.2648	19.7657	20.0005	19.9745	19.6266	18.8374	17.8784	17.0772 (92)	
Temperature adjustment												0.0000	
adjusted MIT	17.1319	17.4746	17.9910	18.6513	19.2648	19.7657	20.0005	19.9745	19.6266	18.8374	17.8784	17.0772 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9077	0.8772	0.8382	0.7802	0.6967	0.5756	0.4436	0.4723	0.6383	0.7924	0.8795	0.9163 (94)
Useful gains	422.4364	481.3311	508.2378	502.5138	458.3624	364.9684	270.4623	277.6219	363.3015	411.6620	406.0722	400.8515 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1234.6114	1206.3992	1099.3361	920.5433	712.3408	480.7306	316.4575	331.9200	516.6654	775.6823	1020.1223	1225.2225 (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	604.2582	487.2457	439.7771	300.9812	188.9600	0.0000	0.0000	0.0000	0.0000	270.8310	442.1161	613.3320 (98)
Space heating												3347.5014 (98)
Space heating per m2										(98) / (4) =		42.7304 (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	874.7815	688.6578	705.7170	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6550	0.7215	0.7043	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.9768	496.8626	497.0666	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	186.8201	227.1690	209.2774	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												623.2665 (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	46.7050	56.7923	52.3193	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												155.8166 (107)
Space cooling per m2												1.9890 (108)
Energy for space heating												42.7304 (99)
Energy for space cooling												1.9890 (108)
Total												44.7194 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.7 (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			Openings	NetArea	U-value	A x U		K-value	A x K		
	m2			m2	m2	W/m2K	W/K		kJ/m2K	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)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.5536	39.2700	38.9920	37.6864	37.4421	36.3050	36.3050	36.0944	36.7430	37.4421	37.9363	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)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1149	1.1113	1.1078	1.0911	1.0880	1.0735	1.0735	1.0708	1.0790	1.0880	1.0943	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 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	31.8660	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)		
South				6.5250	46.7521	0.6300	0.7000	0.7700		93.2295 (78)		
West				0.7190	19.6403	0.6300	0.7000	0.7700		4.3157 (80)		

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, Thl (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	62.2864	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	
	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)
Useful gains	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					4.8800
Infiltration rate					0.4486 (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) =	0.4150 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate												
Effective ac	0.5084	0.4772	0.4669	0.4357	0.4357	0.4254	0.4254	0.4150	0.4150	0.4461	0.4461	0.4565 (22b)
	0.6292	0.6139	0.6090	0.5949	0.5949	0.5905	0.5905	0.5861	0.5861	0.5995	0.5995	0.6042 (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	40.5856	39.5962	39.2803	38.3743	38.3743	38.0861	38.0861	37.8049	37.8049	38.6693	38.6693	38.9714 (38)
Heat transfer coeff	97.4621	96.4728	96.1569	95.2508	95.2508	94.9627	94.9627	94.6815	94.6815	95.5459	95.5459	95.8479 (39)
Average = Sum(39)m / 12 =												95.5684 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2441	1.2315	1.2274	1.2159	1.2159	1.2122	1.2122	1.2086	1.2086	1.2196	1.2196	1.2235 (40)
HLP (average)												1.2199 (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	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)
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)		
South				6.5250	56.5862	0.7300	0.7200		0.7700	134.4868 (78)		
West				0.7190	25.1733	0.7300	0.7200		0.7700	6.5926 (80)		
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	14.9938	15.1476	15.1974	15.3419	15.3419	15.3885	15.3885	15.4342	15.4342	15.2945	15.2945	15.2463
alpha	1.9996	2.0098	2.0132	2.0228	2.0228	2.0259	2.0259	2.0289	2.0289	2.0196	2.0196	2.0164
util living area	0.8697	0.8467	0.8027	0.7338	0.6347	0.4783	0.3563	0.3495	0.5349	0.7124	0.8235	0.8778 (86)
MIT	18.5902	18.8200	19.2839	19.8525	20.3815	20.7704	20.9150	20.9209	20.6944	20.1361	19.3418	18.5854 (87)
Th 2	19.8849	19.8949	19.8981	19.9073	19.9073	19.9103	19.9103	19.9131	19.9131	19.9043	19.9043	19.9013 (88)
util rest of house	0.8547	0.8294	0.7797	0.7007	0.5827	0.3988	0.2512	0.2427	0.4586	0.6686	0.8001	0.8635 (89)
MIT 2	16.7811	17.1059	17.7571	18.5466	19.2538	19.7247	19.8676	19.8751	19.6481	18.9423	17.8532	16.7818 (90)
Living area fraction	17.1464	17.4520	18.0654	18.8103	19.4815	19.9359	20.0791	20.0863	19.8593	19.1833	18.1538	17.1460 (92)
MIT	16.9964	17.3020	17.9154	18.6603	19.3315	19.7859	19.9291	19.9363	19.7093	19.0333	18.0038	16.9960 (93)
Temperature adjustment												-0.1500
adjusted MIT												16.9960 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8020	0.7764	0.7280	0.6556	0.5516	0.3889	0.2531	0.2452	0.4427	0.6271	0.7478	0.8119 (94)
Useful gains	560.9146	589.6253	593.7082	556.5246	459.4334	326.3198	200.8018	192.5297	339.7737	456.0264	512.5992	536.5056 (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	1100.9737	1080.6922	982.2791	815.3785	593.5559	369.0129	211.6798	202.2676	398.5471	643.3438	879.3881	1073.1144 (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	401.8040	329.9970	289.0968	186.3748	99.7871	0.0000	0.0000	0.0000	0.0000	139.3641	264.0880	399.2369 (98)
Space heating												2109.7488 (98)
RHI space heating demand												2110 (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	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					4.8800
Infiltration rate					0.4486 (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) =	0.4150 (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	0.5291	0.5187	0.5084	0.4565	0.4461	0.3942	0.3942	0.3839	0.4150	0.4461	0.4669	0.4876 (22b)
Effective ac	0.6400	0.6345	0.6292	0.6042	0.5995	0.5777	0.5777	0.5737	0.5861	0.5995	0.6090	0.6189 (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	41.2799	40.9293	40.5856	38.9714	38.6693	37.2634	37.2634	37.0030	37.8049	38.6693	39.2803	39.9191 (38)
Heat transfer coeff	98.1564	97.8058	97.4621	95.8479	95.5459	94.1399	94.1399	93.8796	94.6815	95.5459	96.1569	96.7956 (39)
Average = Sum(39)m / 12 =												95.8465 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2530	1.2485	1.2441	1.2235	1.2196	1.2017	1.2017	1.1984	1.2086	1.2196	1.2274	1.2356 (40)
HLP (average)												1.2235 (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													2877.7463 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	471.4483	382.0056	345.0669	233.8419	144.2577	0.0000	0.0000	0.0000	0.0000	203.4395	338.7818	476.8853	(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)	522.6700	423.5095	382.5576	259.2483	159.9310	0.0000	0.0000	0.0000	0.0000	225.5427	375.5896	528.6977	(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	87.3866	87.2185	86.8832	86.1346	84.7211	76.4000	76.4000	76.4000	76.4000	85.5588	86.8231	87.4808	(216)
(217)m	87.3866	87.2185	86.8832	86.1346	84.7211	76.4000	76.4000	76.4000	76.4000	85.5588	86.8231	87.4808	(217)
Fuel for water heating, kWh/month	117.0146	102.2373	106.4325	96.0329	94.9614	92.4924	88.5764	99.7486	100.3346	102.0569	107.0741	113.3089	(219)
Water heating fuel used												1220.2705	(219)
Annual totals kWh/year													
Space heating fuel - main system												2877.7463	(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												4544.6026	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2877.7463	3.4800	100.1456 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1220.2705	3.4800	42.4654 (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			321.5157 (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] = 1.0948 (257)
SAP value	84.7271
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	2877.7463	0.2160	621.5932 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1220.2705	0.2160	263.5784 (264)
Space and water heating			885.1716 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	371.5858	0.5190	192.8530 (268)
Total kg/year			1116.9497 (272)
CO2 emissions per m2			14.2600 (273)
EI value			87.8651
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	$3.48 / 0.8315 = 4.185$, stars = 5
Water heating environmental impact	$0.216 / 0.8315 = 0.2598$, 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	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					4.8800
Infiltration rate					0.4486 (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) =	0.4150 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate												
Effective ac	0.5084	0.4772	0.4669	0.4357	0.4357	0.4254	0.4254	0.4150	0.4150	0.4461	0.4461	0.4565 (22b)
	0.6292	0.6139	0.6090	0.5949	0.5949	0.5905	0.5905	0.5861	0.5861	0.5995	0.5995	0.6042 (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	40.5856	39.5962	39.2803	38.3743	38.3743	38.0861	38.0861	37.8049	37.8049	38.6693	38.6693	38.9714 (38)
Heat transfer coeff	97.4621	96.4728	96.1569	95.2508	95.2508	94.9627	94.9627	94.6815	94.6815	95.5459	95.5459	95.8479 (39)
Average = Sum(39)m / 12 =												95.5684 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2441	1.2315	1.2274	1.2159	1.2159	1.2122	1.2122	1.2086	1.2086	1.2196	1.2196	1.2235 (40)
HLP (average)												1.2199 (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)
								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	0.8020	0.7764	0.7280	0.6556	0.5516	0.3889	0.2531	0.2452	0.4427	0.6271	0.7478	0.8119 (94)
Useful gains	560.9146	589.6253	593.7082	556.5246	459.4334	326.3198	200.8018	192.5297	339.7737	456.0264	512.5992	536.5056 (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	1100.9737	1080.6922	982.2791	815.3785	593.5559	369.0129	211.6798	202.2676	398.5471	643.3438	879.3881	1073.1144 (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	401.8040	329.9970	289.0968	186.3748	99.7871	0.0000	0.0000	0.0000	0.0000	139.3641	264.0880	399.2369 (98)
Space heating												2109.7488 (98)
Space heating per m2												26.9307 (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	2338.9676 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	401.8040	329.9970	289.0968	186.3748	99.7871	0.0000	0.0000	0.0000	0.0000	139.3641	264.0880	399.2369 (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)	445.4590	365.8503	320.5064	206.6240	110.6288	0.0000	0.0000	0.0000	0.0000	154.5057	292.7805	442.6130 (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	87.0116	86.8623	86.4171	85.4552	83.4701	76.4000	76.4000	76.4000	76.4000	84.3323	86.1485	76.4000 (216)
Fuel for water heating, kWh/month	117.5188	102.6566	107.0066	96.7964	96.3846	92.4924	88.5764	99.7486	100.3346	103.5412	107.9127	113.8411 (219)
Water heating fuel used												1226.8100 (219)
Annual totals kWh/year												
Space heating fuel - main system												2338.9676 (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												4012.3633 (238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2338.9676	10.2300	239.2764 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1226.8100	10.2300	125.5027 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	371.5858	36.7200	136.4463 (250)
Additional standing charges			103.0000 (251)
Total energy cost			631.7653 (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	2338.9676	0.2160	505.2170 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1226.8100	0.2160	264.9910 (264)
Space and water heating			770.2080 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	371.5858	0.5190	192.8530 (268)
Total kg/year			1001.9860 (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	2338.9676	1.2200	2853.5404 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1226.8100	1.2200	1496.7082 (264)
Space and water heating			4350.2486 (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			5721.2670 (272)
Primary energy kWh/m2/year			73.0312 (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	-£ 715	-1010 kg (100.8%)

Measures omitted - SAP change or cost saving too small:	SAP change	Cost change	CO2 change
N Solar water heating	+ 0.9	-£ 61	-141 kg (14.1%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar photovoltaic panels	£715	12.90 kg/m²	A 96	A 98
Total Savings	£715	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 531 TEST (31 Oct 2023)
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	£164	£164	£0
Mains gas	£468	£468	£0
Space heating	£370	£370	£0
Water heating	£126	£126	£0
Lighting	£136	£136	£0
Generated (PV)	-£0	-£715	£715
Total cost of fuels	£632	-£83	£715
Total cost of uses	£632	-£83	£715
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	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					4.8800
Infiltration rate					0.4486 (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) =	0.4150 (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	0.5291	0.5187	0.5084	0.4565	0.4461	0.3942	0.3942	0.3839	0.4150	0.4461	0.4669	0.4876 (22b)
Effective ac	0.6400	0.6345	0.6292	0.6042	0.5995	0.5777	0.5777	0.5737	0.5861	0.5995	0.6090	0.6189 (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	41.2799	40.9293	40.5856	38.9714	38.6693	37.2634	37.2634	37.0030	37.8049	38.6693	39.2803	39.9191 (38)
Heat transfer coeff	98.1564	97.8058	97.4621	95.8479	95.5459	94.1399	94.1399	93.8796	94.6815	95.5459	96.1569	96.7956 (39)
Average = Sum(39)m / 12 =												95.8465 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2530	1.2485	1.2441	1.2235	1.2196	1.2017	1.2017	1.1984	1.2086	1.2196	1.2274	1.2356 (40)
HLP (average)												1.2235 (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 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													2877.7463 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	471.4483	382.0056	345.0669	233.8419	144.2577	0.0000	0.0000	0.0000	0.0000	203.4395	338.7818	476.8853	(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)	522.6700	423.5095	382.5576	259.2483	159.9310	0.0000	0.0000	0.0000	0.0000	225.5427	375.5896	528.6977	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	102.2551	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	87.3866	87.2185	86.8832	86.1346	84.7211	76.4000	76.4000	76.4000	76.4000	85.5588	86.8231	87.4808	(216)
Fuel for water heating, kWh/month	117.0146	102.2373	106.4325	96.0329	94.9614	92.4924	88.5764	99.7486	100.3346	102.0569	107.0741	113.3089	(219)
Water heating fuel used												1220.2705	(219)
Annual totals kWh/year													
Space heating fuel - main system												2877.7463	(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												2817.3632	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2877.7463	3.4800	100.1456 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1220.2705	3.4800	42.4654 (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			93.6928 (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] =	0.3190 (257)
SAP value		95.5493
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	2877.7463	0.2160	621.5932 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1220.2705	0.2160	263.5784 (264)
Space and water heating			885.1716 (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			220.5124 (272)
CO2 emissions per m2			2.8100 (273)
EI value			97.6043
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	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					4.8800
Infiltration rate					0.4486 (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) =	0.4150 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate												
Effective ac	0.5084	0.4772	0.4669	0.4357	0.4357	0.4254	0.4254	0.4150	0.4150	0.4461	0.4461	0.4565 (22b)
	0.6292	0.6139	0.6090	0.5949	0.5949	0.5905	0.5905	0.5861	0.5861	0.5995	0.5995	0.6042 (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)
67.1533 (35)
15.0914 (36)
(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	40.5856	39.5962	39.2803	38.3743	38.3743	38.0861	38.0861	37.8049	37.8049	38.6693	38.6693	38.9714 (38)
Heat transfer coeff	97.4621	96.4728	96.1569	95.2508	95.2508	94.9627	94.9627	94.6815	94.6815	95.5459	95.5459	95.8479 (39)
Average = Sum(39)m / 12 =												95.5684 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2441	1.2315	1.2274	1.2159	1.2159	1.2122	1.2122	1.2086	1.2086	1.2196	1.2196	1.2235 (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	0.8020	0.7764	0.7280	0.6556	0.5516	0.3889	0.2531	0.2452	0.4427	0.6271	0.7478	0.8119 (94)
Useful gains	560.9146	589.6253	593.7082	556.5246	459.4334	326.3198	200.8018	192.5297	339.7737	456.0264	512.5992	536.5056 (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	1100.9737	1080.6922	982.2791	815.3785	593.5559	369.0129	211.6798	202.2676	398.5471	643.3438	879.3881	1073.1144 (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	401.8040	329.9970	289.0968	186.3748	99.7871	0.0000	0.0000	0.0000	0.0000	139.3641	264.0880	399.2369 (98)
Space heating												2109.7488 (98)
Space heating per m2												26.9307 (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													2338.9676 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	401.8040	329.9970	289.0968	186.3748	99.7871	0.0000	0.0000	0.0000	0.0000	139.3641	264.0880	399.2369	(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)	445.4590	365.8503	320.5064	206.6240	110.6288	0.0000	0.0000	0.0000	0.0000	154.5057	292.7805	442.6130	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	102.2551	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	87.0116	86.8623	86.4171	85.4552	83.4701	76.4000	76.4000	76.4000	76.4000	84.3323	86.1485	87.0718	(216)
Fuel for water heating, kWh/month	117.5188	102.6566	107.0066	96.7964	96.3846	92.4924	88.5764	99.7486	100.3346	103.5412	107.9127	113.8411	(219)
Water heating fuel used												1226.8100	(219)
Annual totals kWh/year													
Space heating fuel - main system												2338.9676	(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) =									-1946.4459			-1946.4459	(233)
Total delivered energy for all uses												2065.9174	(238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2338.9676	10.2300	239.2764 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1226.8100	10.2300	125.5027 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	371.5858	36.7200	136.4463 (250)
Additional standing charges			103.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	36.7200	-714.7349 (252)
Total energy cost			-82.9696 (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	2338.9676	0.2160	505.2170 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1226.8100	0.2160	264.9910 (264)
Space and water heating			770.2080 (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			-8.2195 (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	2338.9676	1.2200	2853.5404 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1226.8100	1.2200	1496.7082 (264)
Space and water heating			4350.2486 (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			-254.3221 (272)
Primary energy kWh/m2/year			-3.2464 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	004 - PRJ013014			Issued on Date	30/11/2023
Assessment Reference	004	Prop Type Ref	E		
Property	2 Rashleigh Drive, Netley Abbey, Southampton, SO31 5JY				
SAP Rating	85 B	DER	15.25	TER	18.14
Environmental	88 B	% DER<TER	15.93		
CO ₂ Emissions (t/year)	1.00	DFEE	44.72	TFEE	48.83
General Requirements Compliance	Pass	% DFEE<TFEE	8.42		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	4299-0004
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)	15.25	kgCO ₂ /m ²	Pass
	-2.89 (-15.9%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	48.83	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	44.72	kWh/m ² /yr	
	-4.1 (-8.4%)	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	4.88 (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 South

6.53 m², No overhang

Windows facing West

0.72 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

4.88 (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