

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	077 - PRJ013014			Issued on Date	14/04/2025
Assessment Reference	077	Prop Type Ref	3B		
Property	15 Erwood Close, Netley Abbey, Southampton, SO31 5TJ				
SAP Rating	85 B	DER	14.64	TER	17.88
Environmental	88 B	% DER<TER	18.14		
CO ₂ Emissions (t/year)	1.15	DFEE	47.34	TFEE	53.78
General Requirements Compliance	Pass	% DFEE<TFEE	11.97		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	4299-0004
Client					

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

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DWELLING AS BUILT

Semi-Detached House, total floor area 94 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) 17.88 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.64 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.8 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	1.38 (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: 3.76 (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: 6.17 m², No overhang
Windows facing East: 5.88 m², No overhang
Windows facing West: 5.11 m², No overhang
Air change rate: 4.65 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
Air permeability 3.8 m³/m²h

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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	46.9500 (1b)	x 2.3700 (2b)	= 111.2715 (1b) - (3b)
First floor	46.9500 (1c)	x 2.6200 (2c)	= 123.0090 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.2805 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1281 (8)
Pressure test					Yes
Measured/design AP50					3.7600
Infiltration rate					0.3161 (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) =	0.2923 (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	0.3727	0.3654	0.3581	0.3216	0.3143	0.2777	0.2777	0.2704	0.2923	0.3143	0.3289	0.3435 (22b)
Effective ac	0.5695	0.5668	0.5641	0.5517	0.5494	0.5386	0.5386	0.5366	0.5427	0.5494	0.5541	0.5590 (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)			17.1600	1.3258	22.7500		(27)
Flr - Ground			46.9540	0.1800	8.4517	75.6000	3549.7224 (28a)
Wl - Brick (Timber Frame)	96.8930	19.2470	77.6460	0.2100	16.3057	7.4000	574.5804 (29a)
Rf - Ins Joist	46.9540		46.9540	0.0800	3.7563	7.4000	347.4596 (30)
Total net area of external elements Aum(A, m ²)			190.8040				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.7717		(33)
Party Wall			46.2060	0.0000	0.0000	7.4000	341.9244 (32)
Stud			67.7630			7.4000	501.4465 (32c)
Internal Floor			46.9540			7.4000	347.4596 (32d)
Internal Ceiling			46.9540			7.4000	347.4596 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 6010.0525 (34)
64.0048 (35)
19.1121 (36)
(33) + (36) = 72.8838 (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	44.0271	43.8185	43.6141	42.6539	42.4743	41.6380	41.6380	41.4831	41.9601	42.4743	42.8377	43.2177 (38)
Heat transfer coeff	116.9109	116.7023	116.4979	115.5377	115.3581	114.5218	114.5218	114.3669	114.8439	115.3581	115.7215	116.1015 (39)
Average = Sum(39)m / 12 =												115.5369 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2451	1.2428	1.2407	1.2304	1.2285	1.2196	1.2196	1.2180	1.2230	1.2285	1.2324	1.2364 (40)
HLP (average)												1.2304 (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												2.6754 (42)
Average daily hot water use (litres/day)												97.7415 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	107.5156	103.6060	99.6963	95.7866	91.8770	87.9673	87.9673	91.8770	95.7866	99.6963	103.6060	107.5156 (44)
Energy conte	159.4425	139.4495	143.8994	125.4549	120.3770	103.8762	96.2566	110.4558	111.7750	130.2630	142.1923	154.4116 (45)
Energy content (annual)												Total = Sum(45)m = 1537.8538 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	23.9164	20.9174	21.5849	18.8182	18.0566	15.5814	14.4385	16.5684	16.7663	19.5395	21.3288	23.1617 (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	0.6708	0.6085	0.6456	0.5408	0.4977	0.4112	0.3810	0.4567	0.4818	0.5844	0.6205	0.6497 (61)
Total heat required for water heating calculated for each month												
	160.1134	140.0580	144.5449	125.9957	120.8747	104.2874	96.6376	110.9125	112.2568	130.8474	142.8128	155.0613 (62)
WWHRS	-52.5105	-46.2025	-47.1557	-38.7982	-36.0249	-29.7187	-25.1519	-30.4531	-31.3416	-38.7444	-44.8802	-50.7538 eq. (G10)
Total of WWHRS savings												-471.7356
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	107.6029	93.8555	97.3893	87.1975	84.8498	74.5687	71.4857	80.4594	80.9153	92.1030	97.9325	104.3075 (64)
								Total per year (kWh/year) =	Sum(64)m =			1072.6669 (64)
Heat gains from water heating, kWh/month												
	53.1824	46.5191	48.0079	41.8490	40.1498	34.6416	32.1006	36.8407	37.2856	43.4586	47.4341	51.5043 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8992	0.8678	0.8142	0.7271	0.6145	0.4823	0.3608	0.4066	0.6022	0.7809	0.8724	0.9080 (94)
Useful gains	457.1899	523.4645	586.0671	624.5068	590.4979	462.9971	328.5849	333.4721	426.4854	454.0561	436.1483	434.0485 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1326.4959	1308.2202	1216.2471	1051.9739	833.1447	566.8422	367.9866	384.7617	591.7134	858.5058	1105.8289	1318.1767 (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	646.7637	527.3558	468.8539	307.7763	180.5292	0.0000	0.0000	0.0000	0.0000	300.9106	482.1700	657.7914 (98)
Space heating												3572.1509 (98)
Space heating per m2												38.0421 (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													3960.2560	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	646.7637	527.3558	468.8539	307.7763	180.5292	0.0000	0.0000	0.0000	0.0000	300.9106	482.1700	657.7914	(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)	717.0329	584.6517	519.7937	341.2154	200.1432	0.0000	0.0000	0.0000	0.0000	333.6038	534.5566	729.2587	(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	107.6029	93.8555	97.3893	87.1975	84.8498	74.5687	71.4857	80.4594	80.9153	92.1030	97.9325	104.3075	(64)	
Efficiency of water heater (217)m	87.9344	87.8038	87.4822	86.7410	85.2752	76.4000	76.4000	76.4000	76.4000	86.5369	87.5309	76.4000	(216)	
Fuel for water heating, kWh/month	122.3672	106.8922	111.3246	100.5262	99.5012	97.6030	93.5677	105.3133	105.9100	106.4321	111.8834	118.4991	(219)	
Water heating fuel used												1279.8202	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3960.2560	(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)													393.1448	(232)
Total delivered energy for all uses													5708.2209	(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	3960.2560	0.2160	855.4153 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1279.8202	0.2160	276.4412 (264)
Space and water heating			1131.8564 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	393.1448	0.5190	204.0422 (268)
Total CO2, kg/year			1374.8236 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.6400 (273)

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

DER			14.6400	ZC1
Total Floor Area		TFA	93.9000	
Assumed number of occupants		N	2.6754	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.5290	ZC2
CO2 emissions from cooking, equation (L16)			1.9511	ZC3
Total CO2 emissions			32.1201	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			32.1201	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	46.9500 (1b)	x 2.3700 (2b)	= 111.2715 (1b) - (3b)
First floor	46.9500 (1c)	x 2.6200 (2c)	= 123.0090 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.2805 (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) =	0.1281 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3781 (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) =					0.3497 (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	0.4459	0.4371	0.4284	0.3847	0.3759	0.3322	0.3322	0.3235	0.3497	0.3759	0.3934	0.4109	(22b)				
Effective ac	0.5994	0.5955	0.5918	0.5740	0.5707	0.5552	0.5552	0.5523	0.5611	0.5707	0.5774	0.5844	(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)			17.1600	1.3258	22.7500		(27)					
Flr - Ground			46.9540	0.1300	6.1040		(28a)					
Wl - Brick (Timber Frame)	96.8930	19.2470	77.6460	0.1800	13.9763		(29a)					
Rf - Ins Joist	46.9540		46.9540	0.1300	6.1040		(30)					
Total net area of external elements Aum(A, m2)			190.8040				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.0243		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5955 (36)					
Total fabric heat loss						(33) + (36) =	61.6198 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 46.3410	Feb 46.0426	Mar 45.7501	Apr 44.3762	May 44.1192	Jun 42.9226	Jul 42.9226	Aug 42.7010	Sep 43.3835	Oct 44.1192	Nov 44.6392	Dec 45.1828 (38)
Heat transfer coeff	107.9608	107.6624	107.3699	105.9960	105.7390	104.5424	104.5424	104.3208	105.0033	105.7390	106.2590	106.8026 (39)
Average = Sum(39)m / 12 =												105.9948 (39)
HLP	Jan 1.1497	Feb 1.1466	Mar 1.1434	Apr 1.1288	May 1.1261	Jun 1.1133	Jul 1.1133	Aug 1.1110	Sep 1.1182	Oct 1.1261	Nov 1.1316	Dec 1.1374 (40)
HLP (average)												1.1288 (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												2.6754 (42)
Average daily hot water use (litres/day)												97.7415 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.5156	103.6060	99.6963	95.7866	91.8770	87.9673	87.9673	91.8770	95.7866	99.6963	103.6060	107.5156 (44)
Energy conte	159.4425	139.4495	143.8994	125.4549	120.3770	103.8762	96.2566	110.4558	111.7750	130.2630	142.1923	154.4116 (45)
Energy content (annual)												Total = Sum(45)m = 1537.8538 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.9164	20.9174	21.5849	18.8182	18.0566	15.5814	14.4385	16.5684	16.7663	19.5395	21.3288	23.1617 (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 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	46.0274	50.8041	47.2372	46.8195	43.3811	44.8272	46.8195	47.2372	50.8041	49.3151	50.9589 (61)
Solar input	210.4014	185.4769	194.7035	172.6922	167.1965	147.2573	141.0838	157.2753	159.0123	181.0671	191.5073	205.3705 (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	210.4014	185.4769	194.7035	172.6922	167.1965	147.2573	141.0838	157.2753	159.0123	181.0671	191.5073	205.3705 (64)
	65.7544	57.8738	60.5476	53.5231	51.7302	45.3841	43.2121	48.4314	48.9745	56.0135	59.6077	64.0816 (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	133.7715	133.7715	133.7715	133.7715	133.7715	133.7715	133.7715	133.7715	133.7715	133.7715	133.7715	133.7715	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.3536	19.8543	16.1466	12.2240	9.1376	7.7143	8.3356	10.8349	14.5426	18.4652	21.5517	22.9749	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.0727	248.6261	242.1915	228.4929	211.2009	194.9488	184.0914	181.5379	187.9726	201.6712	218.9632	235.2153	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3772	36.3772	36.3772	36.3772	36.3772	36.3772	36.3772	36.3772	36.3772	36.3772	36.3772	36.3772	(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)	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	(71)
Water heating gains (Table 5)	88.3795	86.1217	81.3811	74.3376	69.5299	63.0335	58.0808	65.0960	68.0201	75.2869	82.7885	86.1312	(72)
Total internal gains	422.9373	420.7336	405.8507	381.1860	355.9998	331.8281	316.6393	323.6004	336.6668	361.5548	389.4348	410.4528	(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				6.1670	10.6334	0.6300	0.7000			0.7700			20.0409 (74)
East				5.8820	19.6403	0.6300	0.7000			0.7700			35.3056 (76)
West				5.1080	19.6403	0.6300	0.7000			0.7700			30.6599 (80)
Solar gains	86.0064	167.3417	277.5944	414.4746	520.6609	539.5866	510.9327	429.6490	325.4102	198.7100	106.9743	70.9539 (83)	
Total gains	508.9437	588.0753	683.4450	795.6606	876.6606	871.4147	827.5720	753.2494	662.0771	560.2648	496.4091	481.4067 (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	60.4000	60.5674	60.7324	61.5196	61.6691	62.3750	62.3750	62.5075	62.1012	61.6691	61.3674	61.0550	
alpha	5.0267	5.0378	5.0488	5.1013	5.1113	5.1583	5.1583	5.1672	5.1401	5.1113	5.0912	5.0703	
util living area	0.9988	0.9971	0.9912	0.9649	0.8804	0.7110	0.5436	0.6131	0.8724	0.9841	0.9974	0.9991 (86)	
MIT	19.7051	19.8521	20.1193	20.4831	20.7875	20.9502	20.9898	20.9818	20.8522	20.4492	20.0147	19.6834 (87)	
Th 2	19.9604	19.9630	19.9655	19.9774	19.9796	19.9900	19.9900	19.9919	19.9860	19.9796	19.9751	19.9704 (88)	
util rest of house	0.9983	0.9961	0.9879	0.9512	0.8358	0.6208	0.4251	0.4906	0.8070	0.9758	0.9963	0.9988 (89)	
MIT 2	18.2279	18.4445	18.8353	19.3636	19.7695	19.9567	19.9862	19.9842	19.8626	19.3247	18.6912	18.2033 (90)	
Living area fraction	18.5158	18.7189	19.0855	19.5818	19.9679	20.1503	20.1818	20.1787	20.0555	19.5439	18.9491	18.4918 (92)	
MIT	18.5158	18.7189	19.0855	19.5818	19.9679	20.1503	20.1818	20.1787	20.0555	19.5439	18.9491	18.4918 (93)	
Temperature adjustment												0.0000	
adjusted MIT	18.5158	18.7189	19.0855	19.5818	19.9679	20.1503	20.1818	20.1787	20.0555	19.5439	18.9491	18.4918 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9974	0.9943	0.9839	0.9444	0.8352	0.6361	0.4483	0.5144	0.8123	0.9707	0.9947	0.9980 (94)	
Ext temp.	507.6174	584.7500	672.4545	751.4052	732.1964	554.3306	370.9909	387.4495	537.8299	543.8759	493.7684	480.4576 (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	1534.7492	1487.7713	1351.3048	1132.2280	874.2424	580.2440	374.4463	394.1925	625.3421	945.7151	1259.0767	1526.3995 (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	764.1861	606.8303	505.0646	274.1924	105.6823	0.0000	0.0000	0.0000	0.0000	298.9683	551.0220	778.1808 (98)	
Space heating per m2												3884.1267 (98)	
												41.3645 (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												4158.5939 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	764.1861	606.8303	505.0646	274.1924	105.6823	0.0000	0.0000	0.0000	0.0000	298.9683	551.0220	778.1808 (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)	818.1864	649.7112	540.7544	293.5678	113.1502	0.0000	0.0000	0.0000	0.0000	320.0946	589.9593	833.1700 (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	210.4014	185.4769	194.7035	172.6922	167.1965	147.2573	141.0838	157.2753	159.0123	181.0671	191.5073	205.3705 (64)
Efficiency of water heater (217)m	88.0102	87.8144	87.3433	86.2098	83.9317	80.3000	80.3000	80.3000	80.3000	86.3054	87.5596	80.3000 (216)
Fuel for water heating, kWh/month	239.0649	211.2147	222.9175	200.3163	199.2054	183.3840	175.6958	195.8597	198.0227	209.7981	218.7166	233.1462 (219)
Water heating fuel used												2487.3421 (219)
Annual totals kWh/year												
Space heating fuel - main system												4158.5939 (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)												394.7720 (232)
Total delivered energy for all uses												7115.7079 (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	4158.5939	0.2160	898.2563 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2487.3421	0.2160	537.2659 (264)
Space and water heating			1435.5222 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.7720	0.5190	204.8867 (268)
Total CO2, kg/m2/year			1679.3338 (272)
Emissions per m2 for space and water heating			15.2878 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1820 (272b)
Emissions per m2 for pumps and fans			0.4145 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.2878 * 1.00) + 2.1820 + 0.4145, rounded to 2 d.p.			17.8800 (273)

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	46.9500 (1b)	x 2.3700 (2b)	= 111.2715 (1b) - (3b)
First floor	46.9500 (1c)	x 2.6200 (2c)	= 123.0090 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.2805 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1281 (8)
Pressure test					Yes
Measured/design AP50					3.7600
Infiltration rate					0.3161 (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) =	0.2923 (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	0.3581	0.3362	0.3289	0.3070	0.3070	0.2997	0.2997	0.2923	0.2923	0.3143	0.3143	0.3216 (22b)
Effective ac	0.5641	0.5565	0.5541	0.5471	0.5471	0.5449	0.5449	0.5427	0.5427	0.5494	0.5494	0.5517 (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)			17.1600	1.3258	22.7500		(27)
Flr - Ground			46.9540	0.1800	8.4517	75.6000	3549.7224 (28a)
Wl - Brick (Timber Frame)	96.8930	19.2470	77.6460	0.2100	16.3057	7.4000	574.5804 (29a)
Rf - Ins Joist	46.9540		46.9540	0.0800	3.7563	7.4000	347.4596 (30)
Total net area of external elements Aum(A, m ²)			190.8040				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.7717		(33)
Party Wall			46.2060	0.0000	0.0000	7.4000	341.9244 (32)
Stud			67.7630			7.4000	501.4465 (32c)
Internal Floor			46.9540			7.4000	347.4596 (32d)
Internal Ceiling			46.9540			7.4000	347.4596 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6010.0525 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.0048 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.1121 (36)
Total fabric heat loss							(33) + (36) = 72.8838 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	43.6141	43.0256	42.8377	42.2988	42.2988	42.1274	42.1274	41.9601	41.9601	42.4743	42.4743	42.6539 (38)
Heat transfer coeff	116.4979	115.9094	115.7215	115.1826	115.1826	115.0112	115.0112	114.8439	114.8439	115.3581	115.3581	115.5377 (39)
Average = Sum(39)m / 12 =												115.3715 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2407	1.2344	1.2324	1.2267	1.2267	1.2248	1.2248	1.2230	1.2230	1.2285	1.2285	1.2304 (40)
HLP (average)												1.2287 (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												2.6754 (42)
Average daily hot water use (litres/day)												97.7415 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.5156	103.6060	99.6963	95.7866	91.8770	87.9673	87.9673	91.8770	95.7866	99.6963	103.6060	107.5156 (44)
Energy conte	159.4425	139.4495	143.8994	125.4549	120.3770	103.8762	96.2566	110.4558	111.7750	130.2630	142.1923	154.4116 (45)
Energy content (annual)												Total = Sum(45)m = 1537.8538 (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

	23.9164	20.9174	21.5849	18.8182	18.0566	15.5814	14.4385	16.5684	16.7663	19.5395	21.3288	23.1617 (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	0.6708	0.6085	0.6456	0.5408	0.4977	0.4112	0.3810	0.4567	0.4818	0.5844	0.6205	0.6497 (61)
Total heat required for water heating calculated for each month	160.1134	140.0580	144.5449	125.9957	120.8747	104.2874	96.6376	110.9125	112.2568	130.8474	142.8128	155.0613 (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	160.1134	140.0580	144.5449	125.9957	120.8747	104.2874	96.6376	110.9125	112.2568	130.8474	142.8128	155.0613 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	53.1824	46.5191	48.0079	41.8490	40.1498	34.6416	32.1006	36.8407	37.2856	43.4586	47.4341	51.5043 (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	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.6537	49.4311	40.2001	30.4341	22.7498	19.2064	20.7531	26.9757	36.2068	45.9728	53.6570	57.2005 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	367.2726	371.0838	361.4798	341.0341	315.2252	290.9683	274.7633	270.9522	280.5561	301.0018	326.8108	351.0676 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280 (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)	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172 (71)
Water heating gains (Table 5)	71.4817	69.2248	64.5268	58.1236	53.9648	48.1134	43.1459	49.5171	51.7856	58.4120	65.8806	69.2262 (72)
Total internal gains	604.6446	599.9763	576.4433	539.8284	502.1763	468.5247	448.8990	457.6816	478.7851	515.6232	556.5851	587.7309 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North				6.1670	13.4684		0.7300	0.7200	0.7700		30.2537 (74)	
East				5.8820	25.1733		0.7300	0.7200	0.7700		53.9328 (76)	
West				5.1080	25.1733		0.7300	0.7200	0.7700		46.8359 (80)	

Solar gains	131.0224	217.4949	367.5598	552.8336	653.9057	747.5898	684.4587	600.3233	454.0794	282.3888	162.5676	106.1616 (83)
Total gains	735.6671	817.4713	944.0032	1092.6620	1156.0820	1216.1145	1133.3577	1058.0049	932.8645	798.0120	719.1527	693.8925 (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	14.3304	14.4031	14.4265	14.4940	14.4940	14.5156	14.5156	14.5368	14.5368	14.4720	14.4720	14.4495
alpha	1.9554	1.9602	1.9618	1.9663	1.9663	1.9677	1.9677	1.9691	1.9691	1.9648	1.9648	1.9633
util living area	0.8877	0.8635	0.8062	0.7077	0.5812	0.4151	0.3080	0.3178	0.5292	0.7353	0.8486	0.8956 (86)
MIT	18.3678	18.6133	19.1799	19.8691	20.4418	20.8082	20.9284	20.9266	20.6758	20.0231	19.1320	18.3431 (87)
Th 2	19.8876	19.8926	19.8942	19.8987	19.8987	19.9002	19.9002	19.9016	19.9016	19.8973	19.8973	19.8957 (88)
util rest of house	0.8746	0.8479	0.7838	0.6736	0.5291	0.3415	0.2141	0.2184	0.4532	0.6932	0.8277	0.8832 (89)
MIT 2	16.4876	16.8329	17.6242	18.5668	19.3172	19.7483	19.8649	19.8667	19.6206	18.8021	17.5762	16.4569 (90)
Living area fraction									fLA = Living area / (4) =			0.1949 (91)
MIT	16.8540	17.1798	17.9274	18.8206	19.5364	19.9549	20.0721	20.0733	19.8262	19.0400	17.8794	16.8245 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.7040	17.0298	17.7774	18.6706	19.3864	19.8049	19.9221	19.9233	19.6762	18.8900	17.7294	16.6745 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8216	0.7932	0.7295	0.6287	0.5020	0.3347	0.2161	0.2205	0.4359	0.6465	0.7727	0.8314 (94)
Useful gains	604.4052	648.3785	688.6565	686.9991	580.3859	407.0222	244.8800	233.2778	406.6109	515.9232	555.6556	576.9059 (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	1281.9421	1266.8719	1166.1673	987.1868	724.0819	449.1029	255.5696	243.8425	479.6129	760.2125	1030.0821	1256.4140 (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	504.0875	415.6276	355.2680	216.1351	106.9098	0.0000	0.0000	0.0000	0.0000	181.7513	341.5871	505.5540 (98)
Space heating												2626.9204 (98)
RHI space heating demand												2627 (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	46.9500 (1b)	x 2.3700 (2b)	= 111.2715 (1b) - (3b)
First floor	46.9500 (1c)	x 2.6200 (2c)	= 123.0090 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.2805 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1281 (8)
Pressure test					Yes
Measured/design AP50					3.7600
Infiltration rate					0.3161 (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) =	0.2923 (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	0.3727	0.3654	0.3581	0.3216	0.3143	0.2777	0.2777	0.2704	0.2923	0.3143	0.3289	0.3435 (22b)
Effective ac	0.5695	0.5668	0.5641	0.5517	0.5494	0.5386	0.5386	0.5366	0.5427	0.5494	0.5541	0.5590 (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)			17.1600	1.3258	22.7500		(27)
Flr - Ground			46.9540	0.1800	8.4517	75.6000	3549.7224 (28a)
Wl - Brick (Timber Frame)	96.8930	19.2470	77.6460	0.2100	16.3057	7.4000	574.5804 (29a)
Rf - Ins Joist	46.9540		46.9540	0.0800	3.7563	7.4000	347.4596 (30)
Total net area of external elements Aum(A, m ²)			190.8040				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.7717		(33)
Party Wall			46.2060	0.0000	0.0000	7.4000	341.9244 (32)
Stud			67.7630			7.4000	501.4465 (32c)
Internal Floor			46.9540			7.4000	347.4596 (32d)
Internal Ceiling			46.9540			7.4000	347.4596 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 6010.0525 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 64.0048 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.1121 (36)
Total fabric heat loss (33) + (36) = 72.8838 (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	44.0271	43.8185	43.6141	42.6539	42.4743	41.6380	41.6380	41.4831	41.9601	42.4743	42.8377	43.2177 (38)
Heat transfer coeff	116.9109	116.7023	116.4979	115.5377	115.3581	114.5218	114.5218	114.3669	114.8439	115.3581	115.7215	116.1015 (39)
Average = Sum(39)m / 12 =												115.5369 (39)
HLP	1.2451	1.2428	1.2407	1.2304	1.2285	1.2196	1.2196	1.2180	1.2230	1.2285	1.2324	1.2364 (40)
HLP (average)												1.2304 (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												2.6754 (42)
Average daily hot water use (litres/day)												97.7415 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	107.5156	103.6060	99.6963	95.7866	91.8770	87.9673	87.9673	91.8770	95.7866	99.6963	103.6060	107.5156 (44)
Energy conte	159.4425	139.4495	143.8994	125.4549	120.3770	103.8762	96.2566	110.4558	111.7750	130.2630	142.1923	154.4116 (45)
Energy content (annual)												Total = Sum(45)m = 1537.8538 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water storage loss:	23.9164	20.9174	21.5849	18.8182	18.0566	15.5814	14.4385	16.5684	16.7663	19.5395	21.3288	23.1617 (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	0.6708	0.6085	0.6456	0.5408	0.4977	0.4112	0.3810	0.4567	0.4818	0.5844	0.6205	0.6497 (61)
Total heat required for water heating calculated for each month	160.1134	140.0580	144.5449	125.9957	120.8747	104.2874	96.6376	110.9125	112.2568	130.8474	142.8128	155.0613 (62)
WWHRS	-52.5105	-46.2025	-47.1557	-38.7982	-36.0249	-29.7187	-25.1519	-30.4531	-31.3416	-38.7444	-44.8802	-50.7538 eq. (G10)
Total of WWHRS savings	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-471.7356
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	107.6029	93.8555	97.3893	87.1975	84.8498	74.5687	71.4857	80.4594	80.9153	92.1030	97.9325	104.3075 (64)
Heat gains from water heating, kWh/month	53.1824	46.5191	48.0079	41.8490	40.1498	34.6416	32.1006	36.8407	37.2856	43.4586	47.4341	51.5043 (65)
												1072.6669 (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	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.6537	49.4311	40.2001	30.4341	22.7498	19.2064	20.7531	26.9757	36.2068	45.9728	53.6570	57.2005 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	367.2726	371.0838	361.4798	341.0341	315.2252	290.9683	274.7633	270.9522	280.5561	301.0018	326.8108	351.0676 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280 (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)	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172 (71)
Water heating gains (Table 5)	71.4817	69.2248	64.5268	58.1236	53.9648	48.1134	43.1459	49.5171	51.7856	58.4120	65.8806	69.2262 (72)
Total internal gains	604.6446	599.9763	576.4433	539.8284	502.1763	468.5247	448.8990	457.6816	478.7851	515.6232	556.5851	587.7309 (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			6.1670		10.6334		0.7300		0.7200		0.7700		23.8855 (74)	
East			5.8820		19.6403		0.7300		0.7200		0.7700		42.0786 (76)	
West			5.1080		19.6403		0.7300		0.7200		0.7700		36.5415 (80)	
Solar gains	102.5056	199.4440	330.8472	493.9861	620.5427	643.0991	608.9483	512.0715	387.8359	236.8299	127.4959	84.5655	(83)	
Total gains	707.1502	799.4204	907.2905	1033.8145	1122.7191	1111.6238	1057.8473	969.7531	866.6210	752.4531	684.0809	672.2964	(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	14.2798	14.3053	14.3304	14.4495	14.4720	14.5777	14.5777	14.5974	14.5368	14.4720	14.4265	14.3793
alpha	1.9520	1.9537	1.9554	1.9633	1.9648	1.9718	1.9718	1.9732	1.9691	1.9648	1.9618	1.9586
util living area	0.9075	0.8824	0.8367	0.7563	0.6475	0.5202	0.4114	0.4539	0.6331	0.8010	0.8833	0.9150 (86)
MIT	17.9513	18.2675	18.8322	19.5574	20.1896	20.6360	20.8383	20.7976	20.4274	19.6009	18.6506	17.8817 (87)
Th 2	19.8841	19.8859	19.8876	19.8957	19.8973	19.9043	19.9043	19.9057	19.9016	19.8973	19.8942	19.8910 (88)
util rest of house	0.8973	0.8694	0.8184	0.7281	0.6045	0.4562	0.3260	0.3677	0.5734	0.7713	0.8683	0.9055 (89)
MIT 2	15.8933	16.3402	17.1353	18.1431	18.9928	19.5628	19.7900	19.7545	19.3260	18.2295	16.8957	15.7967 (90)
Living area fraction	16.2943	16.7158	17.4660	18.4187	19.2261	19.7720	19.9943	19.9578	19.5406	18.4968	17.2377	16.2031 (92)
MIT	16.2943	16.7158	17.4660	18.4187	19.2261	19.7720	19.9943	19.9578	19.5406	18.4968	17.2377	16.2031 (92)
Temperature adjustment	16.1443	16.5658	17.3160	18.2687	19.0761	19.6220	19.8443	19.8078	19.3906	18.3468	17.0877	-0.1500
adjusted MIT	16.1443	16.5658	17.3160	18.2687	19.0761	19.6220	19.8443	19.8078	19.3906	18.3468	17.0877	16.0531 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8472	0.8159	0.7629	0.6776	0.5680	0.4381	0.3209	0.3593	0.5413	0.7179	0.8150	0.8571 (94)
Ext temp.	599.0870	652.2559	692.1532	700.5604	637.6666	487.0015	339.4865	348.4046	469.0807	540.1533	557.5239	576.2226 (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	1384.7318	1361.4260	1260.0392	1082.4389	850.8882	575.1239	371.5410	389.7373	607.5989	893.6542	1155.7946	1376.1601 (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	584.5197	476.5622	422.5072	274.9525	158.6369	0.0000	0.0000	0.0000	0.0000	263.0046	430.7549	595.1535 (98)
Space heating per m2												3206.0916 (98)
												(98) / (4) = 34.1437 (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													3554.4253	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	584.5197	476.5622	422.5072	274.9525	158.6369	0.0000	0.0000	0.0000	0.0000	263.0046	430.7549	595.1535	(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)	648.0263	528.3395	468.4115	304.8253	175.8723	0.0000	0.0000	0.0000	0.0000	291.5794	477.5554	659.8155	(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	107.6029	93.8555	97.3893	87.1975	84.8498	74.5687	71.4857	80.4594	80.9153	92.1030	97.9325	104.3075	(64)	
Efficiency of water heater (217)m	87.7362	87.5966	87.2479	86.4406	84.8586	76.4000	76.4000	76.4000	76.4000	86.1633	87.2797	87.8341	(217)	
Fuel for water heating, kWh/month	122.6436	107.1451	111.6237	100.8756	99.9897	97.6030	93.5677	105.3133	105.9100	106.8935	112.2054	118.7551	(219)	
Water heating fuel used												1282.5257	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3554.4253	(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)													393.1448	(232)
Total delivered energy for all uses													5305.0958	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3554.4253	3.4800	123.6940 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1282.5257	3.4800	44.6319 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	393.1448	13.1900	51.8558 (250)
Additional standing charges			120.0000 (251)
Total energy cost			350.0742 (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] =	1.0585 (257)
SAP value		85.2334
SAP rating (Section 12)		85 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3554.4253	0.2160	767.7559 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1282.5257	0.2160	277.0255 (264)
Space and water heating			1044.7814 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	393.1448	0.5190	204.0422 (268)
Total kg/year			1287.7486 (272)
CO2 emissions per m2			13.7100 (273)
EI value			87.5768
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	$3.48 / 0.8340 = 4.173$, stars = 5
Water heating environmental impact	$0.216 / 0.8340 = 0.2590$, 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	46.9500 (1b)	x 2.3700 (2b)	= 111.2715 (1b) - (3b)
First floor	46.9500 (1c)	x 2.6200 (2c)	= 123.0090 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.2805 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1281 (8)
Pressure test					Yes
Measured/design AP50					3.7600
Infiltration rate					0.3161 (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) =		0.2923 (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	0.3581	0.3362	0.3289	0.3070	0.3070	0.2997	0.2997	0.2923	0.2923	0.3143	0.3143	0.3216 (22b)
Effective ac	0.5641	0.5565	0.5541	0.5471	0.5471	0.5449	0.5449	0.5427	0.5427	0.5494	0.5494	0.5517 (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)			17.1600	1.3258	22.7500		(27)
Flr - Ground			46.9540	0.1800	8.4517	75.6000	3549.7224 (28a)
Wl - Brick (Timber Frame)	96.8930	19.2470	77.6460	0.2100	16.3057	7.4000	574.5804 (29a)
Rf - Ins Joist	46.9540		46.9540	0.0800	3.7563	7.4000	347.4596 (30)
Total net area of external elements Aum(A, m ²)			190.8040				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.7717		(33)
Party Wall			46.2060	0.0000	0.0000	7.4000	341.9244 (32)
Stud			67.7630			7.4000	501.4465 (32c)
Internal Floor			46.9540			7.4000	347.4596 (32d)
Internal Ceiling			46.9540			7.4000	347.4596 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6010.0525 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.0048 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.1121 (36)
Total fabric heat loss							(33) + (36) = 72.8838 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	43.6141	43.0256	42.8377	42.2988	42.2988	42.1274	42.1274	41.9601	41.9601	42.4743	42.4743	42.6539 (38)
Heat transfer coeff	116.4979	115.9094	115.7215	115.1826	115.1826	115.0112	115.0112	114.8439	114.8439	115.3581	115.3581	115.5377 (39)
Average = Sum(39)m / 12 =												115.3715 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2407	1.2344	1.2324	1.2267	1.2267	1.2248	1.2248	1.2230	1.2230	1.2285	1.2285	1.2304 (40)
HLP (average)												1.2287 (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												2.6754 (42)
Average daily hot water use (litres/day)												97.7415 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.5156	103.6060	99.6963	95.7866	91.8770	87.9673	87.9673	91.8770	95.7866	99.6963	103.6060	107.5156 (44)
Energy conte	159.4425	139.4495	143.8994	125.4549	120.3770	103.8762	96.2566	110.4558	111.7750	130.2630	142.1923	154.4116 (45)
Energy content (annual)												Total = Sum(45)m = 1537.8538 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	23.9164	20.9174	21.5849	18.8182	18.0566	15.5814	14.4385	16.5684	16.7663	19.5395	21.3288	23.1617 (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	0.6708	0.6085	0.6456	0.5408	0.4977	0.4112	0.3810	0.4567	0.4818	0.5844	0.6205	0.6497 (61)
Total heat required for water heating calculated for each month												
	160.1134	140.0580	144.5449	125.9957	120.8747	104.2874	96.6376	110.9125	112.2568	130.8474	142.8128	155.0613 (62)
WWHRS	-52.5105	-46.2025	-47.1557	-38.7982	-36.0249	-29.7187	-25.1519	-30.4531	-31.3416	-38.7444	-44.8802	-50.7538 eq. (G10)
Total of WWHRS savings												-471.7356
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	107.6029	93.8555	97.3893	87.1975	84.8498	74.5687	71.4857	80.4594	80.9153	92.1030	97.9325	104.3075 (64)
								Total per year (kWh/year) =	Sum(64)m =			1072.6669 (64)
Heat gains from water heating, kWh/month												
	53.1824	46.5191	48.0079	41.8490	40.1498	34.6416	32.1006	36.8407	37.2856	43.4586	47.4341	51.5043 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.6537	49.4311	40.2001	30.4341	22.7498	19.2064	20.7531	26.9757	36.2068	45.9728	53.6570	57.2005 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	367.2726	371.0838	361.4798	341.0341	315.2252	290.9683	274.7633	270.9522	280.5561	301.0018	326.8108	351.0676 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280 (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)	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172 (71)
Water heating gains (Table 5)	71.4817	69.2248	64.5268	58.1236	53.9648	48.1134	43.1459	49.5171	51.7856	58.4120	65.8806	69.2262 (72)
Total internal gains	604.6446	599.9763	576.4433	539.8284	502.1763	468.5247	448.8990	457.6816	478.7851	515.6232	556.5851	587.7309 (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	6.1670	13.4684	0.7300	0.7200	0.7700	30.2537 (74)
East	5.8820	25.1733	0.7300	0.7200	0.7700	53.9328 (76)
West	5.1080	25.1733	0.7300	0.7200	0.7700	46.8359 (80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8216	0.7932	0.7295	0.6287	0.5020	0.3347	0.2161	0.2205	0.4359	0.6465	0.7727	0.8314 (94)
Useful gains	604.4052	648.3785	688.6565	686.9991	580.3859	407.0222	244.8800	233.2778	406.6109	515.9232	555.6556	576.9059 (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	1281.9421	1266.8719	1166.1673	987.1868	724.0819	449.1029	255.5696	243.8425	479.6129	760.2125	1030.0821	1256.4140 (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	504.0875	415.6276	355.2680	216.1351	106.9098	0.0000	0.0000	0.0000	0.0000	181.7513	341.5871	505.5540 (98)
Space heating												2626.9204 (98)
Space heating per m2												27.9757 (99)
										(98) / (4) =		26.9204 (98)

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													2912.3286 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	504.0875	415.6276	355.2680	216.1351	106.9098	0.0000	0.0000	0.0000	0.0000	181.7513	341.5871	505.5540	(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)	558.8553	460.7845	393.8670	239.6177	118.5253	0.0000	0.0000	0.0000	0.0000	201.4981	378.6997	560.4812	(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	107.6029	93.8555	97.3893	87.1975	84.8498	74.5687	71.4857	80.4594	80.9153	92.1030	97.9325	104.3075	(64)
Efficiency of water heater (217)m	87.4222	87.2953	86.8258	85.7476	83.5244	76.4000	76.4000	76.4000	76.4000	85.0342	86.7102	87.4969	(216)
Fuel for water heating, kWh/month	123.0841	107.5149	112.1663	101.6909	101.5869	97.6030	93.5677	105.3133	105.9100	108.3129	112.9424	119.2128	(219)
Water heating fuel used												1288.9052	(219)
Annual totals kWh/year													
Space heating fuel - main system												2912.3286	(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)													393.1448 (232)
Total delivered energy for all uses													4669.3786 (238)

10a. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2912.3286	5.7300	166.8764 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1288.9052	5.7300	73.8543 (247)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Energy for lighting	393.1448	24.1800	95.0624 (250)
Additional standing charges			114.0000 (251)
Total energy cost			467.9281 (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	2912.3286	0.2160	629.0630 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1288.9052	0.2160	278.4035 (264)
Space and water heating			907.4665 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	393.1448	0.5190	204.0422 (268)
Total kg/year			1150.4336 (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	2912.3286	1.2200	3553.0409 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1288.9052	1.2200	1572.4643 (264)
Space and water heating			5125.5052 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	393.1448	3.0700	1206.9545 (268)
Primary energy kWh/year			6562.7097 (272)
Primary energy kWh/m2/year			69.8904 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:
Current environmental impact rating:

B 85
B 88

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 9.6	-£ 471	-1010 kg (87.8%)
Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.9	-£ 34	-148 kg (12.8%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£471 10.76 kg/m²	A 95	A 96
Total Savings	£471 10.76 kg/m²		
Potential energy efficiency rating:		A 95	
Potential environmental impact rating:			A 96

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
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	£113	£113	£0
Mains gas	£355	£355	£0
Space heating	£299	£299	£0
Water heating	£74	£74	£0
Lighting	£95	£95	£0
Generated (PV)	-£0	-£471	£471
Total cost of fuels	£468	-£3	£471
Total cost of uses	£468	-£3	£471
Delivered energy	50 kWh/m²	29 kWh/m²	21 kWh/m²
Carbon dioxide emissions	1.2 tonnes	0.1 tonnes	1.0 tonnes
CO2 emissions per m²	12 kg/m²	1 kg/m²	11 kg/m²
Primary energy	70 kWh/m²	6 kWh/m²	64 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	46.9500 (1b)	x 2.3700 (2b)	= 111.2715 (1b) - (3b)
First floor	46.9500 (1c)	x 2.6200 (2c)	= 123.0090 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.2805 (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) = 0.1281 (8)
Pressure test					Yes
Measured/design AP50					3.7600
Infiltration rate					0.3161 (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) =	0.2923 (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	0.3727	0.3654	0.3581	0.3216	0.3143	0.2777	0.2777	0.2704	0.2923	0.3143	0.3289	0.3435 (22b)
Effective ac	0.5695	0.5668	0.5641	0.5517	0.5494	0.5386	0.5386	0.5366	0.5427	0.5494	0.5541	0.5590 (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)			17.1600	1.3258	22.7500		(27)
Flr - Ground			46.9540	0.1800	8.4517	75.6000	3549.7224 (28a)
Wl - Brick (Timber Frame)	96.8930	19.2470	77.6460	0.2100	16.3057	7.4000	574.5804 (29a)
Rf - Ins Joist	46.9540		46.9540	0.0800	3.7563	7.4000	347.4596 (30)
Total net area of external elements Aum(A, m ²)			190.8040				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.7717		(33)
Party Wall			46.2060	0.0000	0.0000	7.4000	341.9244 (32)
Stud			67.7630			7.4000	501.4465 (32c)
Internal Floor			46.9540			7.4000	347.4596 (32d)
Internal Ceiling			46.9540			7.4000	347.4596 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 6010.0525 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							64.0048 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.1121 (36)
Total fabric heat loss							(33) + (36) = 72.8838 (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	44.0271	43.8185	43.6141	42.6539	42.4743	41.6380	41.6380	41.4831	41.9601	42.4743	42.8377	43.2177 (38)
Heat transfer coeff	116.9109	116.7023	116.4979	115.5377	115.3581	114.5218	114.5218	114.3669	114.8439	115.3581	115.7215	116.1015 (39)
Average = Sum(39)m / 12 =												115.5369 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2451	1.2428	1.2407	1.2304	1.2285	1.2196	1.2196	1.2180	1.2230	1.2285	1.2324	1.2364 (40)
HLP (average)												1.2304 (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												2.6754 (42)
Average daily hot water use (litres/day)												97.7415 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.5156	103.6060	99.6963	95.7866	91.8770	87.9673	87.9673	91.8770	95.7866	99.6963	103.6060	107.5156 (44)
Energy conte	159.4425	139.4495	143.8994	125.4549	120.3770	103.8762	96.2566	110.4558	111.7750	130.2630	142.1923	154.4116 (45)
Energy content (annual)												Total = Sum(45)m = 1537.8538 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	23.9164	20.9174	21.5849	18.8182	18.0566	15.5814	14.4385	16.5684	16.7663	19.5395	21.3288	23.1617 (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	0.6708	0.6085	0.6456	0.5408	0.4977	0.4112	0.3810	0.4567	0.4818	0.5844	0.6205	0.6497 (61)
Total heat required for water heating calculated for each month												
	160.1134	140.0580	144.5449	125.9957	120.8747	104.2874	96.6376	110.9125	112.2568	130.8474	142.8128	155.0613 (62)
WWHRS	-52.5105	-46.2025	-47.1557	-38.7982	-36.0249	-29.7187	-25.1519	-30.4531	-31.3416	-38.7444	-44.8802	-50.7538 eq. (G10)
Total of WWHRS savings												-471.7356
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	107.6029	93.8555	97.3893	87.1975	84.8498	74.5687	71.4857	80.4594	80.9153	92.1030	97.9325	104.3075 (64)
								Total per year (kWh/year) =	Sum(64)m =			1072.6669 (64)
Heat gains from water heating, kWh/month												
	53.1824	46.5191	48.0079	41.8490	40.1498	34.6416	32.1006	36.8407	37.2856	43.4586	47.4341	51.5043 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258	160.5258 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.6537	49.4311	40.2001	30.4341	22.7498	19.2064	20.7531	26.9757	36.2068	45.9728	53.6570	57.2005 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	367.2726	371.0838	361.4798	341.0341	315.2252	290.9683	274.7633	270.9522	280.5561	301.0018	326.8108	351.0676 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280	53.7280 (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)	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172	-107.0172 (71)
Water heating gains (Table 5)	71.4817	69.2248	64.5268	58.1236	53.9648	48.1134	43.1459	49.5171	51.7856	58.4120	65.8806	69.2262 (72)
Total internal gains	604.6446	599.9763	576.4433	539.8284	502.1763	468.5247	448.8990	457.6816	478.7851	515.6232	556.5851	587.7309 (73)

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	6.1670	10.6334	0.7300	0.7200	0.7700	23.8855 (74)
East	5.8820	19.6403	0.7300	0.7200	0.7700	42.0786 (76)
West	5.1080	19.6403	0.7300	0.7200	0.7700	36.5415 (80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8472	0.8159	0.7629	0.6776	0.5680	0.4381	0.3209	0.3593	0.5413	0.7179	0.8150	0.8571 (94)
Useful gains	599.0870	652.2559	692.1532	700.5604	637.6666	487.0015	339.4865	348.4046	469.0807	540.1533	557.5239	576.2226 (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												
	1384.7318	1361.4260	1260.0392	1082.4389	850.8882	575.1239	371.5410	389.7373	607.5989	893.6542	1155.7946	1376.1601 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	584.5197	476.5622	422.5072	274.9525	158.6369	0.0000	0.0000	0.0000	0.0000	263.0046	430.7549	595.1535 (98)
Space heating												3206.0916 (98)
Space heating per m2												(98) / (4) = 34.1437 (99)

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													3554.4253	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	584.5197	476.5622	422.5072	274.9525	158.6369	0.0000	0.0000	0.0000	0.0000	263.0046	430.7549	595.1535	(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)	648.0263	528.3395	468.4115	304.8253	175.8723	0.0000	0.0000	0.0000	0.0000	291.5794	477.5554	659.8155	(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	107.6029	93.8555	97.3893	87.1975	84.8498	74.5687	71.4857	80.4594	80.9153	92.1030	97.9325	104.3075	(64)	
Efficiency of water heater (217)m	87.7362	87.5966	87.2479	86.4406	84.8586	76.4000	76.4000	76.4000	76.4000	86.1633	87.2797	87.8341	(217)	
Fuel for water heating, kWh/month	122.6436	107.1451	111.6237	100.8756	99.9897	97.6030	93.5677	105.3133	105.9100	106.8935	112.2054	118.7551	(219)	
Water heating fuel used												1282.5257	(219)	
Annual totals kWh/year														
Space heating fuel - main system													3554.4253	(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)													393.1448	(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													3577.8564	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3554.4253	3.4800	123.6940
Space heating - secondary	0.0000	0.0000	0.0000
Water heating (other fuel)	1282.5257	3.4800	44.6319
Pumps and fans for heating	75.0000	13.1900	9.8925
Energy for lighting	393.1448	13.1900	51.8558
Additional standing charges			120.0000
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229
Total energy cost			122.2513

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3697	(257)
SAP value		94.8433	
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	3554.4253	0.2160	767.7559
Space heating - secondary	0.0000	0.0000	0.0000
Water heating (other fuel)	1282.5257	0.2160	277.0255
Space and water heating			1044.7814
Pumps and fans	75.0000	0.5190	38.9250
Energy for lighting	393.1448	0.5190	204.0422
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372
Total kg/year			391.3113
CO2 emissions per m2			4.1700
EI value			96.2249
EI rating			96
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	46.9500 (1b)	x 2.3700 (2b)	= 111.2715 (1b) - (3b)
First floor	46.9500 (1c)	x 2.6200 (2c)	= 123.0090 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	93.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 234.2805 (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) =	0.1281 (8)	
Pressure test										Yes							
Measured/design AP50										3.7600							
Infiltration rate										0.3161 (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) =					0.2923 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
	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	0.3581	0.3362	0.3289	0.3070	0.3070	0.2997	0.2997	0.2923	0.2923	0.3143	0.3143	0.3216	(22b)				
Effective ac	0.5641	0.5565	0.5541	0.5471	0.5471	0.5449	0.5449	0.5427	0.5427	0.5494	0.5494	0.5517	(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)			17.1600	1.3258	22.7500		(27)					
Flr - Ground			46.9540	0.1800	8.4517	75.6000	3549.7224 (28a)					
Wl - Brick (Timber Frame)	96.8930	19.2470	77.6460	0.2100	16.3057	7.4000	574.5804 (29a)					
Rf - Ins Joist	46.9540		46.9540	0.0800	3.7563	7.4000	347.4596 (30)					
Total net area of external elements Aum(A, m2)			190.8040				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	53.7717			(33)					
Party Wall			46.2060	0.0000	0.0000	7.4000	341.9244 (32)					
Stud			67.7630			7.4000	501.4465 (32c)					
Internal Floor			46.9540			7.4000	347.4596 (32d)					
Internal Ceiling			46.9540			7.4000	347.4596 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		6010.0525 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							64.0048 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.1121 (36)					
Total fabric heat loss						(33) + (36) =	72.8838 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	43.6141	43.0256	42.8377	42.2988	42.2988	42.1274	42.1274	41.9601	41.9601	42.4743	42.4743	42.6539 (38)
Heat transfer coeff	116.4979	115.9094	115.7215	115.1826	115.1826	115.0112	115.0112	114.8439	114.8439	115.3581	115.3581	115.5377 (39)
Average = Sum(39)m / 12 =												115.3715 (39)
HLP	Jan 1.2407	Feb 1.2344	Mar 1.2324	Apr 1.2267	May 1.2267	Jun 1.2248	Jul 1.2248	Aug 1.2230	Sep 1.2230	Oct 1.2285	Nov 1.2285	Dec 1.2304 (40)
HLP (average)												1.2287 (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												2.6754 (42)
Average daily hot water use (litres/day)												97.7415 (43)
Daily hot water use	Jan 107.5156	Feb 103.6060	Mar 99.6963	Apr 95.7866	May 91.8770	Jun 87.9673	Jul 87.9673	Aug 91.8770	Sep 95.7866	Oct 99.6963	Nov 103.6060	Dec 107.5156 (44)
Energy conte	159.4425	139.4495	143.8994	125.4549	120.3770	103.8762	96.2566	110.4558	111.7750	130.2630	142.1923	154.4116 (45)
Energy content (annual)												Total = Sum(45)m = 1537.8538 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	23.9164	20.9174	21.5849	18.8182	18.0566	15.5814	14.4385	16.5684	16.7663	19.5395	21.3288	23.1617 (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	0.6708	0.6085	0.6456	0.5408	0.4977	0.4112	0.3810	0.4567	0.4818	0.5844	0.6205	0.6497 (61)
Total heat required for water heating calculated for each month												
	160.1134	140.0580	144.5449	125.9957	120.8747	104.2874	96.6376	110.9125	112.2568	130.8474	142.8128	155.0613 (62)
WWHRS	-52.5105	-46.2025	-47.1557	-38.7982	-36.0249	-29.7187	-25.1519	-30.4531	-31.3416	-38.7444	-44.8802	-50.7538 eq. (G10)
Total of WWHRS savings												-471.7356
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	107.6029	93.8555	97.3893	87.1975	84.8498	74.5687	71.4857	80.4594	80.9153	92.1030	97.9325	104.3075 (64)
								Total per year (kWh/year) =	Sum(64)m =			1072.6669 (64)
Heat gains from water heating, kWh/month												
	53.1824	46.5191	48.0079	41.8490	40.1498	34.6416	32.1006	36.8407	37.2856	43.4586	47.4341	51.5043 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8216	0.7932	0.7295	0.6287	0.5020	0.3347	0.2161	0.2205	0.4359	0.6465	0.7727	0.8314 (94)
Useful gains	604.4052	648.3785	688.6565	686.9991	580.3859	407.0222	244.8800	233.2778	406.6109	515.9232	555.6556	576.9059 (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	1281.9421	1266.8719	1166.1673	987.1868	724.0819	449.1029	255.5696	243.8425	479.6129	760.2125	1030.0821	1256.4140 (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	504.0875	415.6276	355.2680	216.1351	106.9098	0.0000	0.0000	0.0000	0.0000	181.7513	341.5871	505.5540 (98)
Space heating												2626.9204 (98)
Space heating per m2												27.9757 (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													2912.3286 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	504.0875	415.6276	355.2680	216.1351	106.9098	0.0000	0.0000	0.0000	0.0000	181.7513	341.5871	505.5540	(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)	558.8553	460.7845	393.8670	239.6177	118.5253	0.0000	0.0000	0.0000	0.0000	201.4981	378.6997	560.4812	(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	107.6029	93.8555	97.3893	87.1975	84.8498	74.5687	71.4857	80.4594	80.9153	92.1030	97.9325	104.3075	(64)
Efficiency of water heater (217)m	87.4222	87.2953	86.8258	85.7476	83.5244	76.4000	76.4000	76.4000	76.4000	85.0342	86.7102	87.4969	(216)
Fuel for water heating, kWh/month	123.0841	107.5149	112.1663	101.6909	101.5869	97.6030	93.5677	105.3133	105.9100	108.3129	112.9424	119.2128	(219)
Water heating fuel used												1288.9052	(219)
Annual totals kWh/year													
Space heating fuel - main system												2912.3286	(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)													393.1448 (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												2722.9326	(238)

10a. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2912.3286	5.7300	166.8764 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1288.9052	5.7300	73.8543 (247)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Energy for lighting	393.1448	24.1800	95.0624 (250)
Additional standing charges			114.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	24.1800	-470.6506 (252)
Total energy cost			-2.7225 (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	2912.3286	0.2160	629.0630 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1288.9052	0.2160	278.4035 (264)
Space and water heating			907.4665 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	393.1448	0.5190	204.0422 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			140.2282 (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	2912.3286	1.2200	3553.0409 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1288.9052	1.2200	1572.4643 (264)
Space and water heating			5125.5052 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	393.1448	3.0700	1206.9545 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			587.1207 (272)
Primary energy kWh/m2/year			6.2526 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	077 - PRJ013014			Issued on Date	14/04/2025
Assessment Reference	077	Prop Type Ref	3B		
Property	15 Erwood Close, Netley Abbey, Southampton, SO31 5TJ				
SAP Rating	85 B	DER	14.64	TER	17.88
Environmental	88 B	% DER<TER	18.14		
CO ₂ Emissions (t/year)	1.15	DFEE	47.34	TFEE	53.78
General Requirements Compliance	Pass	% DFEE<TFEE	11.97		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	4299-0004
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.88	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.64	kgCO ₂ /m ²	Pass
	-3.24 (-18.1%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.78	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	47.34	kWh/m ² /yr	
	-6.5 (-12.1%)	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	1.38 (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	3.76 (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

6.17 m², No overhang

Windows facing East

5.88 m², No overhang

Windows facing West

5.11 m², No overhang

Air change rate

4.65 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

3.76 (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

Air permeability

3.8 m³/m²h

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