

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	013 - PRJ013014			Issued on Date	08/02/2024
Assessment Reference	013	Prop Type Ref	2B		
Property	17 Deeble way, Netley Abbey, Southampton, SO31 5JP				
SAP Rating	86 B	DER	13.84	TER	17.00
Environmental	89 B	% DER<TER	18.58		
CO ₂ Emissions (t/year)	0.95	DFEE	39.07	TFEE	43.58
General Requirements Compliance	Pass	% DFEE<TFEE	10.34		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	U903-0001
Client					

FULL SAP CALCULATION PRINTOUT

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

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DWELLING AS BUILT

Mid-Terrace House, total floor area 82 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) 17.00 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.84 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 43.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 39.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.16 (max. 0.25)	0.16 (max. 0.70)	OK
Roof	0.08 (max. 0.20)	0.08 (max. 0.35)	OK
Openings	1.36 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.69 (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 East: 6.36 m², No overhang
Windows facing South West: 2.72 m², No overhang
Air change rate: 4.66 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	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (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) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.6900
Infiltration rate					0.3815 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3242 (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	0.4134	0.4053	0.3972	0.3567	0.3486	0.3080	0.3080	0.2999	0.3242	0.3486	0.3648	0.3810 (22b)
Effective ac	0.5855	0.5821	0.5789	0.5636	0.5607	0.5474	0.5474	0.5450	0.5526	0.5607	0.5665	0.5726 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9100	0.1600	6.5456	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2100	6.9296	7.4000	244.1852 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2940		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.2404 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4340 (36)
Total fabric heat loss							(33) + (36) = 45.7280 (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	39.4398	39.2163	38.9972	37.9680	37.7755	36.8791	36.8791	36.7131	37.2244	37.7755	38.1650	38.5722 (38)
Heat transfer coeff	85.1678	84.9443	84.7252	83.6961	83.5035	82.6072	82.6072	82.4412	82.9524	83.5035	83.8930	84.3003 (39)
Average = Sum(39)m / 12 =												83.6951 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0409	1.0382	1.0355	1.0229	1.0206	1.0096	1.0096	1.0076	1.0138	1.0206	1.0253	1.0303 (40)
HLP (average)												1.0229 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												

	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.3323	19.8354	16.1312	12.2124	9.1289	7.7070	8.3277	10.8246	14.5288	18.4476	21.5311	22.9530 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.2022	225.5183	219.6817	207.2563	191.5714	176.8299	166.9816	164.6655	170.5021	182.9275	198.6124	213.3539 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824 (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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	68.3832	66.2196	61.7121	55.5885	51.6114	46.0154	41.2646	47.3577	49.5270	55.8641	63.0206	66.2254 (72)
Total internal gains	377.3650	375.0206	360.9723	338.5045	315.7590	293.9996	280.0212	286.2951	298.0051	320.6865	346.6114	365.9797 (73)

[Jan				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	Table 6b		Specific data	Specific data		factor	W
					W/m2			or Table 6b	or Table 6c		Table 6d	
Northeast				6.3550	11.2829			0.7300	0.7200	0.7700		26.1172 (75)
Southwest				2.7240	36.7938			0.7300	0.7200	0.7700		36.5065 (79)

Solar gains	62.6237	115.3465	180.8646	262.7229	329.5247	342.6484	323.8964	271.6886	208.8383	133.6953	76.5886	52.5706 (83)
Total gains	439.9887	490.3671	541.8370	601.2273	645.2837	636.6480	603.9176	557.9837	506.8434	454.3818	423.2000	418.5503 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	17.7827	17.8295	17.8756	18.0954	18.1371	18.3339	18.3339	18.3708	18.2576	18.1371	18.0529	17.9657
alpha	2.1855	2.1886	2.1917	2.2064	2.2091	2.2223	2.2223	2.2247	2.2172	2.2091	2.2035	2.1977
util living area												
	0.9455	0.9294	0.8997	0.8416	0.7494	0.6236	0.5056	0.5502	0.7299	0.8697	0.9290	0.9506 (86)
MIT	18.1146	18.3821	18.8700	19.5351	20.1520	20.6170	20.8309	20.7896	20.4124	19.6303	18.7678	18.0659 (87)
Th 2	20.0494	20.0516	20.0538	20.0643	20.0662	20.0753	20.0753	20.0770	20.0718	20.0662	20.0623	20.0581 (88)
util rest of house												
	0.9395	0.9215	0.8880	0.8219	0.7153	0.5663	0.4228	0.4690	0.6812	0.8494	0.9198	0.9451 (89)
MIT 2	16.1604	16.5469	17.2504	18.2030	19.0628	19.6848	19.9403	19.9006	19.4345	18.3541	17.1139	16.0931 (90)
Living area fraction												
MIT	16.4883	16.8548	17.5221	18.4265	19.2456	19.8413	20.0897	20.0498	19.5986	18.5682	17.3914	16.4241 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.3383	16.7048	17.3721	18.2765	19.0956	19.6913	19.9397	19.8998	19.4486	18.4182	17.2414	16.2741 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9036	0.8811	0.8423	0.7738	0.6731	0.5395	0.4095	0.4517	0.6422	0.8014	0.8792	0.9113 (94)
Useful gains	397.5864	432.0510	456.3973	465.2279	434.3694	343.5032	247.3211	252.0557	325.5039	364.1524	372.0903	381.4283 (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	1025.2776	1002.7544	921.1438	784.7785	617.5565	420.5749	275.8837	288.5263	443.6753	652.8513	850.7966	1017.8522 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	467.0022	383.5126	345.7714	230.0765	136.2913	0.0000	0.0000	0.0000	0.0000	214.7919	344.6686	473.4993 (98)
Space heating												2595.6138 (99)
Space heating per m2												31.7235 (99)
										(98) / (4) =		

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

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2877.6207 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	467.0022	383.5126	345.7714	230.0765	136.2913	0.0000	0.0000	0.0000	0.0000	214.7919	344.6686	473.4993 (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)	517.7408	425.1803	383.3386	255.0737	151.0990	0.0000	0.0000	0.0000	0.0000	238.1285	382.1160	524.9438 (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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Efficiency of water heater (217)m	87.3337	87.1946	86.8525	86.0460	84.4836	76.4000	76.4000	76.4000	76.4000	85.6802	86.8304	76.4000 (216)
Fuel for water heating, kWh/month	118.7337	103.7237	107.9931	97.5323	96.6286	93.8672	89.9191	101.2456	101.8344	103.4144	108.6172	114.9649 (219)
Water heating fuel used												1238.4744 (219)
Annual totals kWh/year												
Space heating fuel - main system												2877.6207 (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)												394.3960 (232)
Total delivered energy for all uses												4585.4910 (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	2877.6207	0.2160	621.5661 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1238.4744	0.2160	267.5105 (264)
Space and water heating			889.0765 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total CO2, kg/year			1132.6931 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.8400 (273)

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

DER		13.8400 ZC1
Total Floor Area	TFA	81.8200
Assumed number of occupants	N	2.4965
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.1654 ZC2
CO2 emissions from cooking, equation (L16)		2.1867 ZC3
Total CO2 emissions		32.1921 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		32.1921 ZC8

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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	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (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) =	0.1470 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3970 (18)							
Number of sides sheltered										2 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3374 (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	0.4302	0.4218	0.4133	0.3712	0.3627	0.3205	0.3205	0.3121	0.3374	0.3627	0.3796	0.3965	(22b)				
Effective ac	0.5925	0.5889	0.5854	0.5689	0.5658	0.5514	0.5514	0.5487	0.5569	0.5658	0.5720	0.5786	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.0900	1.0000	2.0900		(26)					
TER Opening Type (Uw = 1.40)			9.0800	1.3258	12.0379		(27)					
Flr - Ground			40.9100	0.1300	5.3183		(28a)					
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.1800	5.9396		(29a)					
Rf - Ins Joist	40.9120		40.9120	0.1300	5.3186		(30)					
Total net area of external elements Aum(A, m2)			125.9900				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		30.7044		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3231 (36)					
Total fabric heat loss						(33) + (36) =	39.0275 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.9171	Feb 39.6751	Mar 39.4378	Apr 38.3233	May 38.1148	Jun 37.1441	Jul 37.1441	Aug 36.9644	Sep 37.5180	Oct 38.1148	Nov 38.5366	Dec 38.9776 (38)
Heat transfer coeff	78.9446	78.7026	78.4653	77.3508	77.1423	76.1716	76.1716	75.9919	76.5455	77.1423	77.5641	78.0051 (39)
Average = Sum(39)m / 12 =												77.3498 (39)
HLP	Jan 0.9649	Feb 0.9619	Mar 0.9590	Apr 0.9454	May 0.9428	Jun 0.9310	Jul 0.9310	Aug 0.9288	Sep 0.9355	Oct 0.9428	Nov 0.9480	Dec 0.9534 (40)
HLP (average)												0.9454 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	Jan 102.8407	Feb 99.1011	Mar 95.3614	Apr 91.6217	May 87.8821	Jun 84.1424	Jul 84.1424	Aug 87.8821	Sep 91.6217	Oct 95.3614	Nov 99.1011	Dec 102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	45.6136	48.5951	45.1833	44.7837	41.4949	42.8781	44.7837	45.1833	48.5951	48.8718	50.9589 (61)
Solar input	203.4687	178.9997	186.2376	165.1834	159.9266	140.8545	134.9493	150.4368	152.0983	173.1942	184.8814	198.6565 (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	203.4687	178.9997	186.2376	165.1834	159.9266	140.8545	134.9493	150.4368	152.0983	173.1942	184.8814	198.6565 (64)
	63.4492	55.7543	57.9149	51.1958	49.4810	43.4108	41.3332	46.3256	46.8450	53.5780	57.4411	61.8492 (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)
(66)m	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4705	19.9581	16.2310	12.2879	9.1854	7.7547	8.3792	10.8916	14.6187	18.5617	21.6643	23.0950	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.2022	225.5183	219.6817	207.2563	191.5714	176.8299	166.9816	164.6655	170.5021	182.9275	198.6124	213.3539	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	(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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	(71)
Water heating gains (Table 5)	85.2812	82.9677	77.8426	71.1053	66.5067	60.2927	55.5554	62.2656	65.0626	72.0134	79.7794	83.1306	(72)
Total internal gains	394.4012	391.8914	377.2027	354.0969	330.7108	308.3246	294.3635	301.2699	313.6306	336.9499	363.5033	383.0269	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF			Access factor Table 6d			Gains W
Northeast					6.3550	11.2829		0.6300	0.7000			0.7700			21.9134 (75)
Southwest					2.7240	36.7938		0.6300	0.7000			0.7700			30.6305 (79)
Solar gains	52.5439	96.7804	151.7528	220.4353	276.4847	287.4961	271.7624	227.9579	175.2239	112.1758	64.2610			44.1089	(83)
Total gains	446.9451	488.6718	528.9555	574.5322	607.1955	595.8207	566.1259	529.2278	488.8545	449.1258	427.7643	427.1358			(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	71.9738	72.1952	72.4135	73.4568	73.6554	74.5940	74.5940	74.7704	74.2296	73.6554	73.2548	72.8407	
alpha	5.7983	5.8130	5.8276	5.8971	5.9104	5.9729	5.9729	5.9847	5.9486	5.9104	5.8837	5.8560	
util living area	0.9988	0.9976	0.9938	0.9775	0.9162	0.7586	0.5812	0.6407	0.8870	0.9855	0.9974	0.9990	(86)
MIT	19.9642	20.0734	20.2721	20.5537	20.8078	20.9576	20.9927	20.9874	20.8871	20.5710	20.2236	19.9479	(87)
Th 2	20.1127	20.1152	20.1176	20.1291	20.1312	20.1413	20.1413	20.1431	20.1374	20.1312	20.1269	20.1224	(88)
util rest of house	0.9983	0.9968	0.9915	0.9686	0.8830	0.6794	0.4735	0.5313	0.8310	0.9781	0.9963	0.9987	(89)
MIT 2	18.7171	18.8786	19.1701	19.5841	19.9316	20.1110	20.1383	20.1374	20.0396	19.6142	19.1072	18.7006	(90)
Living area fraction	18.9264	19.0791	19.3550	19.7468	20.0786	20.2531	20.2817	20.2801	20.1818	19.7747	19.2945	18.9099	(91)
MIT	18.9264	19.0791	19.3550	19.7468	20.0786	20.2531	20.2817	20.2801	20.1818	19.7747	19.2945	18.9099	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9264	19.0791	19.3550	19.7468	20.0786	20.2531	20.2817	20.2801	20.1818	19.7747	19.2945	18.9099	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	445.8275	486.4033	523.0353	553.5789	534.6964	411.4512	278.2909	290.8459	407.8742	437.4597	425.5563	426.3123	(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	1154.6759	1115.9276	1008.6710	839.0097	646.3481	430.6048	280.4381	294.8538	465.5331	707.7606	945.8584	1147.4458	(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	527.3831	423.0404	361.3129	205.5101	83.0688	0.0000	0.0000	0.0000	0.0000	201.1039	374.6175	536.5233	(98)
Space heating												2712.5601	(98)
Space heating per m2												33.1528	(99)

8c. Space cooling requirement

Not applicable

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

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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													2904.2399 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	527.3831	423.0404	361.3129	205.5101	83.0688	0.0000	0.0000	0.0000	0.0000	201.1039	374.6175	536.5233	(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)	564.6501	452.9340	386.8447	220.0323	88.9388	0.0000	0.0000	0.0000	0.0000	215.3147	401.0894	574.4361	(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	203.4687	178.9997	186.2376	165.1834	159.9266	140.8545	134.9493	150.4368	152.0983	173.1942	184.8814	198.6565	(64)
Efficiency of water heater	87.3416	87.1412	86.6913	85.6022	83.4888	80.3000	80.3000	80.3000	80.3000	85.4281	86.7927	87.4286	(217)
Fuel for water heating, kWh/month	232.9574	205.4134	214.8285	192.9663	191.5547	175.4103	168.0564	187.3435	189.4125	202.7368	213.0149	227.2216	(219)
Water heating fuel used												2400.9163	(219)
Annual totals kWh/year													
Space heating fuel - main system												2904.2399	(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)												396.8354	(232)
Total delivered energy for all uses												5776.9916	(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	2904.2399	0.2160	627.3158 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2400.9163	0.2160	518.5979 (264)
Space and water heating			1145.9137 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	396.8354	0.5190	205.9576 (268)
Total CO2, kg/m2/year			1390.7963 (272)
Emissions per m2 for space and water heating			14.0053 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5172 (272b)
Emissions per m2 for pumps and fans			0.4757 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.0053 * 1.00) + 2.5172 + 0.4757, rounded to 2 d.p.			17.0000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	013 - PRJ013014	Issued on Date	08/02/2024
Assessment Reference	013	Prop Type Ref	2B
Property	17 Deeble way, Netley Abbey, Southampton, SO31 5JP		

SAP Rating	86 B	DER	13.84	TER	17.00
Environmental	89 B	% DER<TER	18.58		
CO ₂ Emissions (t/year)	0.95	DFEE	39.07	TTEE	43.58
General Requirements Compliance	Pass	% DFEE<TFEE	10.34		

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (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) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.6900
Infiltration rate					0.3815 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3242 (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	0.4134	0.4053	0.3972	0.3567	0.3486	0.3080	0.3080	0.2999	0.3242	0.3486	0.3648	0.3810 (22b)
Effective ac	0.5855	0.5821	0.5789	0.5636	0.5607	0.5474	0.5474	0.5450	0.5526	0.5607	0.5665	0.5726 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Fir - Ground			40.9100	0.1600	6.5456	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2100	6.9296	7.4000	244.1852 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2940		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	5452.2404 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4340 (36)
Total fabric heat loss						(33) + (36) =	45.7280 (37)

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

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

(38)m	Jan 39.4398	Feb 39.2163	Mar 38.9972	Apr 37.9680	May 37.7755	Jun 36.8791	Jul 36.8791	Aug 36.7131	Sep 37.2244	Oct 37.7755	Nov 38.1650	Dec 38.5722 (38)
Heat transfer coeff	85.1678	84.9443	84.7252	83.6961	83.5035	82.6072	82.6072	82.4412	82.9524	83.5035	83.8930	84.3003 (39)
Average = Sum(39)m / 12 =												83.6951 (39)
HLP	Jan 1.0409	Feb 1.0382	Mar 1.0355	Apr 1.0229	May 1.0206	Jun 1.0096	Jul 1.0096	Aug 1.0076	Sep 1.0138	Oct 1.0206	Nov 1.0253	Dec 1.0303 (40)
HLP (average)												1.0229 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	Jan 102.8407	Feb 99.1011	Mar 95.3614	Apr 91.6217	May 87.8821	Jun 84.1424	Jul 84.1424	Aug 87.8821	Sep 91.6217	Oct 95.3614	Nov 99.1011	Dec 102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)										Total = Sum(45)m =		1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	32.4083	28.3445	29.2490	25.5000	24.4679	21.1139	19.5651	22.4513	22.7194	26.4773	28.9020	31.3857 (65)

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

Metabolic gains (Table 5), Watts	Jan 124.8244	Feb 124.8244	Mar 124.8244	Apr 124.8244	May 124.8244	Jun 124.8244	Jul 124.8244	Aug 124.8244	Sep 124.8244	Oct 124.8244	Nov 124.8244	Dec 124.8244 (66)
(66)m	22.3323	19.8354	16.1312	12.2124	9.1289	7.7070	8.3277	10.8246	14.5288	18.4476	21.5311	22.9530 (67)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	223.2022	225.5183	219.6817	207.2563	191.5714	176.8299	166.9816	164.6655	170.5021	182.9275	198.6124	213.3539 (68)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824 (69)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see 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)
Pumps, fans	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Losses e.g. evaporation (negative values) (Table 5)	43.5596	42.1794	39.3132	35.4167	32.8869	29.3249	26.2972	30.1765	31.5548	35.5878	40.1417	42.1851 (72)
Water heating gains (Table 5)	349.5414	347.9804	335.5735	315.3327	294.0346	274.3090	262.0538	266.1139	277.0329	297.4102	320.7325	338.9394 (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
Northeast				6.3550	11.2829	0.7300		0.7200		0.7700		26.1172 (75)
Southwest				2.7240	36.7938	0.7300		0.7200		0.7700		36.5065 (79)

Solar gains	62.6237	115.3465	180.8646	262.7229	329.5247	342.6484	323.8964	271.6886	208.8383	133.6953	76.5886	52.5706 (83)
Total gains	412.1652	463.3269	516.4381	578.0555	623.5592	616.9574	585.9502	537.8025	485.8712	431.1055	397.3211	391.5100 (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 17.7827	Feb 17.8295	Mar 17.8756	Apr 18.0954	May 18.1371	Jun 18.3339	Jul 18.3339	Aug 18.3708	Sep 18.2576	Oct 18.1371	Nov 18.0529	Dec 17.9657
tau	2.1855	2.1886	2.1917	2.2064	2.2091	2.2223	2.2223	2.2247	2.2172	2.2091	2.2035	2.1977
alpha	0.9517	0.9361	0.9074	0.8507	0.7600	0.6350	0.5165	0.5637	0.7435	0.8801	0.9365	0.9564 (86)
util living area	18.0464	18.3189	18.8157	19.4939	20.1239	20.6017	20.8231	20.7786	20.3871	19.5848	18.7070	17.9983 (87)
MIT	20.0494	20.0516	20.0538	20.0643	20.0662	20.0753	20.0753	20.0770	20.0718	20.0662	20.0623	20.0581 (88)
Th 2	0.9462	0.9289	0.8964	0.8317	0.7265	0.5779	0.4330	0.4821	0.6958	0.8610	0.9281	0.9515 (89)
util rest of house	17.3215	17.5922	18.0837	18.7529	19.3555	19.7967	19.9783	19.9493	19.6152	18.8528	17.9868	17.2796 (90)
MIT 2	17.4431	17.7141	18.2065	18.8772	19.4844	19.9318	20.1201	20.0885	19.7447	18.9756	18.1077	17.4002 (92)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
MIT	17.4431	17.7141	18.2065	18.8772	19.4844	19.9318	20.1201	20.0885	19.7447	18.9756	18.1077	17.4002 (92)
Temperature adjustment												0.0000
adjusted MIT	17.4431	17.7141	18.2065	18.8772	19.4844	19.9318	20.1201	20.0885	19.7447	18.9756	18.1077	17.4002 (93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9258	0.9052	0.8690	0.8026	0.7026	0.5681	0.4374	0.4832	0.6763	0.8329	0.9048	0.9323	(94)
Useful gains	381.5639	419.4026	448.7934	463.9539	438.0965	350.4916	256.3068	259.8889	328.6138	359.0735	359.4876	365.0210	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
Month fracti	1119.3735	1088.4852	991.8391	835.0528	650.0272	440.4466	290.7853	304.0841	468.2402	699.3929	923.4674	1112.7823	(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	548.9303	449.6235	404.0260	267.1912	157.6764	0.0000	0.0000	0.0000	0.0000	253.1976	406.0654	556.3344	(98)
Space heating per m2												3043.0451	(98)
											(98) / (4) =	37.1919	(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													
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	776.5072	611.2929	626.5528	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7063	0.7677	0.7376	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	548.4821	469.2607	462.1762	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	815.4208	777.3281	722.9706	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh						1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	192.1959	229.2021	194.0311	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction												615.4291	(104)
Intermittency factor (Table 10b)									FC = cooled area / (4) =			1.0000	(105)
Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	48.0490	57.3005	48.5078	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												153.8573	(107)
Space cooling per m2												1.8804	(108)
Energy for space heating												37.1919	(99)
Energy for space cooling												1.8804	(108)
Total												39.0724	(109)
Dwelling Fabric Energy Efficiency (DFEE)												39.1	(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	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (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) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3970 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3374 (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	0.4302	0.4218	0.4133	0.3712	0.3627	0.3205	0.3205	0.3121	0.3374	0.3627	0.3796	0.3965 (22b)
Effective ac	0.5925	0.5889	0.5854	0.5689	0.5658	0.5514	0.5514	0.5487	0.5569	0.5658	0.5720	0.5786 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.0900	1.0000	2.0900		(26)					
TER Opening Type (Uw = 1.40)			9.0800	1.3258	12.0379		(27)					
Flr - Ground			40.9100	0.1300	5.3183		(28a)					
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.1800	5.9396		(29a)					
Rf - Ins Joist	40.9120		40.9120	0.1300	5.3186		(30)					
Total net area of external elements Aum(A, m2)			125.9900				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		30.7044		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3231 (36)					
Total fabric heat loss						(33) + (36) =	39.0275 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	39.9171	39.6751	39.4378	38.3233	38.1148	37.1441	37.1441	36.9644	37.5180	38.1148	38.5366	38.9776 (38)
Heat transfer coeff	78.9446	78.7026	78.4653	77.3508	77.1423	76.1716	76.1716	75.9919	76.5455	77.1423	77.5641	78.0051 (39)
Average = Sum(39)m / 12 =												77.3498 (39)
HLP	0.9649	0.9619	0.9590	0.9454	0.9428	0.9310	0.9310	0.9288	0.9355	0.9428	0.9480	0.9534 (40)
HLP (average)												0.9454 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)										Total = Sum(45)m =	1470.9864 (45)	
Distribution loss	(46)m = 0.15 x (45)m											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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)
	32.4083	28.3445	29.2490	25.5000	24.4679	21.1139	19.5651	22.4513	22.7194	26.4773	28.9020	31.3857 (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	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4705	19.9581	16.2310	12.2879	9.1854	7.7547	8.3792	10.8916	14.6187	18.5617	21.6643	23.0950	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.2022	225.5183	219.6817	207.2563	191.5714	176.8299	166.9816	164.6655	170.5021	182.9275	198.6124	213.3539	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	(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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	(71)
Water heating gains (Table 5)	43.5596	42.1794	39.3132	35.4167	32.8869	29.3249	26.2972	30.1765	31.5548	35.5878	40.1417	42.1851	(72)
Total internal gains	349.6796	348.1031	335.6732	315.4082	294.0910	274.3567	262.1053	266.1808	277.1228	297.5243	320.8657	339.0814	(73)

6. Solar gains

[Jan]												Gains
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	W
Northeast				6.3550	11.2829		0.6300		0.7000		0.7700	21.9134
Southwest				2.7240	36.7938		0.6300		0.7000		0.7700	30.6305 (75)
Solar gains	52.5439	96.7804	151.7528	220.4353	276.4847	287.4961	271.7624	227.9579	175.2239	112.1758	64.2610	44.1089 (83)
Total gains	402.2235	444.8835	487.4261	535.8435	570.5757	561.8528	533.8677	494.1387	452.3467	409.7001	385.1267	383.1903 (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	71.9738	72.1952	72.4135	73.4568	73.6554	74.5940	74.5940	74.7704	74.2296	73.6554	73.2548	72.8407	
alpha	5.7983	5.8130	5.8276	5.8971	5.9104	5.9729	5.9729	5.9847	5.9486	5.9104	5.8837	5.8560	
util living area	0.9993	0.9985	0.9959	0.9837	0.9335	0.7894	0.6127	0.6788	0.9134	0.9907	0.9985	0.9995	(86)
MIT	19.9114	20.0220	20.2243	20.5126	20.7795	20.9474	20.9904	20.9831	20.8626	20.5272	20.1735	19.8958	(87)
Th 2	20.1127	20.1152	20.1176	20.1291	20.1312	20.1413	20.1413	20.1431	20.1374	20.1312	20.1269	20.1224	(88)
util rest of house	0.9990	0.9980	0.9944	0.9770	0.9049	0.7121	0.5010	0.5665	0.8651	0.9858	0.9979	0.9993	(89)
MIT 2	19.1072	19.2197	19.4233	19.7177	19.9713	20.1149	20.1385	20.1377	20.0528	19.7360	19.3808	19.0996	(90)
Living area fraction	19.2421	19.3543	19.5577	19.8511	20.1069	20.2546	20.2815	20.2796	20.1887	19.8687	19.5138	19.2332	(92)
MIT	19.2421	19.3543	19.5577	19.8511	20.1069	20.2546	20.2815	20.2796	20.1887	19.8687	19.5138	19.2332	(93)
Temperature adjustment												0.0000	
adjusted MIT	19.2421	19.3543	19.5577	19.8511	20.1069	20.2546	20.2815	20.2796	20.1887	19.8687	19.5138	19.2332	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	401.7055	443.7265	484.0376	522.0328	515.7898	406.3509	277.5465	289.2583	392.8871	403.0496	384.0721	382.8212	(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	1179.6008	1137.5892	1024.5793	847.0740	648.5310	430.7227	280.4241	294.8153	466.0630	715.0106	962.8648	1172.6693	(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	578.7542	466.2757	402.1630	234.0297	98.7595	0.0000	0.0000	0.0000	0.0000	232.0990	416.7308	587.6470	(98)
Space heating												3016.4588	(98)
Space heating per m2												36.8670	(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	716.0131	563.6699	577.5381	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8762	0.9374	0.9130	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	627.3936	528.3575	527.3203	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	751.0762	716.5210	672.0242	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	89.0515	139.9937	107.6597	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												336.7049	(104)
Cooled fraction												1.0000	(105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	22.2629	34.9984	26.9149	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											84.1762 (107)
Space cooling per m2											1.0288 (108)
Energy for space heating											36.8670 (99)
Energy for space cooling											1.0288 (108)
Total											37.8958 (109)
Target Fabric Energy Efficiency (TFEE)											43.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	013 - PRJ013014	Issued on Date	08/02/2024
Assessment Reference	013	Prop Type Ref	2B
Property	17 Deeble way, Netley Abbey, Southampton, SO31 5JP		

SAP Rating	86 B	DER	13.84	TER	17.00
Environmental	89 B	% DER<TER	18.58		
CO ₂ Emissions (t/year)	0.95	DFEE	39.07	TFEE	43.58
General Requirements Compliance	Pass	% DFEE<TFEE	10.34		

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (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								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) =	0.1470 (8)			
Pressure test								Yes				
Measured/design AP50								4.6900				
Infiltration rate								0.3815	(18)			
Number of sides sheltered								2	(19)			
Shelter factor								(20) = 1 - [0.075 x (19)] =	0.8500 (20)			
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =	0.3242 (21)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000 (22)
Wind factor	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000 (22a)
Adj infiltr rate	0.3972	0.3729	0.3648	0.3405	0.3405	0.3323	0.3323	0.3242	0.3242	0.3486	0.3486	0.3567 (22b)
Effective ac	0.5789	0.5695	0.5665	0.5580	0.5580	0.5552	0.5552	0.5526	0.5526	0.5607	0.5607	0.5636 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Fir - Ground			40.9100	0.1600	6.5456	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2100	6.9296	7.4000	244.1852 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2940		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	5452.2404 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4340 (36)
Total fabric heat loss						(33) + (36) =	45.7280 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	38.9972	38.3664	38.1650	37.5874	37.5874	37.4037	37.4037	37.2244	37.2244	37.7755	37.7755	37.9680	(38)
Heat transfer coeff	84.7252	84.0944	83.8930	83.3154	83.3154	83.1317	83.1317	82.9524	82.9524	83.5035	83.5035	83.6961	(39)
Average = Sum(39)m / 12 =												83.5179	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0355	1.0278	1.0253	1.0183	1.0183	1.0160	1.0160	1.0138	1.0138	1.0206	1.0206	1.0229	(40)
Days in month												1.0208	(40)
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

Assumed occupancy												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy content	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)											Total = Sum (45)m =	1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month												
	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)
Output from w/h												
	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (64)
	Total per year (kWh/year) = Sum (64)m =											1477.1660 (64)
RHI water heating demand												1477 (64)
Heat gains from water heating, kWh/month												
	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	68.3832	66.2196	61.7121	55.5885	51.6114	46.0154	41.2646	47.3577	49.5270	55.8641	63.0206	66.2254 (72)
Total internal gains	562.7568	557.8078	535.3285	500.8623	465.7663	434.6133	416.7152	425.5938	445.7348	480.4144	518.6899	547.4518 (73)

[Jan				Area	Solar flux	g		FF		Access		Gains
				m2	Table 6a	Table 6b		Table 6c		factor		W
					W/m2	or Table 6b		or Table 6c		Table 6d		
Northeast				6.3550	14.6130	0.7300		0.7200		0.7700		33.8255
Southwest				2.7240	45.0642	0.7300		0.7200		0.7700		44.7123 (75)
Solar gains	78.5379	123.8216	199.1239	293.4539	347.8662	399.4431	364.9442	318.4939	243.0489	157.2851	95.8917	64.7126 (83)
Total gains	641.2946	681.6294	734.4523	794.3163	813.6325	834.0564	781.6594	744.0876	688.7837	637.6995	614.5816	612.1645 (84)

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	17.8756	18.0096	18.0529	18.1781	18.1781	18.2182	18.2182	18.2576	18.2576	18.1371	18.1371	18.0954
alpha	2.1917	2.2006	2.2035	2.2119	2.2119	2.2145	2.2145	2.2172	2.2172	2.2091	2.2091	2.2064
util living area												
	0.8792	0.8607	0.8157	0.7334	0.6132	0.4453	0.3277	0.3325	0.5402	0.7319	0.8381	0.8858 (86)
MIT	18.8945	19.0780	19.5080	20.0566	20.5385	20.8476	20.9474	20.9477	20.7557	20.2483	19.5424	18.8897 (87)
Th 2	20.0538	20.0602	20.0623	20.0681	20.0681	20.0700	20.0700	20.0718	20.0718	20.0662	20.0662	20.0643 (88)
util rest of house												
	0.8664	0.8462	0.7961	0.7038	0.5671	0.3787	0.2430	0.2442	0.4734	0.6942	0.8183	0.8735 (89)
MIT 2	17.2785	17.5416	18.1517	18.9180	19.5634	19.9393	20.0401	20.0430	19.8460	19.1950	18.2129	17.2777 (90)
Living area fraction												
									FLA = Living area / (4) =			0.1678 (91)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

MIT	17.5497	17.7994	18.3793	19.1091	19.7270	20.0917	20.1923	20.1948	19.9986	19.3717	18.4360	17.5482 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.3997	17.6494	18.2293	18.9591	19.5770	19.9417	20.0423	20.0448	19.8486	19.2217	18.2860	17.3982 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8190	0.7982	0.7486	0.6630	0.5403	0.3689	0.2404	0.2415	0.4558	0.6539	0.7703	0.8270 (94)	
Useful gains	525.2055	544.1075	549.8129	526.6564	439.6035	307.6793	187.9102	179.6658	313.9396	417.0189	473.4298	506.2486 (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													
	991.2560	971.2434	883.3340	738.0995	539.6359	335.9918	194.7226	186.2139	360.7279	577.9885	792.1159	970.7243 (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													
	346.7416	287.0353	248.1397	152.2390	74.4241	0.0000	0.0000	0.0000	0.0000	119.7614	229.4540	345.5699 (98)	
Space heating													1803.3651 (98)
RHI space heating demand													1803 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (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) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.6900
Infiltration rate					0.3815 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3242 (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	0.4134	0.4053	0.3972	0.3567	0.3486	0.3080	0.3080	0.2999	0.3242	0.3486	0.3648	0.3810 (22b)
Effective ac	0.5855	0.5821	0.5789	0.5636	0.5607	0.5474	0.5474	0.5450	0.5526	0.5607	0.5665	0.5726 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9100	0.1600	6.5456	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2100	6.9296	7.4000	244.1852 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2940		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.2404 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4340 (36)
Total fabric heat loss							(33) + (36) = 45.7280 (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	39.4398	39.2163	38.9972	37.9680	37.7755	36.8791	36.8791	36.7131	37.2244	37.7755	38.1650	38.5722 (38)
Heat transfer coeff	85.1678	84.9443	84.7252	83.6961	83.5035	82.6072	82.6072	82.4412	82.9524	83.5035	83.8930	84.3003 (39)
Average = Sum(39)m / 12 =												83.6951 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0409	1.0382	1.0355	1.0229	1.0206	1.0096	1.0096	1.0076	1.0138	1.0206	1.0253	1.0303 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (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:	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)
												1032.4919 (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	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	68.3832	66.2196	61.7121	55.5885	51.6114	46.0154	41.2646	47.3577	49.5270	55.8641	63.0206	66.2254 (72)
Total internal gains	562.7568	557.8078	535.3285	500.8623	465.7663	434.6133	416.7152	425.5938	445.7348	480.4144	518.6899	547.4518 (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			
Northeast				6.3550	11.2829	0.7300	0.7200	0.7700	26.1172 (75)			
Southwest				2.7240	36.7938	0.7300	0.7200	0.7700	36.5065 (79)			

Solar gains	62.6237	115.3465	180.8646	262.7229	329.5247	342.6484	323.8964	271.6886	208.8383	133.6953	76.5886	52.5706 (83)
Total gains	625.3805	673.1542	716.1931	763.5852	795.2909	777.2616	740.6116	697.2824	654.5731	614.1097	595.2785	600.0224 (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	17.7827	17.8295	17.8756	18.0954	18.1371	18.3339	18.3339	18.3708	18.2576	18.1371	18.0529	17.9657
alpha	2.1855	2.1886	2.1917	2.2064	2.2091	2.2223	2.2223	2.2247	2.2172	2.2091	2.2035	2.1977
util living area	0.8997	0.8798	0.8444	0.7785	0.6802	0.5503	0.4336	0.4694	0.6418	0.7970	0.8742	0.9067 (86)
MIT	18.5350	18.7741	19.2070	19.7907	20.3180	20.7063	20.8769	20.8489	20.5580	19.9032	19.1352	18.4870 (87)
Th 2	20.0494	20.0516	20.0538	20.0643	20.0662	20.0753	20.0753	20.0770	20.0718	20.0662	20.0623	20.0581 (88)
util rest of house	0.8896	0.8678	0.8282	0.7543	0.6428	0.4934	0.3573	0.3934	0.5892	0.7699	0.8597	0.8973 (89)
MIT 2	16.7595	17.1021	17.7210	18.5488	19.2729	19.7826	19.9798	19.9543	19.6059	18.7218	17.6312	16.6947 (90)
Living area fraction	17.0575	17.3826	17.9704	18.7572	19.4483	19.9376	20.1303	20.1044	19.7657	18.9200	17.8836	16.9954 (91)
MIT	16.9075	17.2326	17.8204	18.6072	19.2983	19.7876	19.9803	19.9544	19.6157	18.7700	17.7336	16.8454 (93)
Temperature adjustment												-0.1500
adjusted MIT												16.8454 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8440	0.8204	0.7798	0.7092	0.6079	0.4741	0.3489	0.3825	0.5600	0.7238	0.8122	0.8530 (94)
Ext temp.	527.8102	552.2496	558.4557	541.5222	483.4325	368.5227	258.4302	266.7295	366.5285	444.4662	483.4611	511.8087 (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	1073.7507	1047.5878	959.1230	812.4575	634.4821	428.5326	279.2369	293.0271	457.5397	682.2272	892.0843	1066.0147 (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	406.1797	332.8673	298.0965	195.0734	112.3809	0.0000	0.0000	0.0000	0.0000	176.8942	294.2087	412.3292 (98)
Space heating per m2												2228.0299 (98)
												(98) / (4) = 27.2309 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2470.0997 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	406.1797	332.8673	298.0965	195.0734	112.3809	0.0000	0.0000	0.0000	0.0000	176.8942	294.2087	412.3292 (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)	450.3101	369.0325	330.4840	216.2676	124.5908	0.0000	0.0000	0.0000	0.0000	196.1133	326.1737	457.1277 (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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Efficiency of water heater (217)m	87.0039	86.8484	86.4621	85.5517	83.8288	76.4000	76.4000	76.4000	76.4000	85.0718	86.4111	76.4000 (216)
Fuel for water heating, kWh/month	119.1838	104.1372	108.4807	98.0958	97.3833	93.8672	89.9191	101.2456	101.8344	104.1541	109.1442	115.3854 (219)
Water heating fuel used												1242.8308 (219)
Annual totals kWh/year												
Space heating fuel - main system												2470.0997 (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)												394.3960 (232)
Total delivered energy for all uses												4182.3265 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2470.0997	3.4800	85.9595 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1242.8308	3.4800	43.2505 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	394.3960	13.1900	52.0208 (250)
Additional standing charges			120.0000 (251)
Total energy cost			311.1233 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0304 (257)
SAP value		85.6263
SAP rating (Section 12)		86 (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	2470.0997	0.2160	533.5415 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1242.8308	0.2160	268.4515 (264)
Space and water heating			801.9930 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total kg/year			1045.6095 (272)
CO2 emissions per m2			12.7800 (273)
EI value			88.9519
EI rating			89 (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	$3.48 / 0.8282 = 4.202$, stars = 5
Water heating environmental impact	$0.216 / 0.8282 = 0.2608$, 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	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (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) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.6900
Infiltration rate					0.3815 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.3242 (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	0.3972	0.3729	0.3648	0.3405	0.3405	0.3323	0.3323	0.3242	0.3242	0.3486	0.3486	0.3567 (22b)
Effective ac	0.5789	0.5695	0.5665	0.5580	0.5580	0.5552	0.5552	0.5526	0.5526	0.5607	0.5607	0.5636 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9100	0.1600	6.5456	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2100	6.9296	7.4000	244.1852 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2940		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	5452.2404 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4340 (36)
Total fabric heat loss						(33) + (36) =	45.7280 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	38.9972	38.3664	38.1650	37.5874	37.5874	37.4037	37.4037	37.2244	37.2244	37.7755	37.7755	37.9680 (38)
Heat transfer coeff	84.7252	84.0944	83.8930	83.3154	83.3154	83.1317	83.1317	82.9524	82.9524	83.5035	83.5035	83.6961 (39)
Average = Sum(39)m / 12 =												83.5179 (39)
HLP	1.0355	1.0278	1.0253	1.0183	1.0183	1.0160	1.0160	1.0138	1.0138	1.0206	1.0206	1.0229 (40)
HLP (average)												1.0208 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy content (annual)	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Distribution loss (46)m = 0.15 x (45)m												1470.9864 (45)

	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
												1032.4919 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	68.3832	66.2196	61.7121	55.5885	51.6114	46.0154	41.2646	47.3577	49.5270	55.8641	63.0206	66.2254 (72)
Total internal gains	562.7568	557.8078	535.3285	500.8623	465.7663	434.6133	416.7152	425.5938	445.7348	480.4144	518.6899	547.4518 (73)

[Jan				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	Specific data		Specific data	factor		W	
					W/m2	or Table 6b		or Table 6c	Table 6d			
Northeast				6.3550	14.6130	0.7300		0.7200	0.7700		33.8255 (75)	
Southwest				2.7240	45.0642	0.7300		0.7200	0.7700		44.7123 (79)	
Solar gains	78.5379	123.8216	199.1239	293.4539	347.8662	399.4431	364.9442	318.4939	243.0489	157.2851	95.8917	64.7126 (83)
Total gains	641.2946	681.6294	734.4523	794.3163	813.6325	834.0564	781.6594	744.0876	688.7837	637.6995	614.5816	612.1645 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	17.8756	18.0096	18.0529	18.1781	18.1781	18.2182	18.2182	18.2576	18.2576	18.1371	18.1371	18.0954
alpha	2.1917	2.2006	2.2035	2.2119	2.2119	2.2145	2.2145	2.2172	2.2172	2.2091	2.2091	2.2064
util living area	0.8792	0.8607	0.8157	0.7334	0.6132	0.4453	0.3277	0.3325	0.5402	0.7319	0.8381	0.8858 (86)
MIT	18.8945	19.0780	19.5080	20.0566	20.5385	20.8476	20.9474	20.9477	20.7557	20.2483	19.5424	18.8897 (87)
Th 2	20.0538	20.0602	20.0623	20.0681	20.0681	20.0700	20.0700	20.0718	20.0718	20.0662	20.0662	20.0643 (88)
util rest of house	0.8664	0.8462	0.7961	0.7038	0.5671	0.3787	0.2430	0.2442	0.4734	0.6942	0.8183	0.8735 (89)
MIT 2	17.2785	17.5416	18.1517	18.9180	19.5634	19.9393	20.0401	20.0430	19.8460	19.1950	18.2129	17.2777 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
MIT	17.5497	17.7994	18.3793	19.1091	19.7270	20.0917	20.1923	20.1948	19.9986	19.3717	18.4360	17.5482 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.3997	17.6494	18.2293	18.9591	19.5770	19.9417	20.0423	20.0448	19.8486	19.2217	18.2860	17.3982 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8190	0.7982	0.7486	0.6630	0.5403	0.3689	0.2404	0.2415	0.4558	0.6539	0.7703	0.8270 (94)
Useful gains	525.2055	544.1075	549.8129	526.6564	439.6035	307.6793	187.9102	179.6658	313.9396	417.0189	473.4298	506.2486 (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	991.2560	971.2434	883.3340	738.0995	539.6359	335.9918	194.7226	186.2139	360.7279	577.9885	792.1159	970.7243 (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	346.7416	287.0353	248.1397	152.2390	74.4241	0.0000	0.0000	0.0000	0.0000	119.7614	229.4540	345.5699 (98)
Space heating												1803.3651 (99)
Space heating per m2												22.0406 (99)
										(98) / (4) =		

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1999.2961 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	346.7416	287.0353	248.1397	152.2390	74.4241	0.0000	0.0000	0.0000	0.0000	119.7614	229.4540	345.5699 (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)	384.4142	318.2210	275.0994	168.7794	82.5101	0.0000	0.0000	0.0000	0.0000	132.7732	254.3836	383.1152 (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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Efficiency of water heater (217)m	86.5990	86.4583	85.9418	84.7594	82.4130	76.4000	76.4000	76.4000	76.4000	83.7659	85.6912	76.4000 (216)
Fuel for water heating, kWh/month	119.7411	104.6070	109.1375	99.0127	99.0563	93.8672	89.9191	101.2456	101.8344	105.7777	110.0612	115.9758 (219)
Water heating fuel used												1250.2356 (219)
Annual totals kWh/year												
Space heating fuel - main system												1999.2961 (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)												394.3960 (232)
Total delivered energy for all uses												3718.9278 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1999.2961	7.6100	152.1464 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1250.2356	7.6100	95.1429 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	394.3960	31.0800	122.5783 (250)
Additional standing charges			105.0000 (251)
Total energy cost			498.1776 (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	1999.2961	0.2160	431.8480 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1250.2356	0.2160	270.0509 (264)
Space and water heating			701.8989 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total kg/year			945.5154 (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	1999.2961	1.2200	2439.1413 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1250.2356	1.2200	1525.2875 (264)
Space and water heating			3964.4287 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	394.3960	3.0700	1210.7958 (268)
Primary energy kWh/year			5405.4745 (272)
Primary energy kWh/m2/year			66.0654 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 86
Current environmental impact rating: B 89

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 10.5	-£ 605	-1010 kg (106.8%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.9	-£ 44	-144 kg (15.2%)
-----------------------	-------	-------	-----------------

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£605 12.35 kg/m²	A 96	A 98
Total Savings	£605 12.35 kg/m²		
Potential energy efficiency rating:		A 96	
Potential environmental impact rating:			A 98

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

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

	Current	Potential	Saving
Electricity	£146	£146	£0
Mains gas	£352	£352	£0
Space heating	£280	£280	£0
Water heating	£95	£95	£0
Lighting	£123	£123	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£498	-£107	£605
Total cost of uses	£498	-£107	£605
Delivered energy	45 kWh/m²	22 kWh/m²	24 kWh/m²
Carbon dioxide emissions	0.9 tonnes	-0.1 tonnes	1.0 tonnes
CO2 emissions per m²	12 kg/m²	-1 kg/m²	12 kg/m²
Primary energy	66 kWh/m²	-7 kWh/m²	73 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	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (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) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.6900
Infiltration rate					0.3815 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3242 (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	0.4134	0.4053	0.3972	0.3567	0.3486	0.3080	0.3080	0.2999	0.3242	0.3486	0.3648	0.3810 (22b)
Effective ac	0.5855	0.5821	0.5789	0.5636	0.5607	0.5474	0.5474	0.5450	0.5526	0.5607	0.5665	0.5726 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9100	0.1600	6.5456	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2100	6.9296	7.4000	244.1852 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2940		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5452.2404 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4340 (36)
Total fabric heat loss							(33) + (36) = 45.7280 (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	39.4398	39.2163	38.9972	37.9680	37.7755	36.8791	36.8791	36.7131	37.2244	37.7755	38.1650	38.5722 (38)
Heat transfer coeff	85.1678	84.9443	84.7252	83.6961	83.5035	82.6072	82.6072	82.4412	82.9524	83.5035	83.8930	84.3003 (39)
Average = Sum(39)m / 12 =												83.6951 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0409	1.0382	1.0355	1.0229	1.0206	1.0096	1.0096	1.0076	1.0138	1.0206	1.0253	1.0303 (40)
HLP (average)												1.0229 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Water storage loss:	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)
Total per year (kWh/year) = Sum(64)m = 1032.4919 (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	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (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)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	68.3832	66.2196	61.7121	55.5885	51.6114	46.0154	41.2646	47.3577	49.5270	55.8641	63.0206	66.2254 (72)
Total internal gains	562.7568	557.8078	535.3285	500.8623	465.7663	434.6133	416.7152	425.5938	445.7348	480.4144	518.6899	547.4518 (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			
Northeast				6.3550	11.2829	0.7300	0.7200	0.7700	26.1172 (75)			
Southwest				2.7240	36.7938	0.7300	0.7200	0.7700	36.5065 (79)			
Solar gains	62.6237	115.3465	180.8646	262.7229	329.5247	342.6484	323.8964	208.8383	133.6953	76.5886	52.5706 (83)	
Total gains	625.3805	673.1542	716.1931	763.5852	795.2909	777.2616	740.6116	697.2824	654.5731	614.1097	595.2785	600.0224 (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	17.7827	17.8295	17.8756	18.0954	18.1371	18.3339	18.3339	18.3708	18.2576	18.1371	18.0529	17.9657
alpha	2.1855	2.1886	2.1917	2.2064	2.2091	2.2223	2.2223	2.2247	2.2172	2.2091	2.2035	2.1977
util living area	0.8997	0.8798	0.8444	0.7785	0.6802	0.5503	0.4336	0.4694	0.6418	0.7970	0.8742	0.9067 (86)
MIT	18.5350	18.7741	19.2070	19.7907	20.3180	20.7063	20.8769	20.8489	20.5580	19.9032	19.1352	18.4870 (87)
Th 2	20.0494	20.0516	20.0538	20.0643	20.0662	20.0753	20.0753	20.0770	20.0718	20.0662	20.0623	20.0581 (88)
util rest of house	0.8896	0.8678	0.8282	0.7543	0.6428	0.4934	0.3573	0.3934	0.5892	0.7699	0.8597	0.8973 (89)
MIT 2	16.7595	17.1021	17.7210	18.5488	19.2729	19.7826	19.9798	19.9543	19.6059	18.7218	17.6312	16.6947 (90)
Living area fraction	17.0575	17.3826	17.9704	18.7572	19.4483	19.9376	20.1303	20.1044	19.7657	18.9200	17.8836	16.9954 (91)
MIT	16.9075	17.2326	17.8204	18.6072	19.2983	19.7876	19.9803	19.9544	19.6157	18.7700	17.7336	16.8454 (93)
Temperature adjustment												-0.1500
adjusted MIT												16.8454 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	527.8102	552.2496	558.4557	541.5222	483.4325	368.5227	258.4302	266.7295	366.5285	444.4662	483.4611	511.8087 (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	1073.7507	1047.5878	959.1230	812.4575	634.4821	428.5326	279.2369	293.0271	457.5397	682.2272	892.0843	1066.0147 (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	406.1797	332.8673	298.0965	195.0734	112.3809	0.0000	0.0000	0.0000	0.0000	176.8942	294.2087	412.3292 (98)
Space heating												2228.0299 (98)
Space heating per m2												(98) / (4) = 27.2309 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2470.0997 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	406.1797	332.8673	298.0965	195.0734	112.3809	0.0000	0.0000	0.0000	0.0000	176.8942	294.2087	412.3292 (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)	450.3101	369.0325	330.4840	216.2676	124.5908	0.0000	0.0000	0.0000	0.0000	196.1133	326.1737	457.1277 (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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Efficiency of water heater (217)m	87.0039	86.8484	86.4621	85.5517	83.8288	76.4000	76.4000	76.4000	76.4000	85.0718	86.4111	76.4000 (216)
Fuel for water heating, kWh/month	119.1838	104.1372	108.4807	98.0958	97.3833	93.8672	89.9191	101.2456	101.8344	104.1541	109.1442	115.3854 (219)
Water heating fuel used												1242.8308 (219)
Annual totals kWh/year												
Space heating fuel - main system												2470.0997 (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)												394.3960 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 2.50 * 1080 * 0.80) =												-1727.2394 (233)
Total delivered energy for all uses												2455.0871 (238)

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	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (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) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.6900
Infiltration rate					0.3815 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.3242 (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	0.3972	0.3729	0.3648	0.3405	0.3405	0.3323	0.3323	0.3242	0.3242	0.3486	0.3486	0.3567 (22b)
Effective ac	0.5789	0.5695	0.5665	0.5580	0.5580	0.5552	0.5552	0.5526	0.5526	0.5607	0.5607	0.5636 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Solid Door			2.0900	1.2000	2.5080		(26)
Windows (Uw = 1.40)			9.0800	1.3258	12.0379		(27)
Flr - Ground			40.9100	0.1600	6.5456	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	44.1670	11.1690	32.9980	0.2100	6.9296	7.4000	244.1852 (29a)
Rf - Ins Joist	40.9120		40.9120	0.0800	3.2730	7.4000	302.7488 (30)
Total net area of external elements Aum(A, m ²)			125.9900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2940		(33)
Party Wall			92.4080	0.0000	0.0000	7.4000	683.8192 (32)
Stud			70.7018			7.4000	523.1936 (32c)
Internal Floor			40.9120			7.4000	302.7488 (32d)
Internal Ceiling			40.9120			7.4000	302.7488 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	5452.2404 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4340 (36)
Total fabric heat loss						(33) + (36) =	45.7280 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	38.9972	38.3664	38.1650	37.5874	37.5874	37.4037	37.4037	37.2244	37.2244	37.7755	37.7755	37.9680 (38)
Heat transfer coeff	84.7252	84.0944	83.8930	83.3154	83.3154	83.1317	83.1317	82.9524	82.9524	83.5035	83.5035	83.6961 (39)
Average = Sum(39)m / 12 =												83.5179 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.0355	1.0278	1.0253	1.0183	1.0183	1.0160	1.0160	1.0138	1.0138	1.0206	1.0206	1.0229 (40)
HLP (average)												1.0208 (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												2.4965 (42)
Average daily hot water use (litres/day)												93.4916 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy conte	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Energy content (annual)												Total = Sum(45)m = 1470.9864 (45)
Distribution loss (46)m = 0.15 x (45)m												

	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (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	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1999.2961 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	346.7416	287.0353	248.1397	152.2390	74.4241	0.0000	0.0000	0.0000	0.0000	119.7614	229.4540	345.5699	(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)	384.4142	318.2210	275.0994	168.7794	82.5101	0.0000	0.0000	0.0000	0.0000	132.7732	254.3836	383.1152	(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	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189	(64)
Efficiency of water heater (217)m	86.5990	86.4583	85.9418	84.7594	82.4130	76.4000	76.4000	76.4000	76.4000	83.7659	85.6912	76.4000	(216)
Fuel for water heating, kWh/month	119.7411	104.6070	109.1375	99.0127	99.0563	93.8672	89.9191	101.2456	101.8344	105.7777	110.0612	115.9758	(219)
Water heating fuel used												1250.2356	(219)
Annual totals kWh/year													
Space heating fuel - main system												1999.2961	(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)												394.3960	(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												1772.4818	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1999.2961	7.6100	152.1464 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1250.2356	7.6100	95.1429 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	394.3960	31.0800	122.5783 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	31.0800	-604.9554 (252)
Total energy cost			-106.7778 (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	1999.2961	0.2160	431.8480 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1250.2356	0.2160	270.0509 (264)
Space and water heating			701.8989 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			-64.6901 (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	1999.2961	1.2200	2439.1413 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1250.2356	1.2200	1525.2875 (264)
Space and water heating			3964.4287 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	394.3960	3.0700	1210.7958 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			-570.1145 (272)
Primary energy kWh/m2/year			-6.9679 (273)