

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	012 - PRJ013014			Issued on Date	08/02/2024
Assessment Reference	012	Prop Type Ref	2B		
Property	19 Deeble way, Netley Abbey, Southampton, SO31 5JP				
SAP Rating	85 B	DER	15.16	TER	18.52
Environmental	88 B	% DER<TER	18.16		
CO ₂ Emissions (t/year)	1.04	DFEE	45.74	TFEE	51.59
General Requirements Compliance	Pass	% DFEE<TFEE	11.34		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	U903-0001
Client					

FULL SAP CALCULATION PRINTOUT

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

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DWELLING AS BUILT

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) 15.16 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)45.7 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: 4.67 (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

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.6700
Infiltration rate					0.3805 (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) =	0.3519 (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	0.4487	0.4399	0.4311	0.3871	0.3783	0.3343	0.3343	0.3255	0.3519	0.3783	0.3959	0.4135 (22b)
Effective ac	0.6007	0.5968	0.5929	0.5749	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855 (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)							15.2477 (36)
Total fabric heat loss							(33) + (36) = 57.0628 (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	40.4648	40.2015	39.9434	38.7310	38.5041	37.4482	37.4482	37.2526	37.8549	38.5041	38.9630	39.4428 (38)
Heat transfer coeff	97.5276	97.2642	97.0061	95.7937	95.5669	94.5109	94.5109	94.3154	94.9177	95.5669	96.0258	96.5055 (39)
Average = Sum(39)m / 12 =												95.7926 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1920	1.1888	1.1856	1.1708	1.1680	1.1551	1.1551	1.1527	1.1601	1.1680	1.1736	1.1795 (40)
HLP (average)												1.1708 (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	15.5291	15.5711	15.6125	15.8101	15.8477	16.0247	16.0247	16.0579	15.9561	15.8477	15.7719	15.6935
alpha	2.0353	2.0381	2.0408	2.0540	2.0565	2.0683	2.0683	2.0705	2.0637	2.0565	2.0515	2.0462
util living area	0.9482	0.9336	0.9072	0.8556	0.7728	0.6567	0.5432	0.5867	0.7551	0.8805	0.9333	0.9528 (86)
MIT	17.7500	18.0232	18.5385	19.2545	19.9426	20.4908	20.7607	20.7094	20.2596	19.3905	18.4588	17.7027 (87)
Th 2	19.9264	19.9290	19.9315	19.9434	19.9457	19.9561	19.9561	19.9580	19.9521	19.9457	19.9412	19.9364 (88)
util rest of house	0.9419	0.9256	0.8953	0.8355	0.7373	0.5944	0.4488	0.4955	0.7039	0.8599	0.9239	0.9471 (89)
MIT 2	15.6042	15.9967	16.7359	17.7570	18.7151	19.4494	19.7731	19.7235	19.1661	17.9658	16.6317	15.5385 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
MIT	15.9643	16.3368	17.0384	18.0083	18.9211	19.6242	19.9388	19.8890	19.3496	18.2049	16.9383	15.9017 (92)
Temperature adjustment												-0.1500
adjusted MIT	15.8143	16.1868	16.8884	17.8583	18.7711	19.4742	19.7888	19.7390	19.1996	18.0549	16.7883	15.7517 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9041	0.8828	0.8464	0.7824	0.6882	0.5608	0.4317	0.4735	0.6580	0.8077	0.8809	0.9114 (94)
Useful gains	397.7880	432.8990	458.6172	470.4303	444.1001	357.0595	260.7005	264.1879	333.4920	367.0182	372.8052	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	1122.9612	1097.7982	1007.7377	858.1518	675.7640	460.6610	301.3771	314.9148	484.0435	712.4385	930.3301	1114.8036 (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	539.5289	446.8122	408.5457	279.1595	172.3580	0.0000	0.0000	0.0000	0.0000	256.9927	401.4179	545.6093 (98)
Space heating												3050.4241 (99)
Space heating per m2												37.2821 (99)
										(98) / (4) =		

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

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3381.8449 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	539.5289	446.8122	408.5457	279.1595	172.3580	0.0000	0.0000	0.0000	0.0000	256.9927	401.4179	545.6093	(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)	598.1473	495.3572	452.9331	309.4895	191.0842	0.0000	0.0000	0.0000	0.0000	284.9143	445.0309	604.8883	(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	87.6478	87.5382	87.2572	86.5850	85.2507	76.4000	76.4000	76.4000	76.4000	86.2077	87.2033	76.4000	(216)
Fuel for water heating, kWh/month	118.3083	103.3165	107.4923	96.9251	95.7590	93.8672	89.9191	101.2456	101.8344	102.7816	108.1527	114.5715	(219)
Water heating fuel used												1234.1735	(219)
Annual totals kWh/year													
Space heating fuel - main system												3381.8449	(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												5085.4144	(238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	3381.8449	0.2160	730.4785 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1234.1735	0.2160	266.5815 (264)
Space and water heating			997.0600 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total CO ₂ , kg/year			1240.6765 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.1600 (273)

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

DER		15.1600	ZC1
Total Floor Area	TFA	81.8200	
Assumed number of occupants	N	2.4965	
CO ₂ emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO ₂ emissions from appliances, equation (L14)		16.1654	ZC2
CO ₂ emissions from cooking, equation (L16)		2.1867	ZC3
Total CO ₂ emissions		33.5121	ZC4
Residual CO ₂ emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year		0.0000	ZC6
Resulting CO ₂ emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO ₂ emissions		33.5121	ZC8

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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	(91)
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	(92)
Temperature adjustment												0.0000	
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	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	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	012 - PRJ013014	Issued on Date	08/02/2024
Assessment Reference	012	Prop Type Ref	2B
Property	19 Deeble way, Netley Abbey, Southampton, SO31 5JP		

SAP Rating	85 B	DER	15.16	TER	18.52
Environmental	88 B	% DER<TER	18.16		
CO ₂ Emissions (t/year)	1.04	DFEE	45.74	TTEE	51.59
General Requirements Compliance	Pass	% DFEE<TFEE	11.34		

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (5)

2. Ventilation rate

	main heating		secondary heating		other		total		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									4.6700			
Infiltration rate									0.3805 (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) =	0.3519 (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	0.4487	0.4399	0.4311	0.3871	0.3783	0.3343	0.3343	0.3255	0.3519	0.3783	0.3959	0.4135 (22b)
Effective ac	0.6007	0.5968	0.5929	0.5749	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855 (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)							15.2477 (36)
Total fabric heat loss						(33) + (36) =	57.0628 (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 40.4648	Feb 40.2015	Mar 39.9434	Apr 38.7310	May 38.5041	Jun 37.4482	Jul 37.4482	Aug 37.2526	Sep 37.8549	Oct 38.5041	Nov 38.9630	Dec 39.4428 (38)
Heat transfer coeff	97.5276	97.2642	97.0061	95.7937	95.5669	94.5109	94.5109	94.3154	94.9177	95.5669	96.0258	96.5055 (39)
Average = Sum(39)m / 12 =												95.7926 (39)
HLP	Jan 1.1920	Feb 1.1888	Mar 1.1856	Apr 1.1708	May 1.1680	Jun 1.1551	Jul 1.1551	Aug 1.1527	Sep 1.1601	Oct 1.1680	Nov 1.1736	Dec 1.1795 (40)
HLP (average)												1.1708 (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 15.5291	Feb 15.5711	Mar 15.6125	Apr 15.8101	May 15.8477	Jun 16.0247	Jul 16.0247	Aug 16.0579	Sep 15.9561	Oct 15.8477	Nov 15.7719	Dec 15.6935
tau	2.0353	2.0381	2.0408	2.0540	2.0565	2.0683	2.0683	2.0705	2.0637	2.0565	2.0515	2.0462
alpha	0.9537	0.9397	0.9140	0.8636	0.7824	0.6674	0.5539	0.5997	0.7675	0.8898	0.9400	0.9580 (86)
util living area	17.6853	17.9629	18.4860	19.2135	19.9132	20.4736	20.7512	20.6963	20.2329	19.3457	18.4007	17.6388 (87)
MIT	19.9264	19.9290	19.9315	19.9434	19.9457	19.9561	19.9561	19.9580	19.9521	19.9457	19.9412	19.9364 (88)
Th 2	0.9481	0.9323	0.9029	0.8443	0.7476	0.6055	0.4590	0.5085	0.7175	0.8703	0.9315	0.9529 (89)
util rest of house	16.8864	17.1625	17.6809	18.4008	19.0734	19.5946	19.8247	19.7885	19.3894	18.5418	17.6076	16.8466 (90)
MIT 2	17.0204	17.2968	17.8160	18.5371	19.2143	19.7421	19.9801	19.9408	19.5310	18.6767	17.7407	16.9796 (92)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
MIT	17.0204	17.2968	17.8160	18.5371	19.2143	19.7421	19.9801	19.9408	19.5310	18.6767	17.7407	16.9796 (92)
Temperature adjustment												0.0000
adjusted MIT	17.0204	17.2968	17.8160	18.5371	19.2143	19.7421	19.9801	19.9408	19.5310	18.6767	17.7407	16.9796 (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	0.8736	0.8121	0.7190	0.5911	0.4615	0.5068	0.6933	0.8397	0.9068	0.9327	(94)
Useful gains	381.8754	420.3579	451.1519	469.4450	448.3342	364.6668	270.3990	272.5402	336.8608	362.0076	360.2721	365.1730	(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	1240.5944	1205.7649	1097.7205	923.1777	718.1193	485.9833	319.4608	333.9559	515.4942	771.8645	1021.7815	1233.2987	(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	638.8870	527.7935	481.0470	326.6876	200.7201	0.0000	0.0000	0.0000	0.0000	304.9336	476.2867	645.8855	(98)
Space heating												3602.2410	(98)
Space heating per m2										(98) / (4) =		44.0264	(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	888.4028	699.3809	716.7969	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6448	0.7090	0.6772	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.8358	495.8374	485.4223	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	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)
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	174.6612	209.4291	176.7360	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												560.8263	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	43.6653	52.3573	44.1840	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												140.2066	(107)
Space cooling per m2												1.7136	(108)
Energy for space heating												44.0264	(99)
Energy for space cooling												1.7136	(108)
Total												45.7400	(109)
Dwelling Fabric Energy Efficiency (DFEE)												45.7	(109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour
										heating	heating			
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)		
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)		
Number of intermittent fans											3 * 10 =	30.0000 (7a)		
Number of passive vents											0 * 10 =	0.0000 (7b)		
Number of flueless gas fires											0 * 40 =	0.0000 (7c)		
												Air changes per hour		
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =										30.0000	/ (5) =	0.1470 (8)	
Pressure test												Yes		
Measured/design AP50												5.0000		
Infiltration rate												0.3970 (18)		
Number of sides sheltered												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	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind factor	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)		
Adj infilt rate	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)		
	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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.8407	99.1011	95.3614	91.6217	87.8821	84.1424	84.1424	87.8821	91.6217	95.3614	99.1011	102.8407 (44)
Energy content (annual)	152.5098	133.3861	137.6425	120.0000	115.1429	99.3596	92.0712	105.6531	106.9149	124.5990	136.0096	147.6976 (45)
Distribution loss	Total = Sum(45)m = 1470.9864 (45)											
	(46)m = 0.15 x (45)m											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	32.4083	28.3445	29.2490	25.5000	24.4679	21.1139	19.5651	22.4513	22.7194	26.4773	28.9020	31.3857 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	124.8244	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4705	19.9581	16.2310	12.2879	9.1854	7.7547	8.3792	10.8916	14.6187	18.5617	21.6643	23.0950	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.2022	225.5183	219.6817	207.2563	191.5714	176.8299	166.9816	164.6655	170.5021	182.9275	198.6124	213.3539	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	35.4824	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	(71)
Water heating gains (Table 5)	43.5596	42.1794	39.3132	35.4167	32.8869	29.3249	26.2972	30.1765	31.5548	35.5878	40.1417	42.1851	(72)
Total internal gains	349.6796	348.1031	335.6732	315.4082	294.0910	274.3567	262.1053	266.1808	277.1228	297.5243	320.8657	339.0814	(73)

6. Solar gains

[Jan]			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	0.6300	0.7000	0.7700	21.9134				
Southwest			2.7240	36.7938	0.6300	0.7000	0.7700	30.6305 (75)				

Solar gains	52.5439	96.7804	151.7528	220.4353	276.4847	287.4961	271.7624	227.9579	175.2239	112.1758	64.2610	44.1089 (83)
Total gains	402.2235	444.8835	487.4261	535.8435	570.5757	561.8528	533.8677	494.1387	452.3467	409.7001	385.1267	383.1903 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	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	(92)
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)
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)

$$fC = \text{cooled area} / (4) =$$

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	012 - PRJ013014	Issued on Date	08/02/2024
Assessment Reference	012	Prop Type Ref	2B
Property	19 Deeble way, Netley Abbey, Southampton, SO31 5JP		

SAP Rating	85 B	DER	15.16	TER	18.52
Environmental	88 B	% DER<TER	18.16		
CO ₂ Emissions (t/year)	1.04	DFEE	45.74	TTEE	51.59
General Requirements Compliance	Pass	% DFEE<TFEE	11.34		

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.9100 (1b)	x 2.3700 (2b)	= 96.9567 (1b) - (3b)
First floor	40.9100 (1c)	x 2.6200 (2c)	= 107.1842 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.1409 (5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour				
Number of chimneys		0	+	0	+	0	=	0 * 40 =	0.0000 (6a)			
Number of open flues		0	+	0	+	0	=	0 * 20 =	0.0000 (6b)			
Number of intermittent fans								3 * 10 =	30.0000 (7a)			
Number of passive vents								0 * 10 =	0.0000 (7b)			
Number of flueless gas fires								0 * 40 =	0.0000 (7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =							30.0000 / (5) =	0.1470 (8)			
Pressure test								Yes				
Measured/design AP50									4.6700			
Infiltration rate									0.3805 (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) =	0.3519 (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	0.4311	0.4047	0.3959	0.3695	0.3695	0.3607	0.3607	0.3519	0.3519	0.3783	0.3783	0.3871 (22b)
Effective ac	0.5929	0.5819	0.5784	0.5683	0.5683	0.5651	0.5651	0.5619	0.5619	0.5716	0.5716	0.5749 (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)							15.2477 (36)
Total fabric heat loss						(33) + (36) =	57.0628 (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 39.9434	Feb 39.2003	Mar 38.9630	Apr 38.2825	May 38.2825	Jun 38.0661	Jul 38.0661	Aug 37.8549	Sep 37.8549	Oct 38.5041	Nov 38.5041	Dec 38.7310 (38)
Heat transfer coeff	97.0061	96.2630	96.0258	95.3453	95.3453	95.1289	95.1289	94.9177	94.9177	95.5669	95.5669	95.7937 (39)
Average = Sum(39)m / 12 =												95.5838 (39)
HLP	Jan 1.1856	Feb 1.1765	Mar 1.1736	Apr 1.1653	May 1.1653	Jun 1.1627	Jul 1.1627	Aug 1.1601	Sep 1.1601	Oct 1.1680	Nov 1.1680	Dec 1.1708 (40)
HLP (average)												1.1682 (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	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 15.6125	Feb 15.7331	Mar 15.7719	Apr 15.8845	May 15.8845	Jun 15.9206	Jul 15.9206	Aug 15.9561	Sep 15.9561	Oct 15.8477	Nov 15.8477	Dec 15.8101
alpha	2.0408	2.0489	2.0515	2.0590	2.0590	2.0614	2.0614	2.0637	2.0637	2.0565	2.0565	2.0540
util living area	0.8889	0.8725	0.8324	0.7582	0.6468	0.4833	0.3626	0.3676	0.5770	0.7569	0.8524	0.8948 (86)
MIT	18.5409	18.7326	19.1998	19.8141	20.3841	20.7771	20.9171	20.9178	20.6610	20.0547	19.2597	18.5409 (87)
Th 2	19.9315	19.9388	19.9412	19.9479	19.9479	19.9500	19.9500	19.9521	19.9521	19.9457	19.9457	19.9434 (88)
util rest of house	0.8760	0.8578	0.8124	0.7275	0.5968	0.4061	0.2598	0.2604	0.5021	0.7174	0.8322	0.8824 (89)
MIT 2	16.7322	17.0055	17.6664	18.5230	19.2876	19.7660	19.9066	19.9106	19.6484	18.8691	17.7639	16.7374 (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	17.0357	17.2954	17.9237	18.7397	19.4716	19.9357	20.0762	20.0796	19.8183	19.0681	18.0149	17.0401 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8857	17.1454	17.7737	18.5897	19.3216	19.7857	19.9262	19.9296	19.6683	18.9181	17.8649	16.8901 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8248	0.8055	0.7593	0.6794	0.5628	0.3929	0.2573	0.2580	0.4791	0.6701	0.7793	0.8323 (94)	
Useful gains	528.9233	549.0685	557.6739	539.6771	457.8732	327.7133	201.1199	191.9506	330.0088	427.2931	478.9262	509.4840 (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	1085.0849	1063.2591	967.3354	809.4525	593.1992	369.6420	211.7761	202.1374	395.6452	632.4673	866.3042	1062.3582 (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	413.7842	345.5361	304.7882	194.2383	100.6825	0.0000	0.0000	0.0000	0.0000	152.6497	278.9122	411.3384 (98)	
RHI space heating demand												2201.9296 (98)	
												2202 (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	=	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								4.6700				
Infiltration rate								0.3805 (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) =	0.3519 (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	0.4487	0.4399	0.4311	0.3871	0.3783	0.3343	0.3343	0.3255	0.3519	0.3783	0.3959	0.4135 (22b)
Effective ac	0.6007	0.5968	0.5929	0.5749	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855 (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)
15.2477 (36)
(33) + (36) = 57.0628 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan 40.4648	Feb 40.2015	Mar 39.9434	Apr 38.7310	May 38.5041	Jun 37.4482	Jul 37.4482	Aug 37.2526	Sep 37.8549	Oct 38.5041	Nov 38.9630	Dec 39.4428 (38)
Heat transfer coeff	97.5276	97.2642	97.0061	95.7937	95.5669	94.5109	94.5109	94.3154	94.9177	95.5669	96.0258	96.5055 (39)
Average = Sum(39)m / 12 =												95.7926 (39)
HLP	Jan 1.1920	Feb 1.1888	Mar 1.1856	Apr 1.1708	May 1.1680	Jun 1.1551	Jul 1.1551	Aug 1.1527	Sep 1.1601	Oct 1.1680	Nov 1.1736	Dec 1.1795 (40)
HLP (average)												1.1708 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water storage loss:	22.8765	20.0079	20.6464	18.0000	17.2714	14.9039	13.8107	15.8480	16.0372	18.6899	20.4014	22.1546 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6702	0.5948	0.5907	0.4948	0.4554	0.3762	0.3486	0.4178	0.4408	0.5347	0.6065	0.6490 (61)
Total heat required for water heating calculated for each month	153.1800	133.9809	138.2331	120.4948	115.5983	99.7358	92.4199	106.0709	107.3557	125.1337	136.6161	148.3467 (62)
WWHRS	-49.4854	-43.5394	-44.4384	-36.5722	-33.9630	-28.0213	-23.7216	-28.7193	-29.5543	-36.5280	-42.3034	-47.8278 eq. (G10)
Total of WWHRS savings												-444.6741
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	103.6946	90.4415	93.7947	83.9226	81.6353	71.7145	68.6982	77.3516	77.8015	88.6057	94.3127	100.5189 (64)
Heat gains from water heating, kWh/month	50.8771	44.4996	45.9138	40.0237	38.3989	33.1311	30.7008	35.2341	35.6594	41.5629	45.3748	49.2717 (65)
												1032.4919 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892	149.7892 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.8308	49.5885	40.3280	30.5309	22.8222	19.2675	20.8192	27.0616	36.3220	46.1191	53.8278	57.3825 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.1376	336.5945	327.8832	309.3378	285.9275	263.9252	249.2263	245.7693	254.4807	273.0261	296.4364	318.4387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754	52.4754 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595	-99.8595 (71)
Water heating gains (Table 5)	68.3832	66.2196	61.7121	55.5885	51.6114	46.0154	41.2646	47.3577	49.5270	55.8641	63.0206	66.2254 (72)
Total internal gains	562.7568	557.8078	535.3285	500.8623	465.7663	434.6133	416.7152	425.5938	445.7348	480.4144	518.6899	547.4518 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast				6.3550	11.2829	0.7300	0.7200	0.7700	26.1172 (75)
Southwest				2.7240	36.7938	0.7300	0.7200	0.7700	36.5065 (79)
Solar gains	62.6237	115.3465	180.8646	262.7229	329.5247	342.6484	323.8964	208.8383	52.5706 (83)
Total gains	625.3805	673.1542	716.1931	763.5852	795.2909	777.2616	740.6116	697.2824	600.0224 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.5291	15.5711	15.6125	15.8101	15.8477	16.0247	16.0247	16.0579	15.9561	15.8477	15.7719	15.6935
alpha	2.0353	2.0381	2.0408	2.0540	2.0565	2.0683	2.0683	2.0705	2.0637	2.0565	2.0515	2.0462
util living area	0.9071	0.8895	0.8580	0.7990	0.7094	0.5868	0.4716	0.5075	0.6738	0.8157	0.8845	0.9134 (86)
MIT	18.1526	18.4018	18.8692	19.5138	20.1202	20.5944	20.8185	20.7817	20.4182	19.6638	18.8145	18.1053 (87)
Th 2	19.9264	19.9290	19.9315	19.9434	19.9457	19.9561	19.9561	19.9580	19.9521	19.9457	19.9412	19.9364 (88)
util rest of house	0.8969	0.8773	0.8415	0.7741	0.6697	0.5234	0.3825	0.4198	0.6170	0.7879	0.8698	0.9039 (89)
MIT 2	16.1747	16.5300	17.1955	18.1065	18.9393	19.5621	19.8217	19.7880	19.3523	18.3328	17.1300	16.1104 (90)
Living area fraction	16.5066	16.8441	17.4763	18.3427	19.1375	19.7353	19.9889	19.9548	19.5312	18.5562	17.4126	16.4452 (91)
MIT	16.5066	16.8441	17.4763	18.3427	19.1375	19.7353	19.9889	19.9548	19.5312	18.5562	17.4126	16.4452 (92)
Temperature adjustment	16.3566	16.6941	17.3263	18.1927	18.9875	19.5853	19.8389	19.8048	19.3812	18.4062	17.2626	16.2952 (93)
adjusted MIT	16.3566	16.6941	17.3263	18.1927	18.9875	19.5853	19.8389	19.8048	19.3812	18.4062	17.2626	16.2952 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	530.4174	556.1302	564.5607	551.7349	498.8661	387.1998	275.1733	282.7907	380.0745	451.7659	487.1326	513.9732 (94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1175.8538	1147.1404	1050.2210	890.1804	696.4421	471.1651	306.1137	321.1215	501.2788	746.0131	975.8762	1167.2490 (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	480.2047	397.1588	361.3313	243.6807	146.9966	0.0000	0.0000	0.0000	0.0000	218.9199	351.8953	486.0372 (98)
Space heating												2686.2246 (98)
Space heating per m2												(98) / (4) = 32.8309 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2978.0761 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	480.2047	397.1588	361.3313	243.6807	146.9966	0.0000	0.0000	0.0000	0.0000	218.9199	351.8953	486.0372	(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)	532.3778	440.3091	400.5890	270.1560	162.9674	0.0000	0.0000	0.0000	0.0000	242.7050	390.1279	538.8439	(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	87.3965	87.2760	86.9628	86.2109	84.7350	76.4000	76.4000	76.4000	76.4000	85.7379	86.8829	76.4000	(216)
Fuel for water heating, kWh/month	118.6484	103.6270	107.8561	97.3458	96.3419	93.8672	89.9191	101.2456	101.8344	103.3448	108.5515	114.8896	(219)
Water heating fuel used												1237.4714	(219)
Annual totals kWh/year													
Space heating fuel - main system												2978.0761	(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												4684.9435	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2978.0761	3.4800	103.6370	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1237.4714	3.4800	43.0640	(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			328.6144	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$		1.0883	(257)
SAP value			84.8182	
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	2978.0761	0.2160	643.2644	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1237.4714	0.2160	267.2938	(264)
Space and water heating			910.5583	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	394.3960	0.5190	204.6915	(268)
Total kg/year			1154.1748	(272)
CO2 emissions per m2			14.1100	(273)
EI value			87.8048	
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	$3.48 / 0.8319 = 4.183$, stars = 5
Water heating environmental impact	$0.216 / 0.8319 = 0.2596$, 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					4.6700
Infiltration rate					0.3805 (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) =	0.3519 (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	0.4311	0.4047	0.3959	0.3695	0.3695	0.3607	0.3607	0.3519	0.3519	0.3783	0.3783	0.3871 (22b)
Effective ac	0.5929	0.5819	0.5784	0.5683	0.5683	0.5651	0.5651	0.5619	0.5619	0.5716	0.5716	0.5749 (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

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	
39.9434	39.2003	38.9630	38.2825	38.2825	38.0661	38.0661	37.8549	37.8549	38.5041	38.5041	38.7310 (38)	
Heat transfer coeff												
97.0061	96.2630	96.0258	95.3453	95.3453	95.1289	95.1289	94.9177	94.9177	95.5669	95.5669	95.7937 (39)	
Average = Sum(39)m / 12 =												95.5838 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1856	1.1765	1.1736	1.1653	1.1653	1.1627	1.1627	1.1601	1.1601	1.1680	1.1680	1.1708 (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	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	15.6125	15.7331	15.7719	15.8845	15.8845	15.9206	15.9206	15.9561	15.9561	15.8477	15.8477	15.8101
alpha	2.0408	2.0489	2.0515	2.0590	2.0590	2.0614	2.0614	2.0637	2.0637	2.0565	2.0565	2.0540
util living area	0.8889	0.8725	0.8324	0.7582	0.6468	0.4833	0.3626	0.3676	0.5770	0.7569	0.8524	0.8948 (86)
MIT	18.5409	18.7326	19.1998	19.8141	20.3841	20.7771	20.9171	20.9178	20.6610	20.0547	19.2597	18.5409 (87)
Th 2	19.9315	19.9388	19.9412	19.9479	19.9479	19.9500	19.9500	19.9521	19.9521	19.9457	19.9457	19.9434 (88)
util rest of house	0.8760	0.8578	0.8124	0.7275	0.5968	0.4061	0.2598	0.2604	0.5021	0.7174	0.8322	0.8824 (89)
MIT 2	16.7322	17.0055	17.6664	18.5230	19.2876	19.7660	19.9066	19.9106	19.6484	18.8691	17.7639	16.7374 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
MIT	17.0357	17.2954	17.9237	18.7397	19.4716	19.9357	20.0762	20.0796	19.8183	19.0681	18.0149	17.0401 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8857	17.1454	17.7737	18.5897	19.3216	19.7857	19.9262	19.9296	19.6683	18.9181	17.8649	16.8901 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8248	0.8055	0.7593	0.6794	0.5628	0.3929	0.2573	0.2580	0.4791	0.6701	0.7793	0.8323 (94)
Useful gains	528.9233	549.0685	557.6739	539.6771	457.8732	327.7133	201.1199	191.9506	330.0088	427.2931	478.9262	509.4840 (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												
	1085.0849	1063.2591	967.3354	809.4525	593.1992	369.6420	211.7761	202.1374	395.6452	632.4673	866.3042	1062.3582 (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												
	413.7842	345.5361	304.7882	194.2383	100.6825	0.0000	0.0000	0.0000	0.0000	152.6497	278.9122	411.3384 (98)
Space heating												2201.9296 (98)
Space heating per m2												26.9119 (99)
										(98) / (4) =		

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.2000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2441.1637 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	413.7842	345.5361	304.7882	194.2383	100.6825	0.0000	0.0000	0.0000	0.0000	152.6497	278.9122	411.3384 (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)	458.7409	383.0777	337.9026	215.3418	111.6214	0.0000	0.0000	0.0000	0.0000	169.2347	309.2153	456.0293 (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	87.0492	86.9422	86.5223	85.5385	83.4506	76.4000	76.4000	76.4000	76.4000	84.5885	86.2626	76.4000 (216)
Fuel for water heating, kWh/month	119.1217	104.0248	108.4052	98.1110	97.8247	93.8672	89.9191	101.2456	101.8344	104.7491	109.3321	115.3930 (219)
Water heating fuel used												1243.8280 (219)
Annual totals kWh/year												
Space heating fuel - main system												2441.1637 (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												4154.3877 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2441.1637	7.6100	185.7726 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1243.8280	7.6100	94.6553 (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			531.3161 (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	2441.1637	0.2160	527.2914 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1243.8280	0.2160	268.6668 (264)
Space and water heating			795.9582 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	394.3960	0.5190	204.6915 (268)
Total kg/year			1039.5747 (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	2441.1637	1.2200	2978.2197 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1243.8280	1.2200	1517.4702 (264)
Space and water heating			4495.6898 (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			5936.7356 (272)
Primary energy kWh/m2/year			72.5585 (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	Already installed
F		Not considered
G		Not considered
H		Not considered
I		Not considered
J		Not considered
K		Not considered
M		Not considered
N	Solar water heating	SAP increase too small
O		Not considered
P		Not considered
R		Not considered
S		Not considered
T		Not considered
U	Solar photovoltaic panels	Recommended
A2		Not considered
A3		Not considered
T2		Not considered
W		Not considered
X		Not considered
Y		Not considered
J2		Not considered
Q2		Not considered
Z1		Not considered
Z2		Not considered
Z3		Not considered
Z4		Not considered
Z5		Not considered
V2	Wind turbine	Not applicable
L2		Not considered
Q3		Not considered
O3		Not considered

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 10.5	-£ 605	-1010 kg (97.2%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.9	-£ 44	-143 kg (13.8%)
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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	£385	£385	£0
Space heating	£314	£314	£0
Water heating	£95	£95	£0
Lighting	£123	£123	£0
Generated (PV)	-£0	-£605	£605
Total cost of fuels	£531	-£74	£605
Total cost of uses	£532	-£73	£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	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1470 (8)
Pressure test					Yes
Measured/design AP50					4.6700
Infiltration rate					0.3805 (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) =	0.3519 (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	0.4487	0.4399	0.4311	0.3871	0.3783	0.3343	0.3343	0.3255	0.3519	0.3783	0.3959	0.4135 (22b)
Effective ac	0.6007	0.5968	0.5929	0.5749	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855 (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)							15.2477 (36)
Total fabric heat loss							(33) + (36) = 57.0628 (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	40.4648	40.2015	39.9434	38.7310	38.5041	37.4482	37.4482	37.2526	37.8549	38.5041	38.9630	39.4428 (38)
Heat transfer coeff	97.5276	97.2642	97.0061	95.7937	95.5669	94.5109	94.5109	94.3154	94.9177	95.5669	96.0258	96.5055 (39)
Average = Sum(39)m / 12 =												95.7926 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1920	1.1888	1.1856	1.1708	1.1680	1.1551	1.1551	1.1527	1.1601	1.1680	1.1736	1.1795 (40)
HLP (average)												1.1708 (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	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, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	15.5291	15.5711	15.6125	15.8101	15.8477	16.0247	16.0247	16.0579	15.9561	15.8477	15.7719	15.6935
alpha	2.0353	2.0381	2.0408	2.0540	2.0565	2.0683	2.0683	2.0705	2.0637	2.0565	2.0515	2.0462
util living area	0.9071	0.8895	0.8580	0.7990	0.7094	0.5868	0.4716	0.5075	0.6738	0.8157	0.8845	0.9134 (86)
MIT	18.1526	18.4018	18.8692	19.5138	20.1202	20.5944	20.8185	20.7817	20.4182	19.6638	18.8145	18.1053 (87)
Th 2	19.9264	19.9290	19.9315	19.9434	19.9457	19.9561	19.9561	19.9580	19.9521	19.9457	19.9412	19.9364 (88)
util rest of house	0.8969	0.8773	0.8415	0.7741	0.6697	0.5234	0.3825	0.4198	0.6170	0.7879	0.8698	0.9039 (89)
MIT 2	16.1747	16.5300	17.1955	18.1065	18.9393	19.5621	19.8217	19.7880	19.3523	18.3328	17.1300	16.1104 (90)
Living area fraction												0.1678 (91)
MIT	16.5066	16.8441	17.4763	18.3427	19.1375	19.7353	19.9889	19.9548	19.5312	18.5562	17.4126	16.4452 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.3566	16.6941	17.3263	18.1927	18.9875	19.5853	19.8389	19.8048	19.3812	18.4062	17.2626	16.2952 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8482	0.8262	0.7883	0.7226	0.6273	0.4982	0.3715	0.4056	0.5806	0.7356	0.8183	0.8566	(94)
Useful gains	530.4174	556.1302	564.5607	551.7349	498.8661	387.1998	275.1733	282.7907	380.0745	451.7659	487.1326	513.9732	(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	1175.8538	1147.1404	1050.2210	890.1804	696.4421	471.1651	306.1137	321.1215	501.2788	746.0131	975.8762	1167.2490	(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	480.2047	397.1588	361.3313	243.6807	146.9966	0.0000	0.0000	0.0000	0.0000	218.9199	351.8953	486.0372	(98)
Space heating												2686.2246	(98)
Space heating per m2												32.8309	(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 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													2978.0761 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	480.2047	397.1588	361.3313	243.6807	146.9966	0.0000	0.0000	0.0000	0.0000	218.9199	351.8953	486.0372	(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)	532.3778	440.3091	400.5890	270.1560	162.9674	0.0000	0.0000	0.0000	0.0000	242.7050	390.1279	538.8439	(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	87.3965	87.2760	86.9628	86.2109	84.7350	76.4000	76.4000	76.4000	76.4000	85.7379	86.8829	76.4000	(216)
Fuel for water heating, kWh/month	118.6484	103.6270	107.8561	97.3458	96.3419	93.8672	89.9191	101.2456	101.8344	103.3448	108.5515	114.8896	(219)
Water heating fuel used												1237.4714	(219)
Annual totals kWh/year													
Space heating fuel - main system												2978.0761	(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												2957.7041	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2978.0761	3.4800	103.6370 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1237.4714	3.4800	43.0640 (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			100.7915 (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] =	0.3338 (257)
SAP value		95.3435
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	2978.0761	0.2160	643.2644 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1237.4714	0.2160	267.2938 (264)
Space and water heating			910.5583 (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			257.7375 (272)
CO2 emissions per m2			3.1500 (273)
EI value			97.2767
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					4.6700
Infiltration rate					0.3805 (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) =				0.3519 (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	0.4311	0.4047	0.3959	0.3695	0.3695	0.3607	0.3607	0.3519	0.3519	0.3783	0.3783	0.3871 (22b)
Effective ac	0.5929	0.5819	0.5784	0.5683	0.5683	0.5651	0.5651	0.5619	0.5619	0.5716	0.5716	0.5749 (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) 15.2477 (36)
 Total fabric heat loss (33) + (36) = 57.0628 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	39.9434	39.2003	38.9630	38.2825	38.2825	38.0661	38.0661	37.8549	37.8549	38.5041	38.5041	38.7310 (38)
Heat transfer coeff	97.0061	96.2630	96.0258	95.3453	95.3453	95.1289	95.1289	94.9177	94.9177	95.5669	95.5669	95.7937 (39)
Average = Sum(39)m / 12 =												95.5838 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1856	1.1765	1.1736	1.1653	1.1653	1.1627	1.1627	1.1601	1.1601	1.1680	1.1680	1.1708 (40)
HLP (average)												1.1682 (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	15.6125	15.7331	15.7719	15.8845	15.8845	15.9206	15.9206	15.9561	15.9561	15.8477	15.8477	15.8101
alpha	2.0408	2.0489	2.0515	2.0590	2.0590	2.0614	2.0614	2.0637	2.0637	2.0565	2.0565	2.0540
util living area	0.8889	0.8725	0.8324	0.7582	0.6468	0.4833	0.3626	0.3676	0.5770	0.7569	0.8524	0.8948 (86)
MIT	18.5409	18.7326	19.1998	19.8141	20.3841	20.7771	20.9171	20.9178	20.6610	20.0547	19.2597	18.5409 (87)
Th 2	19.9315	19.9388	19.9412	19.9479	19.9479	19.9500	19.9500	19.9521	19.9521	19.9457	19.9457	19.9434 (88)
util rest of house	0.8760	0.8578	0.8124	0.7275	0.5968	0.4061	0.2598	0.2604	0.5021	0.7174	0.8322	0.8824 (89)
MIT 2	16.7322	17.0055	17.6664	18.5230	19.2876	19.7660	19.9066	19.9106	19.6484	18.8691	17.7639	16.7374 (90)
Living area fraction									fLA = Living area / (4) =			0.1678 (91)
MIT	17.0357	17.2954	17.9237	18.7397	19.4716	19.9357	20.0762	20.0796	19.8183	19.0681	18.0149	17.0401 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8857	17.1454	17.7737	18.5897	19.3216	19.7857	19.9262	19.9296	19.6683	18.9181	17.8649	16.8901 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8248	0.8055	0.7593	0.6794	0.5628	0.3929	0.2573	0.2580	0.4791	0.6701	0.7793	0.8323 (94)
Useful gains	528.9233	549.0685	557.6739	539.6771	457.8732	327.7133	201.1199	191.9506	330.0088	427.2931	478.9262	509.4840 (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												
	1085.0849	1063.2591	967.3354	809.4525	593.1992	369.6420	211.7761	202.1374	395.6452	632.4673	866.3042	1062.3582 (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												
	413.7842	345.5361	304.7882	194.2383	100.6825	0.0000	0.0000	0.0000	0.0000	152.6497	278.9122	411.3384 (98)
Space heating												2201.9296 (98)
Space heating per m2												26.9119 (99)
										(98) / (4) =		

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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													2441.1637 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	413.7842	345.5361	304.7882	194.2383	100.6825	0.0000	0.0000	0.0000	0.0000	152.6497	278.9122	411.3384	(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)	458.7409	383.0777	337.9026	215.3418	111.6214	0.0000	0.0000	0.0000	0.0000	169.2347	309.2153	456.0293	(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	87.0492	86.9422	86.5223	85.5385	83.4506	76.4000	76.4000	76.4000	76.4000	84.5885	86.2626	76.4000	(216)
Fuel for water heating, kWh/month	119.1217	104.0248	108.4052	98.1110	97.8247	93.8672	89.9191	101.2456	101.8344	104.7491	109.3321	115.3930	(219)
Water heating fuel used												1243.8280	(219)
Annual totals kWh/year													
Space heating fuel - main system												2441.1637	(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												2207.9418	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2441.1637	7.6100	185.7726 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1243.8280	7.6100	94.6553 (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			-73.6393 (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	2441.1637	0.2160	527.2914 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1243.8280	0.2160	268.6668 (264)
Space and water heating			795.9582 (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			29.3693 (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	2441.1637	1.2200	2978.2197 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1243.8280	1.2200	1517.4702 (264)
Space and water heating			4495.6898 (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			-38.8534 (272)
Primary energy kWh/m2/year			-0.4749 (273)