

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	044 - PRJ013014			Issued on Date	11/01/2024
Assessment Reference	044	Prop Type Ref	E		
Property	9 Rashleigh Drive, Netley Abbey, Southampton, SO31 5JY				
SAP Rating	84 B	DER	15.72	TER	18.91
Environmental	88 B	% DER<TER	16.86		
CO ₂ Emissions (t/year)	1.03	DFEE	47.25	TFEE	53.07
General Requirements Compliance	Pass	% DFEE<TFEE	10.95		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	U903-0001
Client					

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

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DWELLING AS BUILT

End-Terrace House, total floor area 79 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.91 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.72 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)47.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	OK
Roof	0.08 (max. 0.20)	0.08 (max. 0.35)	OK
Openings	1.37 (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: 4.84 (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: 7.24 m², No overhang
Windows facing East: 0.72 m², No overhang
Windows facing South: 2.55 m², No overhang
Air change rate: 4.71 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.08 W/m²K

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					4.8400
Infiltration rate					0.4462 (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) =	0.4127 (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	0.5262	0.5159	0.5056	0.4540	0.4437	0.3921	0.3921	0.3818	0.4127	0.4437	0.4643	0.4849 (22b)
Effective ac	0.6384	0.6331	0.6278	0.6031	0.5984	0.5769	0.5769	0.5729	0.5852	0.5984	0.6078	0.6176 (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)			10.5200	1.3258	13.9337		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6610	12.6060	76.0550	0.2100	15.9716	7.4000	562.8070 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6216		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5265.5130 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.0595 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.4364 (36)
Total fabric heat loss							(33) + (36) = 58.0580 (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	41.2754	40.9278	40.5871	38.9870	38.6876	37.2939	37.2939	37.0358	37.8307	38.6876	39.2932	39.9264 (38)
Heat transfer coeff	99.3334	98.9859	98.6452	97.0450	96.7456	95.3519	95.3519	95.0938	95.8887	96.7456	97.3513	97.9845 (39)
Average = Sum(39)m / 12 =												97.0436 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2651	1.2606	1.2563	1.2359	1.2321	1.2144	1.2144	1.2111	1.2212	1.2321	1.2398	1.2479 (40)
HLP (average)												1.2359 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8995	0.8762	0.8400	0.7782	0.6869	0.5617	0.4334	0.4725	0.6511	0.7990	0.8748	0.9072 (94)
Useful gains	399.0066	437.7503	461.6117	468.8347	440.3607	354.1620	259.6449	263.4095	334.3941	371.1346	375.8076	381.9306 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	1137.0795	1112.4664	1020.0764	864.8300	679.7888	462.3907	302.8055	316.4087	487.6763	719.8147	939.8116	1126.0306 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	549.1262	453.4092	415.4977	285.1166	178.1345	0.0000	0.0000	0.0000	0.0000	259.4180	406.0829	553.6104 (98)
Space heating												3100.3957 (98)
Space heating per m2												39.4854 (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													3437.2457 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	549.1262	453.4092	415.4977	285.1166	178.1345	0.0000	0.0000	0.0000	0.0000	259.4180	406.0829	553.6104	(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)	608.7874	502.6710	460.6405	316.0938	197.4884	0.0000	0.0000	0.0000	0.0000	287.6031	450.2028	613.7587	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater (217)m	87.7113	87.5980	87.3267	86.6771	85.3982	76.4000	76.4000	76.4000	76.4000	86.2733	87.2619	87.7904	(216)
Fuel for water heating, kWh/month	116.6704	101.8732	105.9741	95.5071	94.2835	92.5669	88.6492	99.8298	100.4158	101.2926	106.6194	112.9955	(219)
Water heating fuel used												1216.6774	(219)
Annual totals kWh/year													
Space heating fuel - main system												3437.2457	(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)												366.6635	(232)
Total delivered energy for all uses												5095.5866	(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	3437.2457	0.2160	742.4451 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1216.6774	0.2160	262.8023 (264)
Space and water heating			1005.2474 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	366.6635	0.5190	190.2983 (268)
Total CO2, kg/year			1234.4707 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.7200 (273)

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

DER		15.7200	ZC1
Total Floor Area	TFA	78.5200	
Assumed number of occupants	N	2.4342	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.3253	ZC2
CO2 emissions from cooking, equation (L16)		2.2596	ZC3
Total CO2 emissions		34.3049	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		34.3049	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1531 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4031 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250	(20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3729	(21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)				
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)				
Adj infilt rate	0.4754	0.4661	0.4568	0.4102	0.4009	0.3543	0.3543	0.3449	0.3729	0.4009	0.4195	0.4382	(22b)				
Effective ac	0.6130	0.6086	0.6043	0.5841	0.5803	0.5627	0.5627	0.5595	0.5695	0.5803	0.5880	0.5960	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.0900	1.0000	2.0900		(26)					
TER Opening Type (Uw = 1.40)			10.5200	1.3258	13.9337		(27)					
Flr - Ground			39.2630	0.1300	5.1042		(28a)					
Wl - Brick (Timber Frame)	88.6610	12.6060	76.0550	0.1800	13.6899		(29a)					
Rf - Ins Joist	39.2630		39.2630	0.1300	5.1042		(30)					
Total net area of external elements Aum(A, m2)			167.1810				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		39.9220		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9000 (36)					
Total fabric heat loss						(33) + (36) =	48.8220 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.6317	Feb 39.3479	Mar 39.0698	Apr 37.7635	May 37.5191	Jun 36.3813	Jul 36.3813	Aug 36.1706	Sep 36.8196	Oct 37.5191	Nov 38.0135	Dec 38.5304 (38)
Heat transfer coeff	88.4537	88.1699	87.8918	86.5855	86.3411	85.2033	85.2033	84.9926	85.6416	86.3411	86.8355	87.3524 (39)
Average = Sum(39)m / 12 =												86.5843 (39)
HLP	Jan 1.1265	Feb 1.1229	Mar 1.1194	Apr 1.1027	May 1.0996	Jun 1.0851	Jul 1.0851	Aug 1.0824	Sep 1.0907	Oct 1.0996	Nov 1.1059	Dec 1.1125 (40)
HLP (average)												1.1027 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
Daily hot water use	Jan 101.2129	Feb 97.5325	Mar 93.8520	Apr 90.1715	May 86.4911	Jun 82.8106	Jul 82.8106	Aug 86.4911	Sep 90.1715	Oct 93.8520	Nov 97.5325	Dec 101.2129 (44)
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Energy content (annual)										Total = Sum(45)m =		1447.7033 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	22.5144	19.6912	20.3196	17.7151	16.9981	14.6680	13.5921	15.5971	15.7834	18.3940	20.0785	21.8040 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	44.8917	47.8259	44.4681	44.0749	40.8381	42.1994	44.0749	44.4681	47.8259	48.0982	50.9589 (61)
Solar input	201.0548	176.1665	183.2898	162.5688	157.3953	138.6250	132.8133	148.0557	149.6908	170.4528	181.9550	196.3187 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	201.0548	176.1665	183.2898	162.5688	157.3953	138.6250	132.8133	148.0557	149.6908	170.4528	181.9550	196.3187 (64)
	62.6466	54.8718	56.9982	50.3855	48.6978	42.7237	40.6790	45.5923	46.1036	52.7299	56.5319	61.0719 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.8909	18.5551	15.0900	11.4241	8.5397	7.2095	7.7902	10.1259	13.5910	17.2569	20.1414	21.4715	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.3196	218.5643	212.9077	200.8654	185.6642	171.3772	161.8326	159.5879	165.2445	177.2868	192.4880	206.7750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	(71)
Water heating gains (Table 5)	84.2024	81.6544	76.6105	69.9799	65.4540	59.3384	54.6760	61.2800	64.0327	70.8735	78.5166	82.0858	(72)
Total internal gains	383.9255	381.2865	367.1208	344.7820	322.1705	300.4378	286.8114	293.5065	305.3809	327.9299	353.6586	372.8450	(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					7.2440	10.6334	0.6300	0.7000			0.7700			23.5408 (74)
East					0.7190	19.6403	0.6300	0.7000			0.7700			4.3157 (76)
South					2.5540	46.7521	0.6300	0.7000			0.7700			36.4917 (78)
Solar gains	64.3482	113.1940	166.4772	229.1097	279.9217	288.8019	273.8496	233.8407	187.6075	128.0306	77.6768	54.7060	(83)	
Total gains	448.2737	494.4805	533.5981	573.8918	602.0921	589.2397	560.6610	527.3472	492.9884	455.9605	431.3354	427.5509	(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	61.6456	61.8440	62.0397	62.9757	63.1539	63.9972	63.9972	64.1559	63.6698	63.1539	62.7943	62.4227	
alpha	5.1097	5.1229	5.1360	5.1984	5.2103	5.2665	5.2665	5.2771	5.2447	5.2103	5.1863	5.1615	
util living area	0.9984	0.9971	0.9933	0.9797	0.9330	0.8062	0.6397	0.6947	0.9054	0.9854	0.9969	0.9988	(86)
MIT	19.7632	19.8863	20.1046	20.4143	20.7088	20.9149	20.9804	20.9702	20.8252	20.4584	20.0631	19.7469	(87)
Th 2	19.9792	19.9822	19.9851	19.9986	20.0012	20.0130	20.0130	20.0152	20.0084	20.0012	19.9960	19.9906	(88)
util rest of house	0.9979	0.9960	0.9908	0.9712	0.9024	0.7231	0.5107	0.5681	0.8506	0.9777	0.9956	0.9984	(89)
MIT 2	18.3262	18.5081	18.8285	19.2854	19.6946	19.9507	20.0051	20.0016	19.8549	19.3542	18.7768	18.3106	(90)
Living area fraction	18.6176	18.7876	19.0872	19.5143	19.9002	20.1462	20.2028	20.1980	20.0517	19.5781	19.0376	18.6018	(91)
MIT	18.6176	18.7876	19.0872	19.5143	19.9002	20.1462	20.2028	20.1980	20.0517	19.5781	19.0376	18.6018	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6176	18.7876	19.0872	19.5143	19.9002	20.1462	20.2028	20.1980	20.0517	19.5781	19.0376	18.6018	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	446.8353	491.6373	526.9930	554.1897	541.0683	433.4819	301.0135	312.9564	420.7821	443.6810	428.6554	426.4745	(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	1266.4418	1224.4658	1106.3131	919.0442	708.0176	472.5540	306.9708	322.8004	509.7102	775.1750	1036.6067	1258.0303	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	609.7873	492.4608	431.0141	262.6952	124.2103	0.0000	0.0000	0.0000	0.0000	246.6315	437.7249	618.6775	(98)
Space heating												3223.2016	(98)
Space heating per m2												41.0494	(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													3450.9653 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	609.7873	492.4608	431.0141	262.6952	124.2103	0.0000	0.0000	0.0000	0.0000	246.6315	437.7249	618.6775	(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)	652.8772	527.2599	461.4712	281.2583	132.9875	0.0000	0.0000	0.0000	0.0000	264.0594	468.6562	662.3956	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	201.0548	176.1665	183.2898	162.5688	157.3953	138.6250	132.8133	148.0557	149.6908	170.4528	181.9550	196.3187	(64)
Efficiency of water heater (217)m	87.6659	87.5003	87.1301	86.2528	84.4623	80.3000	80.3000	80.3000	80.3000	85.9804	87.1803	80.3000	(216)
Fuel for water heating, kWh/month	229.3420	201.3324	210.3632	188.4795	186.3498	172.6338	165.3964	184.3782	186.4144	198.2462	208.7112	223.7464	(219)
Water heating fuel used												2355.3937	(219)
Annual totals kWh/year													
Space heating fuel - main system												3450.9653	(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)												368.9391	(232)
Total delivered energy for all uses												6250.2981	(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	3450.9653	0.2160	745.4085 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2355.3937	0.2160	508.7650 (264)
Space and water heating			1254.1735 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	368.9391	0.5190	191.4794 (268)
Total CO2, kg/m2/year			1484.5779 (272)
Emissions per m2 for space and water heating			15.9727 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4386 (272b)
Emissions per m2 for pumps and fans			0.4957 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.9727 * 1.00) + 2.4386 + 0.4957, rounded to 2 d.p.			18.9100 (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	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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) = 0.1531 (8)
Pressure test					Yes
Measured/design AP50					4.8400
Infiltration rate					0.3951 (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) =	0.3655 (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	0.4660	0.4569	0.4477	0.4020	0.3929	0.3472	0.3472	0.3381	0.3655	0.3929	0.4112	0.4295 (22b)
Effective ac	0.6086	0.6044	0.6002	0.5808	0.5772	0.5603	0.5603	0.5572	0.5668	0.5772	0.5845	0.5922 (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)			10.5200	1.3258	13.9337		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6610	12.6060	76.0550	0.2100	15.9716	7.4000	562.8070 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6216		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5265.5130 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.0595 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.4364 (36)
Total fabric heat loss							(33) + (36) = 58.0580 (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	39.3445	39.0720	38.8048	37.5498	37.3150	36.2219	36.2219	36.0195	36.6430	37.3150	37.7900	38.2866 (38)
Heat transfer coeff	97.4026	97.1300	96.8628	95.6078	95.3730	94.2800	94.2800	94.0776	94.7010	95.3730	95.8480	96.3446 (39)
Average = Sum(39)m / 12 =												95.6067 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2405	1.2370	1.2336	1.2176	1.2146	1.2007	1.2007	1.1981	1.2061	1.2146	1.2207	1.2270 (40)
HLP (average)												1.2176 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	31.8954	27.8959	28.7861	25.0964	24.0806	20.7797	19.2555	22.0959	22.3598	26.0582	28.4446	30.8890 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	20.7620	18.4406	14.9969	11.3536	8.4870	7.1651	7.7421	10.0635	13.5072	17.1505	20.0171	21.3390 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	216.3196	218.5643	212.9077	200.8654	185.6642	171.3772	161.8326	159.5879	165.2445	177.2868	192.4880	206.7750 (68)
Pumps, fans	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672 (71)
Total internal gains	42.8701	41.5117	38.6909	34.8561	32.3664	28.8607	25.8810	29.6988	31.0553	35.0245	39.5063	41.5174 (72)
	339.4644	338.0293	326.1082	306.5878	286.0302	266.9156	254.9684	258.8628	269.3196	288.9744	311.5241	329.1441 (73)

6. Solar gains

[Jan]				Area	Solar flux		g	FF	Access		Gains	
				m2	Table 6a		Specific data	Specific data	factor		W	
					W/m2		or Table 6b	or Table 6c	Table 6d			
North				7.2440	10.6334		0.7300	0.7200	0.7700		28.0568 (74)	
East				0.7190	19.6403		0.7300	0.7200	0.7700		5.1436 (76)	
South				2.5540	46.7521		0.7300	0.7200	0.7700		43.4921 (78)	
Solar gains	76.6925	134.9088	198.4137	273.0614	333.6209	344.2047	326.3840	278.7000	223.5975	152.5916	92.5781	65.2006 (83)
Total gains	416.1569	472.9382	524.5219	579.6492	619.6511	611.1204	581.3523	537.5628	492.9171	441.5660	404.1023	394.3447 (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	15.0165	15.0586	15.1001	15.2984	15.3360	15.5138	15.5138	15.5472	15.4448	15.3360	15.2600	15.1814
alpha	2.0011	2.0039	2.0067	2.0199	2.0224	2.0343	2.0343	2.0365	2.0297	2.0224	2.0173	2.0121
util living area	0.9505	0.9347	0.9085	0.8589	0.7795	0.6662	0.5530	0.5958	0.7586	0.8818	0.9355	0.9552 (86)
MIT	17.6403	17.9340	18.4598	19.1838	19.8852	20.4550	20.7409	20.6874	20.2258	19.3372	18.3733	17.5909 (87)
Th 2	19.8878	19.8905	19.8932	19.9059	19.9083	19.9194	19.9194	19.9215	19.9151	19.9083	19.9035	19.8985 (88)
util rest of house	0.9444	0.9266	0.8964	0.8387	0.7436	0.6024	0.4551	0.5017	0.7063	0.8607	0.9261	0.9497 (89)
MIT 2	16.8167	17.1086	17.6292	18.3456	19.0194	19.5491	19.7851	19.7503	19.3541	18.5072	17.5557	16.7747 (90)
Living area fraction									fLA = Living area / (4) =			0.2028 (91)
MIT	16.9837	17.2759	17.7976	18.5155	19.1950	19.7328	19.9789	19.9403	19.5308	18.6755	17.7215	16.9402 (92)
Temperature adjustment												0.0000
adjusted MIT	16.9837	17.2759	17.7976	18.5155	19.1950	19.7328	19.9789	19.9403	19.5308	18.6755	17.7215	16.9402 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9219	0.9004	0.8663	0.8064	0.7156	0.5898	0.4611	0.5035	0.6840	0.8298	0.9004	0.9286 (94)
Ext temp.	383.6381	425.8372	454.4001	467.4037	443.4319	360.4430	268.0664	270.6859	337.1791	366.4172	363.8369	366.1741 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1235.4262	1202.0755	1094.3170	919.3216	714.8165	483.9171	318.5624	333.0607	514.3035	770.1840	1018.0471	1227.4501 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	633.7303	521.6322	476.0981	325.3809	201.9102	0.0000	0.0000	0.0000	0.0000	300.4024	471.0313	640.7894 (98)
Space heating per m2												3570.9747 (98)
										(98) / (4) =		45.4785 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	886.2317	697.6718	714.9894	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.6380	0.7025	0.6728	0.0000	0.0000	0.0000	0.0000 (101)
	0.0000	0.0000	0.0000	0.0000	0.0000	565.3963	490.0843	481.0371	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	805.6002	768.9880	719.5244	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	172.9468	207.5044	177.4345	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												557.8857 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
0.0000	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	43.2367	51.8761	44.3586	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												139.4714 (107)
Space cooling per m2												1.7763 (108)
Energy for space heating												45.4785 (99)
Energy for space cooling												1.7763 (108)
Total												47.2548 (109)
Dwelling Fabric Energy Efficiency (DFEE)												47.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1531 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4031 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250	(20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3729	(21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)				
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)				
Adj infilt rate	0.4754	0.4661	0.4568	0.4102	0.4009	0.3543	0.3543	0.3449	0.3729	0.4009	0.4195	0.4382	(22b)				
Effective ac	0.6130	0.6086	0.6043	0.5841	0.5803	0.5627	0.5627	0.5595	0.5695	0.5803	0.5880	0.5960	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.0900	1.0000	2.0900		(26)					
TER Opening Type (Uw = 1.40)			10.5200	1.3258	13.9337		(27)					
Flr - Ground			39.2630	0.1300	5.1042		(28a)					
Wl - Brick (Timber Frame)	88.6610	12.6060	76.0550	0.1800	13.6899		(29a)					
Rf - Ins Joist	39.2630		39.2630	0.1300	5.1042		(30)					
Total net area of external elements Aum(A, m2)			167.1810				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.9220		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9000 (36)					
Total fabric heat loss						(33) + (36) =	48.8220 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.6317	Feb 39.3479	Mar 39.0698	Apr 37.7635	May 37.5191	Jun 36.3813	Jul 36.3813	Aug 36.1706	Sep 36.8196	Oct 37.5191	Nov 38.0135	Dec 38.5304 (38)
Heat transfer coeff	88.4537	88.1699	87.8918	86.5855	86.3411	85.2033	85.2033	84.9926	85.6416	86.3411	86.8355	87.3524 (39)
Average = Sum(39)m / 12 =												86.5843 (39)
HLP	Jan 1.1265	Feb 1.1229	Mar 1.1194	Apr 1.1027	May 1.0996	Jun 1.0851	Jul 1.0851	Aug 1.0824	Sep 1.0907	Oct 1.0996	Nov 1.1059	Dec 1.1125 (40)
HLP (average)												1.1027 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
Daily hot water use	Jan 101.2129	Feb 97.5325	Mar 93.8520	Apr 90.1715	May 86.4911	Jun 82.8106	Jul 82.8106	Aug 86.4911	Sep 90.1715	Oct 93.8520	Nov 97.5325	Dec 101.2129 (44)
Energy conte	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Energy content (annual)										Total = Sum(45)m =		1447.7033 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	31.8954	27.8959	28.7861	25.0964	24.0806	20.7797	19.2555	22.0959	22.3598	26.0582	28.4446	30.8890 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.8909	18.5551	15.0900	11.4241	8.5397	7.2095	7.7902	10.1259	13.5910	17.2569	20.1414	21.4715 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.3196	218.5643	212.9077	200.8654	185.6642	171.3772	161.8326	159.5879	165.2445	177.2868	192.4880	206.7750 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672 (71)
Water heating gains (Table 5)	42.8701	41.5117	38.6909	34.8561	32.3664	28.8607	25.8810	29.6988	31.0553	35.0245	39.5063	41.5174 (72)
Total internal gains	339.5932	338.1438	326.2013	306.6583	286.0829	266.9601	255.0164	258.9253	269.4035	289.0808	311.6484	329.2766 (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			7.2440		10.6334		0.6300		0.7000		0.7700	23.5408 (74)
East			0.7190		19.6403		0.6300		0.7000		0.7700	4.3157 (76)
South			2.5540		46.7521		0.6300		0.7000		0.7700	36.4917 (78)

Solar gains	64.3482	113.1940	166.4772	229.1097	279.9217	288.8019	273.8496	233.8407	187.6075	128.0306	77.6768	54.7060 (83)
Total gains	403.9414	451.3378	492.6785	535.7680	566.0045	555.7620	528.8660	492.7660	457.0109	417.1115	389.3252	383.9825 (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	61.6456	61.8440	62.0397	62.9757	63.1539	63.9972	63.9972	64.1559	63.6698	63.1539	62.7943	62.4227
alpha	5.1097	5.1229	5.1360	5.1984	5.2103	5.2665	5.2665	5.2771	5.2447	5.2103	5.1863	5.1615
util living area	0.9990	0.9981	0.9953	0.9848	0.9461	0.8323	0.6708	0.7303	0.9263	0.9901	0.9981	0.9993 (86)
MIT	19.7103	19.8352	20.0569	20.3726	20.6771	20.8999	20.9756	20.9623	20.7974	20.4145	20.0132	19.6948 (87)
Th 2	19.9792	19.9822	19.9851	19.9986	20.0012	20.0130	20.0130	20.0152	20.0084	20.0012	19.9960	19.9906 (88)
util rest of house	0.9987	0.9974	0.9935	0.9782	0.9201	0.7531	0.5390	0.6031	0.8794	0.9846	0.9973	0.9990 (89)
MIT 2	18.7979	18.9248	19.1482	19.4715	19.7646	19.9614	20.0061	20.0030	19.8825	19.5171	19.1139	18.7915 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9829	19.1094	19.3325	19.6542	19.9496	20.1517	20.2026	20.1975	20.0680	19.6990	19.2962	18.9746 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.9829	19.1094	19.3325	19.6542	19.9496	20.1517	20.2026	20.1975	20.0680	19.6990	19.2962	18.9746 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9982	0.9966	0.9919	0.9752	0.9184	0.7659	0.5661	0.6289	0.8829	0.9823	0.9965	0.9987 (94)
Ext temp.	403.2282	449.7895	488.7109	522.4793	519.8388	425.6333	299.3667	309.9184	403.5012	409.7414	387.9506	383.4652 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1298.7550	1252.8432	1127.8698	931.1579	712.2820	473.0213	306.9560	322.7596	511.1109	785.6204	1059.0669	1290.5979 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	666.2719	539.6521	475.5342	294.2486	143.1777	0.0000	0.0000	0.0000	0.0000	279.6540	483.2037	674.9067 (98)
Space heating per m2	(98) / (4) =											45.2961 (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	800.9112	630.5046	645.9440	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8060	0.8847	0.8540	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	645.5436	557.8315	551.6412	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	740.9549	707.7043	667.2477	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	68.6961	111.5053	86.0112	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												266.2126 (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	17.1740	27.8763	21.5028	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												66.5532 (107)
Space cooling per m2												0.8476 (108)
Energy for space heating												45.2961 (99)
Energy for space cooling												0.8476 (108)
Total												46.1437 (109)
Target Fabric Energy Efficiency (TFEE)												53.1 (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	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (5)

2. Ventilation rate

	main heating	+	secondary heating	+	other	=	total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							4 * 10 =	40.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						40.0000 / (5) =	0.2042 (8)				
Pressure test							Yes					
Measured/design AP50							4.8400					
Infiltration rate							0.4462	(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) =	0.4127 (21)				
Wind speed	Jan 4.9000	Feb 4.6000	Mar 4.5000	Apr 4.2000	May 4.2000	Jun 4.1000	Jul 4.1000	Aug 4.0000	Sep 4.0000	Oct 4.3000	Nov 4.3000	Dec 4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate	0.5056	0.4746	0.4643	0.4334	0.4334	0.4230	0.4230	0.4127	0.4127	0.4437	0.4437	0.4540 (22b)
Effective ac	0.6278	0.6126	0.6078	0.5939	0.5939	0.5895	0.5895	0.5852	0.5852	0.5984	0.5984	0.6031 (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)			10.5200	1.3258	13.9337		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6610	12.6060	76.0550	0.2100	15.9716	7.4000	562.8070 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6216		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 5265.5130 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 67.0595 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.4364 (36)
Total fabric heat loss (33) + (36) = 58.0580 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan 40.5871	Feb 39.6064	Mar 39.2932	Apr 38.3951	May 38.3951	Jun 38.1094	Jul 38.1094	Aug 37.8307	Sep 37.8307	Oct 38.6876	Nov 38.6876	Dec 38.9870 (38)
Heat transfer coeff	98.6452	97.6644	97.3513	96.4531	96.4531	96.1675	96.1675	95.8887	95.8887	96.7456	96.7456	97.0450 (39)
Average = Sum(39)m / 12 =												96.7680 (39)
HLP	Jan 1.2563	Feb 1.2438	Mar 1.2398	Apr 1.2284	May 1.2284	Jun 1.2248	Jul 1.2248	Aug 1.2212	Sep 1.2212	Oct 1.2321	Nov 1.2321	Dec 1.2359 (40)
HLP (average)												1.2324 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	22.5144	19.6912	20.3196	17.7151	16.9981	14.6680	13.5921	15.5971	15.7834	18.3940	20.0785	21.8040 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6693	0.5762	0.5721	0.4792	0.4411	0.3644	0.3377	0.4047	0.4270	0.5179	0.5875	0.6482 (61)
Total heat required for water heating calculated for each month	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081 (62)
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	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081 (64)
RHI water heating demand	50.0742	43.7929	45.1848	39.3883	37.7893	32.6052	30.2135	34.6748	35.0933	40.9029	44.6543	48.4942 (65)
Heat gains from water heating, kWh/month												1454 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9050	46.1016	37.4923	28.3841	21.2174	17.9127	19.3553	25.1587	33.7680	42.8762	50.0428	53.3476 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.8650	326.2153	317.7726	299.7991	277.1107	255.7868	241.5411	238.1908	246.6335	264.6071	287.2955	308.6193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672 (71)
Water heating gains (Table 5)	67.3040	65.1680	60.7322	54.7059	50.7921	45.2851	40.6096	46.6059	48.7407	54.9770	62.0198	65.1804 (72)
Total internal gains	545.7969	541.2078	519.7200	486.6119	452.8430	422.7074	405.2289	413.6783	432.8650	466.1831	503.0809	530.8702 (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				7.2440	13.4684	0.7300	0.7200	0.7700			35.5372 (74)	
East				0.7190	25.1733	0.7300	0.7200	0.7700			6.5926 (76)	
South				2.5540	56.5862	0.7300	0.7200	0.7700			52.6405 (78)	

Solar gains	94.7703	142.5897	215.4499	302.2547	350.4143	399.8616	366.2267	324.3546	257.0927	176.7919	114.1692	79.1175 (83)
Total gains	640.5672	683.7974	735.1699	788.8666	803.2573	822.5690	771.4556	738.0328	689.9577	642.9750	617.2501	609.9877 (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	14.8273	14.9762	15.0244	15.1643	15.1643	15.2093	15.2093	15.2535	15.2535	15.1184	15.1184	15.0718
alpha	1.9885	1.9984	2.0016	2.0110	2.0110	2.0140	2.0140	2.0169	2.0169	2.0079	2.0079	2.0048
util living area	0.8865	0.8692	0.8296	0.7579	0.6501	0.4886	0.3679	0.3712	0.5758	0.7524	0.8487	0.8926 (86)
MIT	18.4483	18.6541	19.1304	19.7561	20.3422	20.7568	20.9079	20.9096	20.6419	20.0196	19.2020	18.4552 (87)
Th 2	19.8752	19.8851	19.8883	19.8974	19.8974	19.9002	19.9002	19.9031	19.9031	19.8944	19.8944	19.8914 (88)
util rest of house	0.8729	0.8537	0.8086	0.7260	0.5982	0.4077	0.2593	0.2584	0.4978	0.7109	0.8274	0.8796 (89)
MIT 2	16.5813	16.8740	17.5457	18.4165	19.2008	19.7038	19.8541	19.8595	19.5888	18.7920	17.6602	16.5975 (90)
Living area fraction									fLA = Living area / (4) =			0.2028 (91)
MIT	16.9598	17.2349	17.8670	18.6881	19.4322	19.9173	20.0678	20.0724	19.8023	19.0409	17.9728	16.9742 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8098	17.0849	17.7170	18.5381	19.2822	19.7673	19.9178	19.9224	19.6523	18.8909	17.8228	16.8242 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8213	0.8010	0.7555	0.6782	0.5650	0.3970	0.2611	0.2606	0.4776	0.6648	0.7744	0.8290 (94)
Useful gains	526.0686	547.7355	555.3868	535.0470	453.8017	326.5676	201.4461	192.3168	329.5335	427.4220	478.0064	505.7023 (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	1095.9294	1072.8317	975.1666	813.8825	596.2949	371.9040	213.2761	203.5126	398.1573	637.6399	872.9154	1069.8406 (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	423.9764	352.8647	312.3161	200.7615	106.0149	0.0000	0.0000	0.0000	0.0000	156.4021	284.3345	419.7189 (98)
Space heating												2256.3892 (98)
RHI space heating demand												2256 (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	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					4.8400
Infiltration rate					0.4462 (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) =	0.4127 (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	0.5262	0.5159	0.5056	0.4540	0.4437	0.3921	0.3921	0.3818	0.4127	0.4437	0.4643	0.4849 (22b)
Effective ac	0.6384	0.6331	0.6278	0.6031	0.5984	0.5769	0.5769	0.5729	0.5852	0.5984	0.6078	0.6176 (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)			10.5200	1.3258	13.9337		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6610	12.6060	76.0550	0.2100	15.9716	7.4000	562.8070 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6216		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5265.5130 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.0595 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.4364 (36)
Total fabric heat loss							(33) + (36) = 58.0580 (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	41.2754	40.9278	40.5871	38.9870	38.6876	37.2939	37.2939	37.0358	37.8307	38.6876	39.2932	39.9264 (38)
Heat transfer coeff	99.3334	98.9859	98.6452	97.0450	96.7456	95.3519	95.3519	95.0938	95.8887	96.7456	97.3513	97.9845 (39)
Average = Sum(39)m / 12 =												97.0436 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2651	1.2606	1.2563	1.2359	1.2321	1.2144	1.2144	1.2111	1.2212	1.2321	1.2398	1.2479 (40)
HLP (average)												1.2359 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9050	46.1016	37.4923	28.3841	21.2174	17.9127	19.3553	25.1587	33.7680	42.8762	50.0428	53.3476 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.8650	326.2153	317.7726	299.7991	277.1107	255.7868	241.5411	238.1908	246.6335	264.6071	287.2955	308.6193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672 (71)
Water heating gains (Table 5)	67.3040	65.1680	60.7322	54.7059	50.7921	45.2851	40.6096	46.6059	48.7407	54.9770	62.0198	65.1804 (72)
Total internal gains	545.7969	541.2078	519.7200	486.6119	452.8430	422.7074	405.2289	413.6783	432.8650	466.1831	503.0809	530.8702 (73)

[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	7.2440	10.6334	0.7300	0.7200	0.7700	28.0568 (74)
East	0.7190	19.6403	0.7300	0.7200	0.7700	5.1436 (76)
South	2.5540	46.7521	0.7300	0.7200	0.7700	43.4921 (78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8453	0.8216	0.7841	0.7205	0.6281	0.5009	0.3749	0.4071	0.5776	0.7301	0.8143	0.8539 (94)
Useful gains	526.1847	555.4652	563.0733	547.3684	494.0095	384.1624	274.3018	281.8903	379.1555	451.7825	485.0473	509.0125 (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	1188.4370	1160.1914	1061.2446	896.0958	700.2876	472.9600	307.6446	322.6212	504.3579	752.0525	983.8060	1176.9009 (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	492.7158	406.3760	370.6394	251.0837	153.4709	0.0000	0.0000	0.0000	0.0000	223.4009	359.1062	496.9090 (98)
Space heating												2753.7019 (98)
Space heating per m2												35.0701 (99)
										(98) / (4) =		35.0701 (99)

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	3052.8845 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	492.7158	406.3760	370.6394	251.0837	153.4709	0.0000	0.0000	0.0000	0.0000	223.4009	359.1062	496.9090 (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)	546.2481	450.5277	410.9085	278.3634	170.1451	0.0000	0.0000	0.0000	0.0000	247.6728	398.1222	550.8968 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991 (64)
Efficiency of water heater (217)m	87.4825	87.3588	87.0581	86.3334	84.9217	76.4000	76.4000	76.4000	76.4000	85.8402	86.9676	76.4000 (216)
Fuel for water heating, kWh/month	116.9755	102.1520	106.3010	95.8874	94.8126	92.5669	88.6492	99.8298	100.4158	101.8036	106.9802	113.2826 (219)
Water heating fuel used	1219.6566 (219)											
Annual totals kWh/year												
Space heating fuel - main system	3052.8845 (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)	366.6635 (232)											
Total delivered energy for all uses	4714.2046 (238)											

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3052.8845	3.4800	106.2404 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1219.6566	3.4800	42.4441 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	366.6635	13.1900	48.3629 (250)
Additional standing charges			120.0000 (251)
Total energy cost			326.9398 (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] = 1.1117 (257)
SAP value	84.4921
SAP rating (Section 12)	84 (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	3052.8845	0.2160	659.4231 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1219.6566	0.2160	263.4458 (264)
Space and water heating			922.8689 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	366.6635	0.5190	190.2983 (268)
Total kg/year			1152.0922 (272)
CO2 emissions per m2			14.6700 (273)
EI value			87.5016
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	$3.48 / 0.8326 = 4.180$, stars = 5
Water heating environmental impact	$0.216 / 0.8326 = 0.2594$, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	+	secondary heating	+	other	=	total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							4 * 10 =	40.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						40.0000 / (5) =	0.2042 (8)				
Pressure test							Yes					
Measured/design AP50							4.8400					
Infiltration rate							0.4462	(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) =	0.4127 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
	0.5056	0.4746	0.4643	0.4334	0.4334	0.4230	0.4230	0.4127	0.4127	0.4437	0.4437	0.4540 (22b)
Effective ac	0.6278	0.6126	0.6078	0.5939	0.5939	0.5895	0.5895	0.5852	0.5852	0.5984	0.5984	0.6031 (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					
Solid Door			2.0900	1.2000	2.5080		(26)					
Windows (Uw = 1.40)			10.5200	1.3258	13.9337		(27)					
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)					
Wl - Brick (Timber Frame)	88.6610	12.6060	76.0550	0.2100	15.9716	7.4000	562.8070 (29a)					
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)					
Total net area of external elements Aum(A, m2)			167.1810				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	42.6216		(33)					
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)					
Stud			74.8825			7.4000	554.1306 (32c)					
Internal Floor			39.2630			7.4000	290.5462 (32d)					
Internal Ceiling			39.2630			7.4000	290.5462 (32e)					
Heat capacity Cm = Sum(A x k)						(28) ... (30) + (32) + (32a) ... (32e) =	5265.5130 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							67.0595 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.4364 (36)					
Total fabric heat loss						(33) + (36) =	58.0580 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	40.5871	39.6064	39.2932	38.3951	38.3951	38.1094	38.1094	37.8307	37.8307	38.6876	38.6876	38.9870 (38)
Heat transfer coeff	98.6452	97.6644	97.3513	96.4531	96.4531	96.1675	96.1675	95.8887	95.8887	96.7456	96.7456	97.0450 (39)
Average = Sum(39)m / 12 =												96.7680 (39)
HLP	Jan 1.2563	Feb 1.2438	Mar 1.2398	Apr 1.2284	May 1.2284	Jun 1.2248	Jul 1.2248	Aug 1.2212	Sep 1.2212	Oct 1.2321	Nov 1.2321	Dec 1.2359 (40)
HLP (average)												1.2324 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

[illegible]

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	51.9050	46.1016	37.4923	28.3841	21.2174	17.9127	19.3553	25.1587	33.7680	42.8762	50.0428	53.3476 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.8650	326.2153	317.7726	299.7991	277.1107	255.7868	241.5411	238.1908	246.6335	264.6071	287.2955	308.6193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672 (71)
Water heating gains (Table 5)	67.3040	65.1680	60.7322	54.7059	50.7921	45.2851	40.6096	46.6059	48.7407	54.9770	62.0198	65.1804 (72)
Total internal gains	545.7969	541.2078	519.7200	486.6119	452.8430	422.7074	405.2289	413.6783	432.8650	466.1831	503.0809	530.8702 (73)

[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	7.2440	13.4684	0.7300	0.7200	0.7700	35.5372 (74)
East	0.7190	25.1733	0.7300	0.7200	0.7700	6.5926 (76)
South	2.5540	56.5862	0.7300	0.7200	0.7700	52.6405 (78)

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													2501.5401 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	423.9764	352.8647	312.3161	200.7615	106.0149	0.0000	0.0000	0.0000	0.0000	156.4021	284.3345	419.7189	(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)	470.0403	391.2026	346.2485	222.5737	117.5331	0.0000	0.0000	0.0000	0.0000	173.3948	315.2267	465.3203	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater (217)m	87.1396	87.0270	86.6235	85.6815	83.6759	76.4000	76.4000	76.4000	76.4000	84.7149	86.3544	87.1894	(216)
Fuel for water heating, kWh/month	117.4358	102.5415	106.8344	96.6169	96.2241	92.5669	88.6492	99.8298	100.4158	103.1559	107.7399	113.7743	(219)
Water heating fuel used												1225.7845	(219)
Annual totals kWh/year													
Space heating fuel - main system												2501.5401	(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)													366.6635 (232)
Total delivered energy for all uses													4168.9880 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2501.5401	7.6100	190.3672 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1225.7845	7.6100	93.2822 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	366.6635	31.0800	113.9590 (250)
Additional standing charges			105.0000 (251)
Total energy cost			525.9184 (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	2501.5401	0.2160	540.3327 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1225.7845	0.2160	264.7694 (264)
Space and water heating			805.1021 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	366.6635	0.5190	190.2983 (268)
Total kg/year			1034.3254 (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	2501.5401	1.2200	3051.8789 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1225.7845	1.2200	1495.4570 (264)
Space and water heating			4547.3360 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	366.6635	3.0700	1125.6568 (268)
Primary energy kWh/year			5903.2428 (272)
Primary energy kWh/m2/year			75.1814 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:
Current environmental impact rating:

B 84
B 88

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 10.8	-£ 605	-1010 kg (97.7%)
Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.9	-£ 43	-141 kg (13.6%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£605 12.87 kg/m ²	A 95	A 97
Total Savings	£605 12.87 kg/m ²		
Potential energy efficiency rating:		A 95	
Potential environmental impact rating:			A 97

Fuel prices for cost data on this page from database revision number 535 TEST (04 Jan 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£137	£137	£0
Mains gas	£389	£389	£0
Space heating	£319	£319	£0
Water heating	£93	£93	£0
Lighting	£114	£114	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£526	-£79	£605
Total cost of uses	£526	-£79	£605
Delivered energy	53 kWh/m ²	28 kWh/m ²	25 kWh/m ²
Carbon dioxide emissions	1.0 tonnes	0.0 tonnes	1.0 tonnes
CO2 emissions per m ²	13 kg/m ²	0 kg/m ²	13 kg/m ²
Primary energy	75 kWh/m ²	-1 kWh/m ²	76 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					4.8400
Infiltration rate					0.4462 (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) =	0.4127 (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	0.5262	0.5159	0.5056	0.4540	0.4437	0.3921	0.3921	0.3818	0.4127	0.4437	0.4643	0.4849 (22b)
Effective ac	0.6384	0.6331	0.6278	0.6031	0.5984	0.5769	0.5769	0.5729	0.5852	0.5984	0.6078	0.6176 (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)			10.5200	1.3258	13.9337		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6610	12.6060	76.0550	0.2100	15.9716	7.4000	562.8070 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6216		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

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	41.2754	40.9278	40.5871	38.9870	38.6876	37.2939	37.2939	37.0358	37.8307	38.6876	39.2932	39.9264 (38)
Heat transfer coeff	99.3334	98.9859	98.6452	97.0450	96.7456	95.3519	95.3519	95.0938	95.8887	96.7456	97.3513	97.9845 (39)
Average = Sum(39)m / 12 =												97.0436 (39)
HLP	1.2651	1.2606	1.2563	1.2359	1.2321	1.2144	1.2144	1.2111	1.2212	1.2321	1.2398	1.2479 (40)
HLP (average)												1.2359 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	101.2129	97.5325	93.8520	90.1715	86.4911	82.8106	82.8106	86.4911	90.1715	93.8520	97.5325	101.2129 (44)
Energy content (annual)	150.0959	131.2748	135.4638	118.1007	113.3204	97.7869	90.6139	103.9808	105.2227	122.6269	133.8568	145.3598 (45)
Distribution loss (46)m = 0.15 x (45)m												1447.7033 (45)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8453	0.8216	0.7841	0.7205	0.6281	0.5009	0.3749	0.4071	0.5776	0.7301	0.8143	0.8539 (94)
Useful gains	526.1847	555.4652	563.0733	547.3684	494.0095	384.1624	274.3018	281.8903	379.1555	451.7825	485.0473	509.0125 (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	1188.4370	1160.1914	1061.2446	896.0958	700.2876	472.9600	307.6446	322.6212	504.3579	752.0525	983.8060	1176.9009 (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	492.7158	406.3760	370.6394	251.0837	153.4709	0.0000	0.0000	0.0000	0.0000	223.4009	359.1062	496.9090 (98)
Space heating												2753.7019 (98)
Space heating per m2												35.0701 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3052.8845 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	492.7158	406.3760	370.6394	251.0837	153.4709	0.0000	0.0000	0.0000	0.0000	223.4009	359.1062	496.9090	(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)	546.2481	450.5277	410.9085	278.3634	170.1451	0.0000	0.0000	0.0000	0.0000	247.6728	398.1222	550.8968	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater (217)m	87.4825	87.3588	87.0581	86.3334	84.9217	76.4000	76.4000	76.4000	76.4000	85.8402	86.9676	87.5678	(216)
Fuel for water heating, kWh/month	116.9755	102.1520	106.3010	95.8874	94.8126	92.5669	88.6492	99.8298	100.4158	101.8036	106.9802	113.2826	(219)
Water heating fuel used												1219.6566	(219)
Annual totals kWh/year													
Space heating fuel - main system												3052.8845	(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)													366.6635 (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												2986.9652	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3052.8845	3.4800	106.2404 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1219.6566	3.4800	42.4441 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	366.6635	13.1900	48.3629 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			99.1170 (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] =	0.3370 (257)
SAP value		95.2985
SAP rating (Section 12)		95 (258)
SAP band		A

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3052.8845	0.2160	659.4231 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1219.6566	0.2160	263.4458 (264)
Space and water heating			922.8689 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	366.6635	0.5190	190.2983 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			255.6550 (272)
CO2 emissions per m2			3.2600 (273)
EI value			97.2265
EI rating			97 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					4.8400
Infiltration rate					0.4462 (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) =	0.4127 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infilt rate	0.5056	0.4746	0.4643	0.4334	0.4334	0.4230	0.4230	0.4127	0.4127	0.4437	0.4437	0.4540 (22b)
Effective ac	0.6278	0.6126	0.6078	0.5939	0.5939	0.5895	0.5895	0.5852	0.5852	0.5984	0.5984	0.6031 (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)			10.5200	1.3258	13.9337		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6610	12.6060	76.0550	0.2100	15.9716	7.4000	562.8070 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6216		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5265.5130 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.0595 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.4364 (36)
Total fabric heat loss						(33) + (36) =	58.0580 (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	40.5871	39.6064	39.2932	38.3951	38.3951	38.1094	38.1094	37.8307	37.8307	38.6876	38.6876	38.9870 (38)
Heat transfer coeff	98.6452	97.6644	97.3513	96.4531	96.4531	96.1675	96.1675	95.8887	95.8887	96.7456	96.7456	97.0450 (39)
Average = Sum(39)m / 12 =												96.7680 (39)
HLP	1.2563	1.2438	1.2398	1.2284	1.2284	1.2248	1.2248	1.2212	1.2212	1.2321	1.2321	1.2359 (40)
HLP (average)												1.2324 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8213	0.8010	0.7555	0.6782	0.5650	0.3970	0.2611	0.2606	0.4776	0.6648	0.7744	0.8290 (94)
Useful gains	526.0686	547.7355	555.3868	535.0470	453.8017	326.5676	201.4461	192.3168	329.5335	427.4220	478.0064	505.7023 (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	1095.9294	1072.8317	975.1666	813.8825	596.2949	371.9040	213.2761	203.5126	398.1573	637.6399	872.9154	1069.8406 (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	423.9764	352.8647	312.3161	200.7615	106.0149	0.0000	0.0000	0.0000	0.0000	156.4021	284.3345	419.7189 (98)
Space heating												2256.3892 (98)
Space heating per m2												28.7365 (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													2501.5401 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	423.9764	352.8647	312.3161	200.7615	106.0149	0.0000	0.0000	0.0000	0.0000	156.4021	284.3345	419.7189	(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)	470.0403	391.2026	346.2485	222.5737	117.5331	0.0000	0.0000	0.0000	0.0000	173.3948	315.2267	465.3203	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater (217)m	87.1396	87.0270	86.6235	85.6815	83.6759	76.4000	76.4000	76.4000	76.4000	84.7149	86.3544	87.1894	(216)
Fuel for water heating, kWh/month	117.4358	102.5415	106.8344	96.6169	96.2241	92.5669	88.6492	99.8298	100.4158	103.1559	107.7399	113.7743	(219)
Water heating fuel used												1225.7845	(219)
Annual totals kWh/year													
Space heating fuel - main system												2501.5401	(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)													366.6635 (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												2222.5421	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2501.5401	7.6100	190.3672 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1225.7845	7.6100	93.2822 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	366.6635	31.0800	113.9590 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	31.0800	-604.9554 (252)
Total energy cost			-79.0370 (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	2501.5401	0.2160	540.3327 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1225.7845	0.2160	264.7694 (264)
Space and water heating			805.1021 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	366.6635	0.5190	190.2983 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			24.1200 (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	2501.5401	1.2200	3051.8789 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1225.7845	1.2200	1495.4570 (264)
Space and water heating			4547.3360 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	366.6635	3.0700	1125.6568 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			-72.3462 (272)
Primary energy kWh/m2/year			-0.9214 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	044 - PRJ013014			Issued on Date	11/01/2024
Assessment Reference	044	Prop Type Ref	E		
Property	9 Rashleigh Drive, Netley Abbey, Southampton, SO31 5JY				
SAP Rating	84 B	DER	15.72	TER	18.91
Environmental	88 B	% DER<TER	16.86		
CO ₂ Emissions (t/year)	1.03	DFEE	47.25	TFEE	53.07
General Requirements Compliance	Pass	% DFEE<TFEE	10.95		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	U903-0001
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.91	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.72	kgCO ₂ /m ²	Pass
	-3.19 (-16.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.07	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	47.25	kWh/m ² /yr	
	-5.8 (-10.9%)	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	1.37 (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	4.84 (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

7.24 m², No overhang

Windows facing East

0.72 m², No overhang

Windows facing South

2.55 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

4.84 (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