

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	014 - PRJ013014			Issued on Date	08/02/2024
Assessment Reference	014	Prop Type Ref	2B		
Property	15 Deeble way, Netley Abbey, Southampton, SO31 5JP				
SAP Rating	85 B	DER	15.21	TER	18.52
Environmental	88 B	% DER<TER	17.89		
CO ₂ Emissions (t/year)	1.04	DFEE	46.00	TFEE	51.59
General Requirements Compliance	Pass	% DFEE<TFEE	10.84		
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

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

End-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) 18.52 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.21 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.0 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 4.89 (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: 4.67 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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.8900
Infiltration rate					0.3915 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3621 (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	0.4617	0.4526	0.4436	0.3983	0.3893	0.3440	0.3440	0.3349	0.3621	0.3893	0.4074	0.4255 (22b)
Effective ac	0.6066	0.6024	0.5984	0.5793	0.5758	0.5592	0.5592	0.5561	0.5656	0.5758	0.5830	0.5905 (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	0.1800	7.3638	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (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)			172.1940				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8151		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (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)							15.3835 (36)
Total fabric heat loss							(33) + (36) = 57.1986 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.8626	40.5838	40.3106	39.0271	38.7869	37.6690	37.6690	37.4620	38.0996	38.7869	39.2727	39.7806 (38)
Heat transfer coeff	98.0612	97.7824	97.5091	96.2256	95.9855	94.8676	94.8676	94.6606	95.2982	95.9855	96.4713	96.9792 (39)
Average = Sum(39)m / 12 =												96.2245 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1985	1.1951	1.1918	1.1761	1.1731	1.1595	1.1595	1.1569	1.1647	1.1731	1.1791	1.1853 (40)
HLP (average)												1.1761 (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	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, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.4446	15.4886	15.5320	15.7392	15.7785	15.9645	15.9645	15.9994	15.8923	15.7785	15.6991	15.6169
alpha	2.0296	2.0326	2.0355	2.0493	2.0519	2.0643	2.0643	2.0666	2.0595	2.0519	2.0466	2.0411
util living area	0.9483	0.9338	0.9074	0.8560	0.7735	0.6576	0.5442	0.5876	0.7558	0.8809	0.9334	0.9529 (86)
MIT	17.7354	18.0092	18.5258	19.2451	19.9356	20.4871	20.7585	20.7070	20.2549	19.3826	18.4482	17.6897 (87)
Th 2	19.9212	19.9239	19.9266	19.9392	19.9416	19.9526	19.9526	19.9546	19.9483	19.9416	19.9368	19.9318 (88)
util rest of house	0.9420	0.9257	0.8955	0.8359	0.7379	0.5951	0.4495	0.4962	0.7045	0.8602	0.9240	0.9472 (89)
MIT 2	15.5823	15.9755	16.7165	17.7422	18.7037	19.4425	19.7682	19.7185	19.1580	17.9533	16.6155	15.5189 (90)
Living area fraction												0.1678 (91)
MIT	15.9436	16.3168	17.0201	17.9944	18.9104	19.6178	19.9344	19.8844	19.3421	18.1931	16.9230	15.8831 (92)
Temperature adjustment												-0.1500
adjusted MIT	15.7936	16.1668	16.8701	17.8444	18.7604	19.4678	19.7844	19.7344	19.1921	18.0431	16.7730	15.7331 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9041	0.8829	0.8466	0.7827	0.6887	0.5614	0.4323	0.4740	0.6584	0.8079	0.8810	0.9114 (94)
Useful gains	397.7946	432.9284	458.6928	470.5849	444.3831	357.4048	261.0462	264.4893	333.7037	367.1000	372.8262	381.4578 (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												
	1127.0787	1101.6935	1011.1821	860.6790	677.6972	461.7996	302.0927	315.6341	485.2636	714.4321	933.1686	1118.4749 (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												
	542.5873	449.4102	411.0520	280.8678	173.5857	0.0000	0.0000	0.0000	0.0000	258.4151	403.4466	548.3408 (98)
Space heating												3067.7055 (98)
Space heating per m2												37.4933 (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 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													3401.0039 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	542.5873	449.4102	411.0520	280.8678	173.5857	0.0000	0.0000	0.0000	0.0000	258.4151	403.4466	548.3408	(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)	601.5380	498.2374	455.7118	311.3833	192.4454	0.0000	0.0000	0.0000	0.0000	286.4913	447.2800	607.9166	(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	87.6595	87.5507	87.2713	86.6013	85.2733	76.4000	76.4000	76.4000	76.4000	86.2234	87.2151	76.4000	(216)
Fuel for water heating, kWh/month	118.2925	103.3019	107.4749	96.9069	95.7338	93.8672	89.9191	101.2456	101.8344	102.7630	108.1381	114.5583	(219)
Water heating fuel used												1234.0356	(219)
Annual totals kWh/year													
Space heating fuel - main system												3401.0039	(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												5104.4355	(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	3401.0039	0.2160	734.6168 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1234.0356	0.2160	266.5517 (264)
Space and water heating			1001.1685 (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			1244.7851 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2100 (273)

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

DER		15.2100	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		33.5621	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		33.5621	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3672 (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	0.4682	0.4590	0.4498	0.4039	0.3947	0.3488	0.3488	0.3396	0.3672	0.3947	0.4131	0.4314 (22b)
Effective ac	0.6096	0.6053	0.6012	0.5816	0.5779	0.5608	0.5608	0.5577	0.5674	0.5779	0.5853	0.5931 (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
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)	90.3710	11.1690	79.2020	0.1800	14.2564		(29a)
Rf - Ins Joist	40.9120		40.9120	0.1300	5.3186		(30)
Total net area of external elements Aum(A, m ²)			172.1940				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.0211		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8094 (36)
Total fabric heat loss						(33) + (36) =	47.8305 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	41.0658	40.7791	40.4981	39.1783	38.9313	37.7818	37.7818	37.5689	38.2246	38.9313	39.4309	39.9532 (38)
Heat transfer coeff	88.8963	88.6096	88.3286	87.0088	86.7618	85.6123	85.6123	85.3994	86.0551	86.7618	87.2614	87.7837 (39)
Average = Sum(39)m / 12 =												87.0076 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0865	1.0830	1.0795	1.0634	1.0604	1.0463	1.0463	1.0437	1.0518	1.0604	1.0665	1.0729 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	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	g Specific data or Table 6b	FF Specific data or Table 6c			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	63.9166	64.1233	64.3273	65.3031	65.4890	66.3683	66.3683	66.5337	66.0268	65.4890	65.1141	64.7267	
alpha	5.2611	5.2749	5.2885	5.3535	5.3659	5.4246	5.4246	5.4356	5.4018	5.3659	5.3409	5.3151	
util living area	0.9987	0.9977	0.9945	0.9819	0.9356	0.8069	0.6390	0.6979	0.9132	0.9880	0.9975	0.9990	(86)
MIT	19.7944	19.9088	20.1225	20.4301	20.7214	20.9214	20.9825	20.9725	20.8278	20.4649	20.0836	19.7799	(87)
Th 2	20.0119	20.0148	20.0176	20.0308	20.0333	20.0449	20.0449	20.0470	20.0404	20.0333	20.0283	20.0230	(88)
util rest of house	0.9983	0.9969	0.9924	0.9742	0.9064	0.7257	0.5136	0.5745	0.8620	0.9816	0.9965	0.9987	(89)
MIT 2	18.3952	18.5644	18.8782	19.3326	19.7383	19.9870	20.0377	20.0343	19.8867	19.3880	18.8301	18.3820	(90)
Living area fraction	18.6300	18.7900	19.0870	19.5168	19.9032	20.1438	20.1963	20.1917	20.0446	19.5687	19.0404	18.6166	(92)
Temperature adjustment	18.6300	18.7900	19.0870	19.5168	19.9032	20.1438	20.1963	20.1917	20.0446	19.5687	19.0404	18.6166	(93)
adjusted MIT	18.6300	18.7900	19.0870	19.5168	19.9032	20.1438	20.1963	20.1917	20.0446	19.5687	19.0404	18.6166	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	445.7700	486.4097	523.4482	556.5630	547.4247	438.0110	302.6217	314.7259	421.5377	438.8676	425.5857	426.2547	(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	1273.8798	1230.7881	1111.7911	923.7526	711.7280	474.6192	307.8861	323.8127	511.5646	778.1384	1041.9390	1265.5376	(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	616.1137	500.2223	437.7271	264.3765	122.2417	0.0000	0.0000	0.0000	0.0000	252.4174	443.7744	624.4265	(98)
Space heating												3261.2997	(98)
Space heating per m2												39.8594	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													3491.7556 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	616.1137	500.2223	437.7271	264.3765	122.2417	0.0000	0.0000	0.0000	0.0000	252.4174	443.7744	624.4265	(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)	659.6507	535.5700	468.6586	283.0584	130.8798	0.0000	0.0000	0.0000	0.0000	270.2542	475.1332	668.5509	(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	87.6627	87.4996	87.1290	86.2294	84.3844	80.3000	80.3000	80.3000	80.3000	85.9983	87.1754	87.7365	(217)
Fuel for water heating, kWh/month	232.1042	204.5719	213.7492	191.5628	189.5216	175.4103	168.0564	187.3435	189.4125	201.3924	212.0798	226.4239	(219)
Water heating fuel used												2391.6286	(219)
Annual totals kWh/year													
Space heating fuel - main system												3491.7556	(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												6355.2197	(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	3491.7556	0.2160	754.2192 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2391.6286	0.2160	516.5918 (264)
Space and water heating			1270.8110 (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			1515.6936 (272)
Emissions per m2 for space and water heating			15.5318 (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) = (15.5318 * 1.00) + 2.5172 + 0.4757, rounded to 2 d.p.			18.5200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	014 - PRJ013014	Issued on Date	08/02/2024
Assessment Reference	014	Prop Type Ref	2B
Property	15 Deeble way, Netley Abbey, Southampton, SO31 5JP		

SAP Rating	85 B	DER	15.21	TER	18.52
Environmental	88 B	% DER<TER	17.89		
CO ₂ Emissions (t/year)	1.04	DFEE	46.00	TTEE	51.59
General Requirements Compliance	Pass	% DFEE<TTEE	10.84		

Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk	Assessor ID	U903-0001
------------------	---	-------------	-----------

Client	
--------	--

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		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													4.8900	
Infiltration rate													0.3915 (18)	
Number of sides sheltered													1 (19)	
Shelter factor													(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) =	0.3621 (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 infiltr rate	0.4617	0.4526	0.4436	0.3983	0.3893	0.3440	0.3440	0.3349	0.3621	0.3893	0.4074	0.4255	(22b)	
Effective ac	0.6066	0.6024	0.5984	0.5793	0.5758	0.5592	0.5592	0.5561	0.5656	0.5758	0.5830	0.5905	(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)
Floor - Ground			40.9100	0.1800	7.3638	75.6000	3092.7960 (28a)
W1 - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (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)			172.1940				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8151		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (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)							15.3835 (36)
Total fabric heat loss						(33) + (36) =	57.1986 (37)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

(38)m	Jan 40.8626	Feb 40.5838	Mar 40.3106	Apr 39.0271	May 38.7869	Jun 37.6690	Jul 37.6690	Aug 37.4620	Sep 38.0996	Oct 38.7869	Nov 39.2727	Dec 39.7806 (38)
Heat transfer coeff	98.0612	97.7824	97.5091	96.2256	95.9855	94.8676	94.8676	94.6606	95.2982	95.9855	96.4713	96.9792 (39)
Average = Sum(39)m / 12 =												96.2245 (39)
HLP	Jan 1.1985	Feb 1.1951	Mar 1.1918	Apr 1.1761	May 1.1731	Jun 1.1595	Jul 1.1595	Aug 1.1569	Sep 1.1647	Oct 1.1731	Nov 1.1791	Dec 1.1853 (40)
HLP (average)												1.1761 (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 15.4446	Feb 15.4886	Mar 15.5320	Apr 15.7392	May 15.7785	Jun 15.9645	Jul 15.9645	Aug 15.9994	Sep 15.8923	Oct 15.7785	Nov 15.6991	Dec 15.6169
tau	2.0296	2.0326	2.0355	2.0493	2.0519	2.0643	2.0643	2.0666	2.0595	2.0519	2.0466	2.0411
alpha	0.9538	0.9398	0.9143	0.8640	0.7830	0.6682	0.5550	0.6007	0.7681	0.8901	0.9402	0.9581 (86)
util living area	17.6709	17.9490	18.4735	19.2041	19.9062	20.4698	20.7490	20.6939	20.2281	19.3380	18.3903	17.6258 (87)
MIT	19.9212	19.9239	19.9266	19.9392	19.9416	19.9526	19.9526	19.9546	19.9483	19.9416	19.9368	19.9318 (88)
Th 2	0.9481	0.9324	0.9031	0.8447	0.7483	0.6062	0.4597	0.5091	0.7181	0.8706	0.9316	0.9530 (89)
util rest of house	16.8689	17.1456	17.6654	18.3888	19.0640	19.5887	19.8201	19.7839	19.3825	18.5316	17.5945	16.8309 (90)
MIT 2	17.0035	17.2804	17.8010	18.5256	19.2053	19.7365	19.9760	19.9366	19.5244	18.6669	17.7281	16.9643 (92)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
Temperature adjustment												0.0000
adjusted MIT	17.0035	17.2804	17.8010	18.5256	19.2053	19.7365	19.9760	19.9366	19.5244	18.6669	17.7281	16.9643 (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	0.9265	0.9073	0.8737	0.8124	0.7195	0.5917	0.4621	0.5074	0.6938	0.8399	0.9068	0.9327	(94)
Useful gains	381.8857	420.3907	451.2321	469.6087	448.6337	365.0303	270.7655	272.8566	337.0810	362.0916	360.2952	365.1768	(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	1245.7172	1210.5877	1101.9517	926.2340	720.4013	487.2901	320.2741	334.7790	516.9367	774.3047	1025.3037	1237.8743	(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	642.6906	531.0124	484.1354	328.7702	202.1951	0.0000	0.0000	0.0000	0.0000	306.6865	478.8062	649.2869	(98)
Space heating per m2												3623.5833	(98)
												(98) / (4) =	44.2873 (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	891.7553	702.0202	719.4203	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.6431	0.7073	0.6756	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	573.4726	496.5419	486.0159	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	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	0.0000	0.0000	0.0000	0.0000	0.0000	174.2027	208.9050	176.2943	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction												559.4020	(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	43.5507	52.2262	44.0736	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling per m2												139.8505	(107)
Energy for space heating												1.7092	(108)
Energy for space cooling												44.2873	(99)
Total												1.7092	(108)
Dwelling Fabric Energy Efficiency (DFEE)												45.9965	(109)
												46.0	(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	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							5.0000					
Infiltration rate							0.3970	(18)				
Number of sides sheltered							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.3672 (21)				
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4682	0.4590	0.4498	0.4039	0.3947	0.3488	0.3488	0.3396	0.3672	0.3947	0.4131	0.4314 (22b)
Effective ac	0.6096	0.6053	0.6012	0.5816	0.5779	0.5608	0.5608	0.5577	0.5674	0.5779	0.5853	0.5931 (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)	90.3710	11.1690	79.2020	0.1800	14.2564		(29a)					
Rf - Ins Joist	40.9120		40.9120	0.1300	5.3186		(30)					
Total net area of external elements Aum(A, m2)			172.1940				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		39.0211		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8094 (36)					
Total fabric heat loss						(33) + (36) =	47.8305 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.0658	Feb 40.7791	Mar 40.4981	Apr 39.1783	May 38.9313	Jun 37.7818	Jul 37.7818	Aug 37.5689	Sep 38.2246	Oct 38.9313	Nov 39.4309	Dec 39.9532 (38)
Heat transfer coeff	88.8963	88.6096	88.3286	87.0088	86.7618	85.6123	85.6123	85.3994	86.0551	86.7618	87.2614	87.7837 (39)
Average = Sum(39)m / 12 =												87.0076 (39)
HLP	Jan 1.0865	Feb 1.0830	Mar 1.0795	Apr 1.0634	May 1.0604	Jun 1.0463	Jul 1.0463	Aug 1.0437	Sep 1.0518	Oct 1.0604	Nov 1.0665	Dec 1.0729 (40)
HLP (average)												1.0634 (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	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]				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	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	63.9166	64.1233	64.3273	65.3031	65.4890	66.3683	66.3683	66.5337	66.0268	65.4890	65.1141	64.7267	
alpha	5.2611	5.2749	5.2885	5.3535	5.3659	5.4246	5.4246	5.4356	5.4018	5.3659	5.3409	5.3151	
util living area	0.9992	0.9985	0.9962	0.9866	0.9487	0.8336	0.6705	0.7343	0.9336	0.9921	0.9985	0.9994	(86)
MIT	19.7428	19.8584	20.0754	20.3887	20.6901	20.9069	20.9781	20.9649	20.7996	20.4214	20.0345	19.7289	(87)
Th 2	20.0119	20.0148	20.0176	20.0308	20.0333	20.0449	20.0449	20.0470	20.0404	20.0333	20.0283	20.0230	(88)
util rest of house	0.9990	0.9980	0.9948	0.9808	0.9240	0.7562	0.5423	0.6103	0.8905	0.9877	0.9979	0.9992	(89)
MIT 2	18.8565	18.9744	19.1931	19.5142	19.8048	19.9966	20.0386	20.0355	19.9137	19.5504	19.1613	18.8517	(90)
Living area fraction	19.0052	19.1227	19.3411	19.6610	19.9534	20.1494	20.1962	20.1914	20.0624	19.6966	19.3078	18.9989	(91)
MIT	19.0052	19.1227	19.3411	19.6610	19.9534	20.1494	20.1962	20.1914	20.0624	19.6966	19.3078	18.9989	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0052	19.1227	19.3411	19.6610	19.9534	20.1494	20.1962	20.1914	20.0624	19.6966	19.3078	18.9989	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9986	0.9973	0.9934	0.9778	0.9214	0.7659	0.5640	0.6310	0.8917	0.9855	0.9972	0.9989	(94)
Ext temp.	401.6586	443.6967	484.2173	523.9499	525.7508	430.3159	301.1033	311.7803	403.3759	403.7661	384.0515	382.7795	(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	1307.2408	1260.2706	1134.2390	936.3009	716.0785	475.0935	307.8818	323.7869	513.0940	789.2371	1065.2719	1299.1048	(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	673.7531	548.7377	483.6161	296.8927	141.6038	0.0000	0.0000	0.0000	0.0000	286.7904	490.4787	681.7460	(98)
Space heating per m2												3603.6186	(98)
												44.0432	(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	804.7558	633.5311	649.0357	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8138	0.8913	0.8589	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	654.9018	564.6756	557.4744	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	69.2456	112.9730	85.2251	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												267.4436	(104)
Cooled fraction												1.0000	(105)

fC = cooled area / (4) =

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	17.3114	28.2432	21.3063	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											66.8609 (107)
Space cooling per m2											0.8172 (108)
Energy for space heating											44.0432 (99)
Energy for space cooling											0.8172 (108)
Total											44.8604 (109)
Target Fabric Energy Efficiency (TFEE)											51.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	014 - PRJ013014	Issued on Date	08/02/2024
Assessment Reference	014	Prop Type Ref	2B
Property	15 Deeble way, Netley Abbey, Southampton, SO31 5JP		

SAP Rating	85 B	DER	15.21	TER	18.52
Environmental	88 B	% DER<TER	17.89		
CO ₂ Emissions (t/year)	1.04	DFEE	46.00	TTEE	51.59
General Requirements Compliance	Pass	% DFEE<TFEE	10.84		

Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk	Assessor ID	U903-0001
------------------	---	-------------	-----------

Client	
--------	--

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								4.8900				
Infiltration rate								0.3915 (18)				
Number of sides sheltered								1 (19)				
Shelter factor								(20) = 1 - [0.075 x (19)] =	0.9250 (20)			
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =	0.3621 (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	0.4436	0.4164	0.4074	0.3802	0.3802	0.3712	0.3712	0.3621	0.3621	0.3893	0.3893	0.3983 (22b)
Effective ac	0.5984	0.5867	0.5830	0.5723	0.5723	0.5689	0.5689	0.5656	0.5656	0.5758	0.5758	0.5793 (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)
Floor - Ground			40.9100	0.1800	7.3638	75.6000	3092.7960 (28a)
W1 - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (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)			172.1940				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8151		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (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)							15.3835 (36)
Total fabric heat loss						(33) + (36) =	57.1986 (37)

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

(38)m	Jan 40.3106	Feb 39.5239	Mar 39.2727	Apr 38.5523	May 38.5523	Jun 38.3232	Jul 38.3232	Aug 38.0996	Sep 38.0996	Oct 38.7869	Nov 38.7869	Dec 39.0271 (38)
Heat transfer coeff	97.5091	96.7225	96.4713	95.7509	95.7509	95.5218	95.5218	95.2982	95.2982	95.9855	95.9855	96.2256 (39)
Average = Sum(39)m / 12 =												96.0034 (39)
HLP	Jan 1.1918	Feb 1.1821	Mar 1.1791	Apr 1.1703	May 1.1703	Jun 1.1675	Jul 1.1675	Aug 1.1647	Sep 1.1647	Oct 1.1731	Nov 1.1731	Dec 1.1761 (40)
HLP (average)												1.1733 (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	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 (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)
RHI water heating demand									Total per year (kWh/year) = Sum(64)m =			1477.1660 (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)

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

Metabolic gains (Table 5), Watts	Jan 149.7892	Feb 149.7892	Mar 149.7892	Apr 149.7892	May 149.7892	Jun 149.7892	Jul 149.7892	Aug 149.7892	Sep 149.7892	Oct 149.7892	Nov 149.7892	Dec 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	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)	

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)												
tau	Jan 15.5320	Feb 15.6583	Mar 15.6991	Apr 15.8172	May 15.8172	Jun 15.8551	Jul 15.8551	Aug 15.8923	Sep 15.8923	Oct 15.7785	Nov 15.7785	Dec 15.7392
alpha	2.0355	2.0439	2.0466	2.0545	2.0545	2.0570	2.0570	2.0595	2.0595	2.0519	2.0519	2.0493
util living area	0.8892	0.8729	0.8330	0.7590	0.6478	0.4845	0.3636	0.3686	0.5780	0.7577	0.8529	0.8951 (86)
MIT	18.5274	18.7204	19.1891	19.8063	20.3789	20.7747	20.9160	20.9168	20.6579	20.0482	19.2505	18.5292 (87)
Th 2	19.9266	19.9343	19.9368	19.9439	19.9439	19.9461	19.9461	19.9483	19.9483	19.9416	19.9416	19.9392 (88)
util rest of house	0.8763	0.8582	0.8129	0.7282	0.5977	0.4069	0.2603	0.2609	0.5029	0.7181	0.8327	0.8827 (89)
MIT 2	16.7116	16.9868	17.6497	18.5104	19.2786	19.7604	19.9023	19.9064	19.6422	18.8583	17.7493	16.7196 (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	17.0163	17.2777	17.9080	18.7278	19.4632	19.9306	20.0724	20.0760	19.8127	19.0580	18.0012	17.0233 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8663	17.1277	17.7580	18.5778	19.3132	19.7806	19.9224	19.9260	19.6627	18.9080	17.8512	16.8733 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8250	0.8058	0.7596	0.6799	0.5634	0.3936	0.2578	0.2584	0.4798	0.6705	0.7795	0.8324 (94)	
Useful gains	529.0507	549.2250	557.9157	540.0469	458.4003	328.2915	201.5014	192.2932	330.4497	427.5922	479.0850	509.5799 (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													
Month fracti	1088.8137	1066.6231	970.3108	811.7594	594.9201	370.6850	212.2913	202.6025	396.6947	634.2737	868.7872	1065.5304 (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													
Space heating	416.4636	347.6915	306.8220	195.6331	101.5707	0.0000	0.0000	0.0000	0.0000	153.7710	280.5856	413.6272 (98)	
RHI space heating demand												2216.1647 (98)	
												2216 (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	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.8900
Infiltration rate					0.3915 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3621 (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	0.4617	0.4526	0.4436	0.3983	0.3893	0.3440	0.3440	0.3349	0.3621	0.3893	0.4074	0.4255 (22b)
Effective ac	0.6066	0.6024	0.5984	0.5793	0.5758	0.5592	0.5592	0.5561	0.5656	0.5758	0.5830	0.5905 (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	0.1800	7.3638	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (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)			172.1940				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8151		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (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/m²K 66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.3835 (36)
Total fabric heat loss (33) + (36) = 57.1986 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.8626	40.5838	40.3106	39.0271	38.7869	37.6690	37.6690	37.4620	38.0996	38.7869	39.2727	39.7806 (38)
Heat transfer coeff	98.0612	97.7824	97.5091	96.2256	95.9855	94.8676	94.8676	94.6606	95.2982	95.9855	96.4713	96.9792 (39)
Average = Sum(39)m / 12 =												96.2245 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1985	1.1951	1.1918	1.1761	1.1731	1.1595	1.1595	1.1569	1.1647	1.1731	1.1791	1.1853 (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												

[illegible]

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	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)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.4446	15.4886	15.5320	15.7392	15.7785	15.9645	15.9645	15.9994	15.8923	15.7785	15.6991	15.6169
alpha	2.0296	2.0326	2.0355	2.0493	2.0519	2.0643	2.0643	2.0666	2.0595	2.0519	2.0466	2.0411
util living area	0.9074	0.8898	0.8584	0.7997	0.7103	0.5877	0.4726	0.5085	0.6747	0.8163	0.8848	0.9136 (86)
MIT	18.1373	18.3872	18.8562	19.5043	20.1135	20.5910	20.8166	20.7797	20.4139	19.6559	18.8034	18.0915 (87)
Th 2	19.9212	19.9239	19.9266	19.9392	19.9416	19.9526	19.9526	19.9546	19.9483	19.9416	19.9368	19.9318 (88)
util rest of house	0.8971	0.8776	0.8420	0.7747	0.6705	0.5242	0.3832	0.4205	0.6177	0.7884	0.8701	0.9041 (89)
MIT 2	16.1515	16.5078	17.1755	18.0916	18.9282	19.5556	19.8170	19.7833	19.3445	18.3201	17.1129	16.0895 (90)
Living area fraction												0.1678 (91)
MIT	16.4848	16.8231	17.4575	18.3287	19.1271	19.7293	19.9847	19.9505	19.5240	18.5443	17.3966	16.4255 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.3348	16.6731	17.3075	18.1787	18.9771	19.5793	19.8347	19.8005	19.3740	18.3943	17.2466	16.2755 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8483	0.8264	0.7886	0.7230	0.6278	0.4988	0.3721	0.4061	0.5812	0.7360	0.8185	0.8567 (94)
Useful gains	530.5118	556.2672	564.7704	552.0409	499.3199	387.6834	275.6143	283.1983	380.4400	451.9773	487.2448	514.0431 (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	1180.1418	1151.2056	1053.8314	892.8493	698.4970	472.3781	306.8710	321.8900	502.6000	748.1392	978.8554	1171.0695 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	483.3247	399.7986	363.8614	245.3820	148.1878	0.0000	0.0000	0.0000	0.0000	220.3445	353.9597	488.8276 (98)
Space heating												2703.6863 (98)
Space heating per m2												33.0443 (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 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												2997.4349 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	483.3247	399.7986	363.8614	245.3820	148.1878	0.0000	0.0000	0.0000	0.0000	220.3445	353.9597	488.8276 (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)	535.8367	443.2357	403.3940	272.0422	164.2880	0.0000	0.0000	0.0000	0.0000	244.2843	392.4165	541.9375 (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	87.4110	87.2912	86.9801	86.2306	84.7616	76.4000	76.4000	76.4000	76.4000	85.7575	86.8977	76.4000 (216)
Fuel for water heating, kWh/month	118.6288	103.6089	107.8347	97.3235	96.3116	93.8672	89.9191	101.2456	101.8344	103.3213	108.5331	114.8732 (219)
Water heating fuel used												1237.3015 (219)
Annual totals kWh/year												2997.4349 (211)
Space heating fuel - main system												0.0000 (215)
Space heating fuel - secondary												
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												4704.1325 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2997.4349	3.4800	104.3107 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1237.3015	3.4800	43.0581 (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			329.2822 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 1.0905 (257)
SAP value	84.7874
SAP rating (Section 12)	85 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2997.4349	0.2160	647.4459 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1237.3015	0.2160	267.2571 (264)
Space and water heating			914.7031 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total kg/year			1158.3196 (272)
CO2 emissions per m2			14.1600 (273)
EI value			87.7610
EI rating			88 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8320 = 4.183$, stars = 5
Water heating environmental impact	$0.216 / 0.8320 = 0.2596$, 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	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.8900
Infiltration rate					0.3915 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3621 (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	0.4436	0.4164	0.4074	0.3802	0.3802	0.3712	0.3712	0.3621	0.3621	0.3893	0.3893	0.3983 (22b)
Effective ac	0.5984	0.5867	0.5830	0.5723	0.5723	0.5689	0.5689	0.5656	0.5656	0.5758	0.5758	0.5793 (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	0.1800	7.3638	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (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)			172.1940				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8151		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (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)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 5452.2404 (34)
66.6370 (35)
15.3835 (36)
(33) + (36) = 57.1986 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.3106	39.5239	39.2727	38.5523	38.5523	38.3232	38.3232	38.0996	38.0996	38.7869	38.7869	39.0271 (38)
Heat transfer coeff	97.5091	96.7225	96.4713	95.7509	95.7509	95.5218	95.5218	95.2982	95.2982	95.9855	95.9855	96.2256 (39)
Average = Sum(39)m / 12 =												96.0034 (39)
HLP	1.1918	1.1821	1.1791	1.1703	1.1703	1.1675	1.1675	1.1647	1.1647	1.1731	1.1731	1.1761 (40)
HLP (average)												1.1733 (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)

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	15.5320	15.6583	15.6991	15.8172	15.8172	15.8551	15.8551	15.8923	15.8923	15.7785	15.7785	15.7392
alpha	2.0355	2.0439	2.0466	2.0545	2.0545	2.0570	2.0570	2.0595	2.0595	2.0519	2.0519	2.0493
util living area	0.8892	0.8729	0.8330	0.7590	0.6478	0.4845	0.3636	0.3686	0.5780	0.7577	0.8529	0.8951 (86)
MIT	18.5274	18.7204	19.1891	19.8063	20.3789	20.7747	20.9160	20.9168	20.6579	20.0482	19.2505	18.5292 (87)
Th 2	19.9266	19.9343	19.9368	19.9439	19.9439	19.9461	19.9461	19.9483	19.9483	19.9416	19.9416	19.9392 (88)
util rest of house	0.8763	0.8582	0.8129	0.7282	0.5977	0.4069	0.2603	0.2609	0.5029	0.7181	0.8327	0.8827 (89)
MIT 2	16.7116	16.9868	17.6497	18.5104	19.2786	19.7604	19.9023	19.9064	19.6422	18.8583	17.7493	16.7196 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
MIT	17.0163	17.2777	17.9080	18.7278	19.4632	19.9306	20.0724	20.0760	19.8127	19.0580	18.0012	17.0233 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8663	17.1277	17.7580	18.5778	19.3132	19.7806	19.9224	19.9260	19.6627	18.9080	17.8512	16.8733 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8250	0.8058	0.7596	0.6799	0.5634	0.3936	0.2578	0.2584	0.4798	0.6705	0.7795	0.8324 (94)
Useful gains	529.0507	549.2250	557.9157	540.0469	458.4003	328.2915	201.5014	192.2932	330.4497	427.5922	479.0850	509.5799 (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												
	1088.8137	1066.6231	970.3108	811.7594	594.9201	370.6850	212.2913	202.6025	396.6947	634.2737	868.7872	1065.5304 (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												
	416.4636	347.6915	306.8220	195.6331	101.5707	0.0000	0.0000	0.0000	0.0000	153.7710	280.5856	413.6272 (98)
Space heating												2216.1647 (99)
Space heating per m2												(98) / (4) = 27.0859 (99)

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													2456.9453 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	416.4636	347.6915	306.8220	195.6331	101.5707	0.0000	0.0000	0.0000	0.0000	153.7710	280.5856	413.6272	(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)	461.7113	385.4673	340.1574	216.8881	112.6061	0.0000	0.0000	0.0000	0.0000	170.4778	311.0705	458.5667	(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	87.0649	86.9577	86.5402	85.5605	83.4809	76.4000	76.4000	76.4000	76.4000	84.6128	86.2794	76.4000	(216)
Fuel for water heating, kWh/month	119.1003	104.0063	108.3828	98.0857	97.7892	93.8672	89.9191	101.2456	101.8344	104.7190	109.3108	115.3754	(219)
Water heating fuel used												1243.6358	(219)
Annual totals kWh/year													
Space heating fuel - main system												2456.9453	(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												4169.9772	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2456.9453	7.6100	186.9735 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1243.6358	7.6100	94.6407 (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			532.5025 (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	2456.9453	0.2160	530.7002 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1243.6358	0.2160	268.6253 (264)
Space and water heating			799.3255 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total kg/year			1042.9421 (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	2456.9453	1.2200	2997.4733 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1243.6358	1.2200	1517.2357 (264)
Space and water heating			4514.7090 (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			5955.7547 (272)
Primary energy kWh/m2/year			72.7909 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: B 88

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E	Low energy lighting
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 (96.9%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.9	-£ 44	-143 kg (13.7%)
-----------------------	-------	-------	-----------------

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£605 12.35 kg/m²	A 95	A 97
Total Savings	£605 12.35 kg/m²		
Potential energy efficiency rating:		A 95	
Potential environmental impact rating:			A 97

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	£387	£387	£0
Space heating	£315	£315	£0
Water heating	£95	£95	£0
Lighting	£123	£123	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£533	-£72	£605
Total cost of uses	£533	-£72	£605
Delivered energy	51 kWh/m²	27 kWh/m²	24 kWh/m²
Carbon dioxide emissions	1.0 tonnes	0.0 tonnes	1.0 tonnes
CO2 emissions per m²	13 kg/m²	0 kg/m²	12 kg/m²
Primary energy	73 kWh/m²	0 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	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.8900
Infiltration rate					0.3915 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3621 (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	0.4617	0.4526	0.4436	0.3983	0.3893	0.3440	0.3440	0.3349	0.3621	0.3893	0.4074	0.4255 (22b)
Effective ac	0.6066	0.6024	0.5984	0.5793	0.5758	0.5592	0.5592	0.5561	0.5656	0.5758	0.5830	0.5905 (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	0.1800	7.3638	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (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)			172.1940				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8151		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (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/m²K 66.6370 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.3835 (36)
Total fabric heat loss (33) + (36) = 57.1986 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.8626	40.5838	40.3106	39.0271	38.7869	37.6690	37.6690	37.4620	38.0996	38.7869	39.2727	39.7806 (38)
Heat transfer coeff	98.0612	97.7824	97.5091	96.2256	95.9855	94.8676	94.8676	94.6606	95.2982	95.9855	96.4713	96.9792 (39)
Average = Sum(39)m / 12 =												96.2245 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1985	1.1951	1.1918	1.1761	1.1731	1.1595	1.1595	1.1569	1.1647	1.1731	1.1791	1.1853 (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)

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												2997.4349 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	483.3247	399.7986	363.8614	245.3820	148.1878	0.0000	0.0000	0.0000	0.0000	220.3445	353.9597	488.8276 (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)	535.8367	443.2357	403.3940	272.0422	164.2880	0.0000	0.0000	0.0000	0.0000	244.2843	392.4165	541.9375 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	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	87.4110	87.2912	86.9801	86.2306	84.7616	76.4000	76.4000	76.4000	76.4000	85.7575	86.8977	76.4000 (216)
Fuel for water heating, kWh/month	118.6288	103.6089	107.8347	97.3235	96.3116	93.8672	89.9191	101.2456	101.8344	103.3213	108.5331	87.5042 (217)
Water heating fuel used												114.8732 (219)
Annual totals kWh/year												1237.3015 (219)
Space heating fuel - main system												2997.4349 (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		-1727.2394 (233)
Total delivered energy for all uses												2976.8931 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2997.4349	3.4800	104.3107 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1237.3015	3.4800	43.0581 (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)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			101.4593 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.4200	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3360 (257)
SAP value	95.3126	
SAP rating (Section 12)	95	(258)
SAP band	A	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2997.4349	0.2160	647.4459	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1237.3015	0.2160	267.2571	(264)
Space and water heating			914.7031	(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	-1727.2394	0.5190	-896.4372	(269)
Total kg/year			261.8824	(272)
CO2 emissions per m2			3.2000	(273)
EI value			97.2329	
EI rating			97	(274)
EI band			A	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	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 * 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					4.8900
Infiltration rate					0.3915 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3621 (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	0.4436	0.4164	0.4074	0.3802	0.3802	0.3712	0.3712	0.3621	0.3621	0.3893	0.3893	0.3983 (22b)
Effective ac	0.5984	0.5867	0.5830	0.5723	0.5723	0.5689	0.5689	0.5656	0.5656	0.5758	0.5758	0.5793 (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	0.1800	7.3638	75.6000	3092.7960 (28a)
Wl - Brick (Timber Frame)	90.3710	11.1690	79.2020	0.2100	16.6324	7.4000	586.0948 (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)			172.1940				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8151		(33)
Party Wall			46.2040	0.0000	0.0000	7.4000	341.9096 (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/m²K 66.6370 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.3835 (36)
 Total fabric heat loss (33) + (36) = 57.1986 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.3106	39.5239	39.2727	38.5523	38.5523	38.3232	38.3232	38.0996	38.0996	38.7869	38.7869	39.0271 (38)
Heat transfer coeff	97.5091	96.7225	96.4713	95.7509	95.7509	95.5218	95.5218	95.2982	95.2982	95.9855	95.9855	96.2256 (39)
Average = Sum(39)m / 12 =												96.0034 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1918	1.1821	1.1791	1.1703	1.1703	1.1675	1.1675	1.1647	1.1647	1.1731	1.1731	1.1761 (40)
HLP (average)												1.1733 (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	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	15.5320	15.6583	15.6991	15.8172	15.8172	15.8551	15.8551	15.8923	15.8923	15.7785	15.7785	15.7392
alpha	2.0355	2.0439	2.0466	2.0545	2.0545	2.0570	2.0570	2.0595	2.0595	2.0519	2.0519	2.0493
util living area	0.8892	0.8729	0.8330	0.7590	0.6478	0.4845	0.3636	0.3686	0.5780	0.7577	0.8529	0.8951 (86)
MIT	18.5274	18.7204	19.1891	19.8063	20.3789	20.7747	20.9160	20.9168	20.6579	20.0482	19.2505	18.5292 (87)
Th 2	19.9266	19.9343	19.9368	19.9439	19.9439	19.9461	19.9461	19.9483	19.9483	19.9416	19.9416	19.9392 (88)
util rest of house	0.8763	0.8582	0.8129	0.7282	0.5977	0.4069	0.2603	0.2609	0.5029	0.7181	0.8327	0.8827 (89)
MIT 2	16.7116	16.9868	17.6497	18.5104	19.2786	19.7604	19.9023	19.9064	19.6422	18.8583	17.7493	16.7196 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
MIT	17.0163	17.2777	17.9080	18.7278	19.4632	19.9306	20.0724	20.0760	19.8127	19.0580	18.0012	17.0233 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8663	17.1277	17.7580	18.5778	19.3132	19.7806	19.9224	19.9260	19.6627	18.9080	17.8512	16.8733 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8250	0.8058	0.7596	0.6799	0.5634	0.3936	0.2578	0.2584	0.4798	0.6705	0.7795	0.8324 (94)
Useful gains	529.0507	549.2250	557.9157	540.0469	458.4003	328.2915	201.5014	192.2932	330.4497	427.5922	479.0850	509.5799 (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												
	1088.8137	1066.6231	970.3108	811.7594	594.9201	370.6850	212.2913	202.6025	396.6947	634.2737	868.7872	1065.5304 (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												
	416.4636	347.6915	306.8220	195.6331	101.5707	0.0000	0.0000	0.0000	0.0000	153.7710	280.5856	413.6272 (98)
Space heating												2216.1647 (99)
Space heating per m2												(98) / (4) = 27.0859 (99)

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 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												2456.9453	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	416.4636	347.6915	306.8220	195.6331	101.5707	0.0000	0.0000	0.0000	0.0000	153.7710	280.5856	413.6272	(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)	461.7113	385.4673	340.1574	216.8881	112.6061	0.0000	0.0000	0.0000	0.0000	170.4778	311.0705	458.5667	(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	87.0649	86.9577	86.5402	85.5605	83.4809	76.4000	76.4000	76.4000	76.4000	84.6128	86.2794	87.1233	(216)
Fuel for water heating, kWh/month	119.1003	104.0063	108.3828	98.0857	97.7892	93.8672	89.9191	101.2456	101.8344	104.7190	109.3108	115.3754	(219)
Water heating fuel used												1243.6358	(219)
Annual totals kWh/year													
Space heating fuel - main system												2456.9453	(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												2223.5312	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2456.9453	7.6100	186.9735 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1243.6358	7.6100	94.6407 (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			-72.4529 (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	2456.9453	0.2160	530.7002 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1243.6358	0.2160	268.6253 (264)
Space and water heating			799.3255 (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			32.7366 (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	2456.9453	1.2200	2997.4733 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1243.6358	1.2200	1517.2357 (264)
Space and water heating			4514.7090 (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			-19.8343 (272)
Primary energy kWh/m2/year			-0.2424 (273)