

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	061 - PRJ013014			Issued on Date	27/01/2025
Assessment Reference	061	Prop Type Ref	E		
Property	4 Paulet Close, Netley Abbey, Southampton, SO31 5JW				
SAP Rating	85 B	DER	15.41	TER	18.87
Environmental	88 B	% DER<TER	18.35		
CO ₂ Emissions (t/year)	1.01	DFEE	45.74	TFEE	52.76
General Requirements Compliance	Pass	% DFEE<TFEE	13.30		
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk			Assessor ID	U903-0001
Client					

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

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DWELLING AS BUILT

Semi-Detached House, total floor area 79 m²

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

1a TER and DER

Fuel for main heating:Mains gas

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.87 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.41 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)52.8 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:	3.34 (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 South East: 2.55 m², No overhang

Windows facing North West: 7.24 m², No overhang

Air change rate: 4.71 ach

Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.08 W/m²K

Air permeability 3.3 m³/m²h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					3.3400
Infiltration rate					0.3712 (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) =	0.3433 (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	0.4378	0.4292	0.4206	0.3777	0.3691	0.3262	0.3262	0.3176	0.3433	0.3691	0.3863	0.4034 (22b)
Effective ac	0.5958	0.5921	0.5884	0.5713	0.5681	0.5532	0.5532	0.5504	0.5589	0.5681	0.5746	0.5814 (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)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	38.5192	38.2786	38.0429	36.9354	36.7282	35.7637	35.7637	35.5851	36.1352	36.7282	37.1474	37.5856 (38)
Heat transfer coeff	95.2268	94.9862	94.7505	93.6430	93.4358	92.4713	92.4713	92.2927	92.8428	93.4358	93.8550	94.2932 (39)
Average = Sum(39)m / 12 =												93.6420 (39)
HLP	1.2128	1.2097	1.2067	1.1926	1.1900	1.1777	1.1777	1.1754	1.1824	1.1900	1.1953	1.2009 (40)
HLP (average)												1.1926 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

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

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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													3308.0403 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	529.7323	437.8243	398.6566	270.3474	165.0196	0.0000	0.0000	0.0000	0.0000	251.6895	394.3787	536.2039	(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)	587.2864	485.3928	441.9697	299.7200	182.9485	0.0000	0.0000	0.0000	0.0000	279.0349	437.2269	594.4611	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater (217)m	87.6371	87.5233	87.2314	86.5357	85.1561	76.4000	76.4000	76.4000	76.4000	86.1878	87.1937	76.4000	(216)
Fuel for water heating, kWh/month	116.7691	101.9601	106.0898	95.6631	94.5516	92.5669	88.6492	99.8298	100.4158	101.3931	106.7028	113.0782	(219)
Water heating fuel used													1217.6695 (219)
Annual totals kWh/year													
Space heating fuel - main system													3308.0403 (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)													372.4349 (232)
Total delivered energy for all uses													4973.1447 (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	3308.0403	0.2160	714.5367	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1217.6695	0.2160	263.0166	(264)
Space and water heating			977.5533	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	372.4349	0.5190	193.2937	(268)
Total CO2, kg/year			1209.7720	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.4100	(273)

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

DER			15.4100	ZC1
Total Floor Area		TFA	78.5200	
Assumed number of occupants		N	2.4342	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.3253	ZC2
CO2 emissions from cooking, equation (L16)			2.2596	ZC3
Total CO2 emissions			33.9949	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			33.9949	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

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

2. Ventilation rate

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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.0900	1.0000	2.0900		(26)					
TER Opening Type (Uw = 1.40)			9.8000	1.3258	12.9792		(27)					
Flr - Ground			39.2630	0.1300	5.1042		(28a)					
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.1800	13.8195		(29a)					
Rf - Ins Joist	39.2630		39.2630	0.1300	5.1042		(30)					
Total net area of external elements Aum(A, m2)			167.1810				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		39.0970		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7265 (36)					
Total fabric heat loss						(33) + (36) =	47.8235 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.6317	Feb 39.3479	Mar 39.0698	Apr 37.7635	May 37.5191	Jun 36.3813	Jul 36.3813	Aug 36.1706	Sep 36.8196	Oct 37.5191	Nov 38.0135	Dec 38.5304 (38)
Heat transfer coeff	87.4552	87.1715	86.8934	85.5870	85.3426	84.2049	84.2049	83.9942	84.6431	85.3426	85.8371	86.3540 (39)
Average = Sum(39)m / 12 =												85.5859 (39)
HLP	Jan 1.1138	Feb 1.1102	Mar 1.1066	Apr 1.0900	May 1.0869	Jun 1.0724	Jul 1.0724	Aug 1.0697	Sep 1.0780	Oct 1.0869	Nov 1.0932	Dec 1.0998 (40)
HLP (average)												1.0900 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

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

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.2210	18.8483	15.3285	11.6046	8.6746	7.3235	7.9133	10.2860	13.8058	17.5296	20.4597	21.8108	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.3196	218.5643	212.9077	200.8654	185.6642	171.3772	161.8326	159.5879	165.2445	177.2868	192.4880	206.7750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	(71)
Water heating gains (Table 5)	84.2024	81.6544	76.6105	69.9799	65.4540	59.3384	54.6760	61.2800	64.0327	70.8735	78.5166	82.0858	(72)
Total internal gains	384.2557	381.5797	367.3593	344.9626	322.3054	300.5517	286.9346	293.6665	305.5957	328.2026	353.9769	373.1843	(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
Southeast					2.5540	36.7938	0.6300	0.7000	0.7700			28.7189 (77)
Northwest					7.2440	11.2829	0.6300	0.7000	0.7700			24.9789 (81)
Solar gains	53.6978	99.7641	158.5398	233.3780	295.1194	307.8161	290.5956	242.2664	184.0987	116.2027	65.8285	44.9764 (83)
Total gains	437.9534	481.3438	525.8992	578.3406	617.4248	608.3678	577.5302	535.9329	489.6943	444.4053	419.8054	418.1607 (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	62.3494	62.5523	62.7525	63.7103	63.8928	64.7561	64.7561	64.9185	64.4208	63.8928	63.5247	63.1445	
alpha	5.1566	5.1702	5.1835	5.2474	5.2595	5.3171	5.3171	5.3279	5.2947	5.2595	5.2350	5.2096	
util living area	0.9986	0.9974	0.9937	0.9787	0.9252	0.7866	0.6184	0.6807	0.9052	0.9867	0.9973	0.9989	(86)
MIT	19.7681	19.8875	20.1110	20.4321	20.7308	20.9268	20.9838	20.9738	20.8294	20.4566	20.0640	19.7530	(87)
Th 2	19.9896	19.9925	19.9954	20.0090	20.0116	20.0234	20.0234	20.0256	20.0189	20.0116	20.0064	20.0010	(88)
util rest of house	0.9981	0.9965	0.9913	0.9698	0.8924	0.7020	0.4929	0.5558	0.8506	0.9796	0.9961	0.9985	(89)
MIT 2	18.3407	18.5173	18.8453	19.3184	19.7310	19.9708	20.0170	20.0138	19.8689	19.3596	18.7856	18.3268	(90)
Living area fraction	18.6301	18.7951	19.1019	19.5442	19.9337	20.1646	20.2130	20.2084	20.0636	19.5821	19.0448	18.6160	(91)
MIT	18.6301	18.7951	19.1019	19.5442	19.9337	20.1646	20.2130	20.2084	20.0636	19.5821	19.0448	18.6160	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6301	18.7951	19.1019	19.5442	19.9337	20.1646	20.2130	20.2084	20.0636	19.5821	19.0448	18.6160	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	436.6921	478.8786	519.7287	557.6701	549.0624	435.3123	299.3820	311.3112	418.0111	433.4256	417.4836	417.2148	(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	(95)
Heat loss rate W	1253.2448	1211.2593	1095.0237	911.0064	702.6843	468.5686	304.2326	319.8872	504.7814	766.5527	1025.3051	1244.8784	(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	607.5152	492.1598	428.0195	254.4021	114.2947	0.0000	0.0000	0.0000	0.0000	247.8466	437.6314	615.7817	(98)
Space heating												3197.6509	(98)
Space heating per m2												40.7240	(99)

8c. Space cooling requirement

Not applicable

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

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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													3423.6091 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	607.5152	492.1598	428.0195	254.4021	114.2947	0.0000	0.0000	0.0000	0.0000	247.8466	437.6314	615.7817	(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)	650.4445	526.9377	458.2650	272.3791	122.3712	0.0000	0.0000	0.0000	0.0000	265.3603	468.5562	659.2952	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	201.0548	176.1665	183.2898	162.5688	157.3953	138.6250	132.8133	148.0557	149.6908	170.4528	181.9550	196.3187	(64)
Efficiency of water heater	87.6584	87.4990	87.1147	86.1741	84.2603	80.3000	80.3000	80.3000	80.3000	85.9926	87.1798	87.7324	(217)
Fuel for water heating, kWh/month	229.3615	201.3353	210.4005	188.6515	186.7965	172.6338	165.3964	184.3782	186.4144	198.2180	208.7124	223.7699	(219)
Water heating fuel used												2356.0684	(219)
Annual totals kWh/year													
Space heating fuel - main system												3423.6091	(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)												374.7696	(232)
Total delivered energy for all uses												6229.4472	(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	3423.6091	0.2160	739.4996 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2356.0684	0.2160	508.9108 (264)
Space and water heating			1248.4104 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	374.7696	0.5190	194.5054 (268)
Total CO2, kg/m2/year			1481.8408 (272)
Emissions per m2 for space and water heating			15.8993 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4771 (272b)
Emissions per m2 for pumps and fans			0.4957 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8993 * 1.00) + 2.4771 + 0.4957, rounded to 2 d.p.			18.8700 (273)

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1531 (8)
Pressure test					Yes
Measured/design AP50					3.3400
Infiltration rate					0.3201 (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) =	0.2961 (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	0.3776	0.3702	0.3628	0.3257	0.3183	0.2813	0.2813	0.2739	0.2961	0.3183	0.3331	0.3479 (22b)
Effective ac	0.5713	0.5685	0.5658	0.5531	0.5507	0.5396	0.5396	0.5375	0.5438	0.5507	0.5555	0.5605 (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)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (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	36.9326	36.7537	36.5783	35.7545	35.6004	34.8829	34.8829	34.7500	35.1592	35.6004	35.9122	36.2381 (38)
Heat transfer coeff	93.6402	93.4613	93.2859	92.4621	92.3080	91.5905	91.5905	91.4576	91.8668	92.3080	92.6198	92.9457 (39)
Average = Sum(39)m / 12 =												92.4614 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1926	1.1903	1.1881	1.1776	1.1756	1.1665	1.1665	1.1648	1.1700	1.1756	1.1796	1.1837 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)

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

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

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.0888	18.7309	15.2330	11.5323	8.6206	7.2778	7.8640	10.2219	13.7198	17.4204	20.3322	21.6749	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.3196	218.5643	212.9077	200.8654	185.6642	171.3772	161.8326	159.5879	165.2445	177.2868	192.4880	206.7750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	(71)
Water heating gains (Table 5)	42.8701	41.5117	38.6909	34.8561	32.3664	28.8607	25.8810	29.6988	31.0553	35.0245	39.5063	41.5174	(72)
Total internal gains	339.7912	338.3196	326.3443	306.7665	286.1638	267.0284	255.0902	259.0212	269.5323	289.2443	311.8392	329.4800	(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	
Southeast			2.5540		36.7938		0.7300		0.7200		0.7700		34.2282 (77)	
Northwest			7.2440		11.2829		0.7300		0.7200		0.7700		29.7707 (81)	
Solar gains			63.9990	118.9025	188.9536	278.1485	351.7341	366.8665	346.3425	288.7420	219.4155	138.4946	78.4568	53.6045 (83)
Total gains			403.7901	457.2221	515.2979	584.9150	637.8979	633.8949	601.4328	547.7632	488.9478	427.7389	390.2960	383.0845 (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	15.6356	15.6656	15.6950	15.8348	15.8613	15.9855	15.9855	16.0088	15.9374	15.8613	15.8079	15.7524	
alpha	2.0424	2.0444	2.0463	2.0557	2.0574	2.0657	2.0657	2.0673	2.0625	2.0574	2.0539	2.0502	
util living area	0.9525	0.9374	0.9093	0.8541	0.7663	0.6471	0.5333	0.5820	0.7559	0.8852	0.9383	0.9571	(86)
MIT	17.7164	18.0003	18.5333	19.2645	19.9630	20.5044	20.7684	20.7128	20.2569	19.3692	18.4204	17.6600	(87)
Th 2	19.9260	19.9278	19.9296	19.9380	19.9396	19.9469	19.9469	19.9483	19.9441	19.9396	19.9364	19.9330	(88)
util rest of house	0.9467	0.9297	0.8976	0.8337	0.7300	0.5839	0.4386	0.4901	0.7044	0.8650	0.9295	0.9518	(89)
MIT 2	16.9159	17.1977	17.7246	18.4443	19.1123	19.6102	19.8265	19.7903	19.4029	18.5592	17.6230	16.8647	(90)
Living area fraction									fLA = Living area / (4) =			0.2028	(91)
MIT	17.0782	17.3604	17.8886	18.6106	19.2848	19.7915	20.0174	19.9773	19.5761	18.7234	17.7846	17.0259	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0782	17.3604	17.8886	18.6106	19.2848	19.7915	20.0174	19.9773	19.5761	18.7234	17.7846	17.0259	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9252	0.9046	0.8683	0.8022	0.7037	0.5734	0.4456	0.4929	0.6830	0.8350	0.9049	0.9317	(94)
Ext temp.	373.5862	413.6226	447.4398	469.1940	448.8826	363.5070	267.9755	270.0020	333.9542	357.1627	353.1603	356.9030	(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	1196.5499	1164.5643	1062.3947	897.8619	700.1346	475.4926	313.0050	327.1724	503.0677	749.8550	989.6087	1192.1152	(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 per m2	612.2850	504.6328	457.5264	308.6409	186.9315	0.0000	0.0000	0.0000	0.0000	292.1630	458.2429	621.3978	(98)
												3441.8204	(98)
												43.8337	(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	860.9505	677.7695	695.0778	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6624	0.7249	0.6911	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	570.2683	491.2952	480.3638	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	832.3700	792.6209	731.6578	0.0000	0.0000	0.0000	0.0000	(103)

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Month fraction	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	188.7132	224.1863	186.9628	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												599.8623 (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	47.1783	56.0466	46.7407	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												149.9656 (107)
Space cooling per m2												1.9099 (108)
Energy for space heating												43.8337 (99)
Energy for space cooling												1.9099 (108)
Total												45.7436 (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	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (5)

2. Ventilation rate

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

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.0900	1.0000	2.0900		(26)					
TER Opening Type (Uw = 1.40)			9.8000	1.3258	12.9792		(27)					
Flr - Ground			39.2630	0.1300	5.1042		(28a)					
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.1800	13.8195		(29a)					
Rf - Ins Joist	39.2630		39.2630	0.1300	5.1042		(30)					
Total net area of external elements Aum(A, m2)			167.1810				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.0970		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7265 (36)					
Total fabric heat loss						(33) + (36) =	47.8235 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 39.6317	Feb 39.3479	Mar 39.0698	Apr 37.7635	May 37.5191	Jun 36.3813	Jul 36.3813	Aug 36.1706	Sep 36.8196	Oct 37.5191	Nov 38.0135	Dec 38.5304 (38)
Heat transfer coeff	87.4552	87.1715	86.8934	85.5870	85.3426	84.2049	84.2049	83.9942	84.6431	85.3426	85.8371	86.3540 (39)
Average = Sum(39)m / 12 =												85.5859 (39)
HLP	Jan 1.1138	Feb 1.1102	Mar 1.1066	Apr 1.0900	May 1.0869	Jun 1.0724	Jul 1.0724	Aug 1.0697	Sep 1.0780	Oct 1.0869	Nov 1.0932	Dec 1.0998 (40)
HLP (average)												1.0900 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

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

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	121.7090	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.2210	18.8483	15.3285	11.6046	8.6746	7.3235	7.9133	10.2860	13.8058	17.5296	20.4597	21.8108	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.3196	218.5643	212.9077	200.8654	185.6642	171.3772	161.8326	159.5879	165.2445	177.2868	192.4880	206.7750	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	35.1709	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	(71)
Water heating gains (Table 5)	42.8701	41.5117	38.6909	34.8561	32.3664	28.8607	25.8810	29.6988	31.0553	35.0245	39.5063	41.5174	(72)
Total internal gains	339.9234	338.4370	326.4398	306.8388	286.2178	267.0740	255.1395	259.0853	269.6183	289.3535	311.9667	329.6159	(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					
Southeast				2.5540	36.7938	0.6300		0.7000	0.7700	28.7189 (77)					
Northwest				7.2440	11.2829	0.6300		0.7000	0.7700	24.9789 (81)					
Solar gains				53.6978	99.7641	158.5398	233.3780	295.1194	307.8161	290.5956	242.2664	184.0987	116.2027	65.8285	44.9764 (83)
Total gains				393.6211	438.2011	484.9796	540.2168	581.3372	574.8901	545.7351	501.3517	453.7169	405.5562	377.7952	374.5923 (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	62.3494	62.5523	62.7525	63.7103	63.8928	64.7561	64.7561	64.9185	64.4208	63.8928	63.5247	63.1445	
alpha	5.1566	5.1702	5.1835	5.2474	5.2595	5.3171	5.3171	5.3279	5.2947	5.2595	5.2350	5.2096	
util living area	0.9992	0.9983	0.9956	0.9840	0.9393	0.8133	0.6485	0.7160	0.9264	0.9911	0.9983	0.9994	(86)
MIT	19.7151	19.8362	20.0631	20.3905	20.7004	20.9134	20.9798	20.9668	20.8016	20.4124	20.0138	19.7007	(87)
Th 2	19.9896	19.9925	19.9954	20.0090	20.0116	20.0234	20.0234	20.0256	20.0189	20.0116	20.0064	20.0010	(88)
util rest of house	0.9989	0.9977	0.9939	0.9771	0.9110	0.7317	0.5197	0.5899	0.8797	0.9862	0.9976	0.9991	(89)
MIT 2	18.8109	18.9342	19.1628	19.4975	19.7941	19.9797	20.0178	20.0150	19.8954	19.5236	19.1230	18.8057	(90)
Living area fraction	18.9942	19.1171	19.3453	19.6786	19.9779	20.1690	20.2129	20.2080	fLA = Living area / (4) =			0.2028	(91)
MIT	18.9942	19.1171	19.3453	19.6786	19.9779	20.1690	20.2129	20.2080	20.0791	19.7038	19.3036	18.9872	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9942	19.1171	19.3453	19.6786	19.9779	20.1690	20.2129	20.2080	20.0791	19.7038	19.3036	18.9872	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9984	0.9970	0.9924	0.9741	0.9099	0.7454	0.5461	0.6156	0.8833	0.9841	0.9969	0.9988	(94)
Ext temp.	393.0091	436.8873	481.3136	526.2171	528.9366	428.5198	298.0442	308.6343	400.7633	399.0996	376.6334	374.1473	(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	1285.0857	1239.3219	1116.1753	922.5075	706.4543	468.9398	304.2196	319.8471	506.0929	776.9451	1047.5223	1276.9307	(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	663.7051	539.2360	472.3371	285.3290	132.0731	0.0000	0.0000	0.0000	0.0000	281.1171	483.0400	671.6708	(98)
Space heating per m2												3528.5082	(98)
												44.9377	(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	791.5259	623.1161	638.3558	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8261	0.8991	0.8659	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	653.8972	560.2645	552.7590	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	763.4640	727.5854	677.4959	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	78.8882	124.4868	92.8043	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												296.1792	(104)
Cooled fraction												1.0000	(105)

fC = cooled area / (4) =

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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	19.7220	31.1217	23.2011	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											74.0448 (107)
Space cooling per m2											0.9430 (108)
Energy for space heating											44.9377 (99)
Energy for space cooling											0.9430 (108)
Total											45.8807 (109)
Target Fabric Energy Efficiency (TFEE)											52.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

										main	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																4 * 10 =	40.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000	/ (5) =	0.2042 (8)
Pressure test										Yes							
Measured/design AP50										3.3400							
Infiltration rate										0.3712 (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) =					0.3433 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Wind factor	4.9000	4.6000	4.5000	4.2000	4.2000	4.1000	4.1000	4.0000	4.0000	4.3000	4.3000	4.4000	(22)				
Adj infilt rate	1.2250	1.1500	1.1250	1.0500	1.0500	1.0250	1.0250	1.0000	1.0000	1.0750	1.0750	1.1000	(22a)				
	0.4206	0.3948	0.3863	0.3605	0.3605	0.3519	0.3519	0.3433	0.3433	0.3691	0.3691	0.3777	(22b)				
Effective ac	0.5884	0.5779	0.5746	0.5650	0.5650	0.5619	0.5619	0.5589	0.5589	0.5681	0.5681	0.5713	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Solid Door			2.0900	1.2000	2.5080		(26)					
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)					
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)					
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)					
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)					
Total net area of external elements Aum(A, m2)			167.1810				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)					
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)					
Stud			74.8825			7.4000	554.1306 (32c)					
Internal Floor			39.2630			7.4000	290.5462 (32d)					
Internal Ceiling			39.2630			7.4000	290.5462 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	5270.8410 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							67.1274 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)					
Total fabric heat loss						(33) + (36) =	56.7076 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	38.0429	37.3641	37.1474	36.5258	36.5258	36.3281	36.3281	36.1352	36.1352	36.7282	36.7282	36.9354 (38)
Heat transfer coeff	94.7505	94.0717	93.8550	93.2334	93.2334	93.0357	93.0357	92.8428	92.8428	93.4358	93.4358	93.6430 (39)
Average = Sum(39)m / 12 =												93.4513 (39)
HLP	Jan 1.2067	Feb 1.1981	Mar 1.1953	Apr 1.1874	May 1.1874	Jun 1.1849	Jul 1.1849	Aug 1.1824	Sep 1.1824	Oct 1.1900	Nov 1.1900	Dec 1.1926 (40)
HLP (average)												1.1902 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

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Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	22.5144	19.6912	20.3196	17.7151	16.9981	14.6680	13.5921	15.5971	15.7834	18.3940	20.0785	21.8040 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.6693	0.5762	0.5721	0.4792	0.4411	0.3644	0.3377	0.4047	0.4270	0.5179	0.5875	0.6482 (61)
Total heat required for water heating calculated for each month	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	150.7652	131.8510	136.0359	118.5799	113.7614	98.1513	90.9516	104.3855	105.6496	123.1448	134.4443	146.0081 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	50.0742	43.7929	45.1848	39.3883	37.7893	32.6052	30.2135	34.6748	35.0933	40.9029	44.6543	48.4942 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7220	46.8272	38.0825	28.8309	21.5514	18.1946	19.6599	25.5547	34.2995	43.5511	50.8305	54.1873 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.8650	326.2153	317.7726	299.7991	277.1107	255.7868	241.5411	238.1908	246.6335	264.6071	287.2955	308.6193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672 (71)
Water heating gains (Table 5)	67.3040	65.1680	60.7322	54.7059	50.7921	45.2851	40.6096	46.6059	48.7407	54.9770	62.0198	65.1804 (72)
Total internal gains	546.6139	541.9334	520.3101	487.0587	453.1770	422.9893	405.5335	414.0743	433.3965	466.8580	503.8686	531.7099 (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
Southeast					2.5540	45.0642	0.7300	0.7200			0.7700	41.9219 (77)
Northwest					7.2440	14.6130	0.7300	0.7200			0.7700	38.5574 (81)
Solar gains	80.4793	128.0337	208.6875	311.4907	372.0258	428.3579	390.9133	339.2685	256.1250	163.4515	98.5093	66.1538 (83)
Total gains	627.0932	669.9671	728.9976	798.5494	825.2028	851.3472	796.4468	753.3428	689.5215	630.3095	602.3780	597.8637 (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	15.4524	15.5639	15.5998	15.7038	15.7038	15.7372	15.7372	15.7699	15.7699	15.6698	15.6698	15.6351
alpha	2.0302	2.0376	2.0400	2.0469	2.0469	2.0491	2.0491	2.0513	2.0513	2.0447	2.0447	2.0423
util living area	0.8876	0.8702	0.8275	0.7486	0.6330	0.4678	0.3500	0.3568	0.5677	0.7523	0.8506	0.8938 (86)
MIT	18.5281	18.7257	19.2059	19.8322	20.4021	20.7871	20.9209	20.9207	20.6665	20.0558	19.2505	18.5244 (87)
Th 2	19.9146	19.9216	19.9238	19.9301	19.9301	19.9321	19.9321	19.9341	19.9341	19.9280	19.9280	19.9259 (88)
util rest of house	0.8744	0.8551	0.8068	0.7168	0.5819	0.3906	0.2483	0.2503	0.4917	0.7118	0.8299	0.8811 (89)
MIT 2	16.7062	16.9872	17.6649	18.5348	19.2949	19.7590	19.8918	19.8951	19.6388	18.8585	17.7416	16.7060 (90)
Living area fraction	17.0756	17.3397	17.9773	18.7978	19.5194	19.9675	20.1004	20.1030	19.8472	19.1013	18.0476	17.0747 (92)
Temperature adjustment	16.9256	17.1897	17.8273	18.6478	19.3694	19.8175	19.9504	19.9530	19.6972	18.9513	17.8976	-0.1500
adjusted MIT												16.9247 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	516.7982	538.4857	550.3947	535.9252	455.0922	324.8412	199.2117	190.0645	325.9478	420.2909	468.7646	497.3507 (94)
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	1063.6344	1043.2231	950.5000	796.9432	584.5133	364.4631	209.3722	199.8950	389.6782	621.4684	850.0376	1041.7498 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	406.8461	339.1835	297.6783	187.9329	96.2893	0.0000	0.0000	0.0000	0.0000	149.6761	274.5166	405.0329 (98)
Space heating												2157.1558 (98)
RHI space heating demand												2157 (98)

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1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					3.3400
Infiltration rate					0.3712 (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) =	0.3433 (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	0.4378	0.4292	0.4206	0.3777	0.3691	0.3262	0.3262	0.3176	0.3433	0.3691	0.3863	0.4034 (22b)
Effective ac	0.5958	0.5921	0.5884	0.5713	0.5681	0.5532	0.5532	0.5504	0.5589	0.5681	0.5746	0.5814 (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)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	38.5192	38.2786	38.0429	36.9354	36.7282	35.7637	35.7637	35.5851	36.1352	36.7282	37.1474	37.5856 (38)
Heat transfer coeff	95.2268	94.9862	94.7505	93.6430	93.4358	92.4713	92.4713	92.2927	92.8428	93.4358	93.8550	94.2932 (39)
Average = Sum(39)m / 12 =												93.6420 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2128	1.2097	1.2067	1.1926	1.1900	1.1777	1.1777	1.1754	1.1824	1.1900	1.1953	1.2009 (40)
HLP (average)												1.1926 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

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

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7220	46.8272	38.0825	28.8309	21.5514	18.1946	19.6599	25.5547	34.2995	43.5511	50.8305	54.1873 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.8650	326.2153	317.7726	299.7991	277.1107	255.7868	241.5411	238.1908	246.6335	264.6071	287.2955	308.6193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672 (71)
Water heating gains (Table 5)	67.3040	65.1680	60.7322	54.7059	50.7921	45.2851	40.6096	46.6059	48.7407	54.9770	62.0198	65.1804 (72)
Total internal gains	546.6139	541.9334	520.3101	487.0587	453.1770	422.9893	405.5335	414.0743	433.3965	466.8580	503.8686	531.7099 (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
Southeast					2.5540	36.7938	0.7300		0.7200	0.7700		34.2282 (77)
Northwest					7.2440	11.2829	0.7300		0.7200	0.7700		29.7707 (81)
Solar gains	63.9990	118.9025	188.9536	278.1485	351.7341	366.8665	346.3425	288.7420	219.4155	138.4946	78.4568	53.6045 (83)
Total gains	610.6129	660.8359	709.2637	765.2072	804.9112	789.8558	751.8761	702.8163	652.8121	605.3526	582.3255	585.3144 (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	15.3751	15.4140	15.4524	15.6351	15.6698	15.8333	15.8333	15.8639	15.7699	15.6698	15.5998	15.5273
alpha	2.0250	2.0276	2.0302	2.0423	2.0447	2.0556	2.0556	2.0576	2.0513	2.0447	2.0400	2.0352
util living area	0.9061	0.8875	0.8539	0.7911	0.6969	0.5722	0.4582	0.4962	0.6659	0.8123	0.8831	0.9126 (86)
MIT	18.1373	18.3940	18.8737	19.5304	20.1413	20.6080	20.8251	20.7873	20.4241	19.6619	18.8018	18.0866 (87)
Th 2	19.9098	19.9122	19.9146	19.9259	19.9280	19.9379	19.9379	19.9397	19.9341	19.9280	19.9238	19.9193 (88)
util rest of house	0.8957	0.8750	0.8369	0.7652	0.6560	0.5079	0.3690	0.4079	0.6079	0.7837	0.8681	0.9029 (89)
MIT 2	16.1457	16.5110	17.1927	18.1180	18.9529	19.5614	19.8106	19.7766	19.3454	18.3195	17.1037	16.0765 (90)
Living area fraction									fLA = Living area / (4) =			0.2028 (91)
MIT	16.5495	16.8928	17.5335	18.4044	19.1939	19.7736	20.0163	19.9816	19.5641	18.5917	17.4480	16.4840 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.3995	16.7428	17.3835	18.2544	19.0439	19.6236	19.8663	19.8316	19.4141	18.4417	17.2980	16.3340 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.8478	0.8247	0.7847	0.7155	0.6167	0.4868	0.3624	0.3980	0.5749	0.7332	0.8176	0.8564 (94)
Useful gains	517.6556	544.9761	556.5602	547.4913	496.4050	384.4649	272.4990	279.7294	375.2769	443.8179	476.1322	501.2471 (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	1152.1929	1124.9006	1031.2206	875.9729	686.1806	464.5387	302.0404	316.7070	493.3752	732.6958	957.1317	1144.1566 (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	472.0958	389.7093	353.1474	236.5068	141.1930	0.0000	0.0000	0.0000	0.0000	214.9252	346.3197	478.3247 (98)
Space heating												2632.2219 (98)
Space heating per m2												(98) / (4) = 33.5229 (99)

8c. Space cooling requirement

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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												2918.2061 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	472.0958	389.7093	353.1474	236.5068	141.1930	0.0000	0.0000	0.0000	0.0000	214.9252	346.3197	478.3247 (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)	523.3878	432.0502	391.5160	262.2026	156.5332	0.0000	0.0000	0.0000	0.0000	238.2763	383.9464	530.2935 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991 (64)
Efficiency of water heater (217)m	87.3880	87.2631	86.9393	86.1647	84.6474	76.4000	76.4000	76.4000	76.4000	85.7241	86.8770	76.4000 (216)
Fuel for water heating, kWh/month	117.1020	102.2640	106.4463	96.0750	95.1199	92.5669	88.6492	99.8298	100.4158	101.9416	107.0918	113.3890 (219)
Water heating fuel used												1220.8912 (219)
Annual totals kWh/year												
Space heating fuel - main system												2918.2061 (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)												372.4349 (232)
Total delivered energy for all uses												4586.5322 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2918.2061	3.4800	101.5536 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1220.8912	3.4800	42.4870 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	372.4349	13.1900	49.1242 (250)
Additional standing charges			120.0000 (251)
Total energy cost			323.0573 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0985 (257)
SAP value		84.6762
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	2918.2061	0.2160	630.3325 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1220.8912	0.2160	263.7125 (264)
Space and water heating			894.0450 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.4349	0.5190	193.2937 (268)
Total kg/year			1126.2637 (272)
CO2 emissions per m2			14.3400 (273)
EI value			87.7818
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	$3.48 / 0.8317 = 4.184$, stars = 5
Water heating environmental impact	$0.216 / 0.8317 = 0.2597$, stars = 5

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

1. Overall dwelling dimensions

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

2. Ventilation rate

										main	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																4 * 10 =	40.0000 (7a)									
Number of passive vents																0 * 10 =	0.0000 (7b)									
Number of flueless gas fires																0 * 40 =	0.0000 (7c)									
										Air changes per hour																
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000	/ (5) =	0.2042 (8)									
Pressure test																Yes										
Measured/design AP50																	3.3400									
Infiltration rate																	0.3712 (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) =		0.3433 (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														0.4206	0.3948	0.3863	0.3605	0.3605	0.3519	0.3519	0.3433	0.3433	0.3691	0.3691	0.3777 (22b)	
Effective ac														0.5884	0.5779	0.5746	0.5650	0.5650	0.5619	0.5619	0.5589	0.5589	0.5681	0.5681	0.5713 (25)	

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Solid Door			2.0900	1.2000	2.5080		(26)					
Windows (Uw = 1.40)			9.8000	1.3258	12.9792		(27)					
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)					
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)					
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)					
Total net area of external elements Aum(A, m2)			167.1810				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	41.8183			(33)					
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)					
Stud			74.8825			7.4000	554.1306 (32c)					
Internal Floor			39.2630			7.4000	290.5462 (32d)					
Internal Ceiling			39.2630			7.4000	290.5462 (32e)					
Heat capacity Cm = Sum(A x k)					(28) ... (30) + (32) + (32a) ... (32e) =		5270.8410 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							67.1274 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)					
Total fabric heat loss						(33) + (36) =	56.7076 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	38.0429	37.3641	37.1474	36.5258	36.5258	36.3281	36.3281	36.1352	36.1352	36.7282	36.7282	36.9354 (38)
Heat transfer coeff	94.7505	94.0717	93.8550	93.2334	93.2334	93.0357	93.0357	92.8428	92.8428	93.4358	93.4358	93.6430 (39)
Average = Sum(39)m / 12 =												93.4513 (39)
HLP	Jan 1.2067	Feb 1.1981	Mar 1.1953	Apr 1.1874	May 1.1874	Jun 1.1849	Jul 1.1849	Aug 1.1824	Sep 1.1824	Oct 1.1900	Nov 1.1900	Dec 1.1926 (40)
HLP (average)												1.1902 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

Design SAP
elmhurst energy

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

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													2391.5252 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	406.8461	339.1835	297.6783	187.9329	96.2893	0.0000	0.0000	0.0000	0.0000	149.6761	274.5166	405.0329	(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)	451.0489	376.0350	330.0203	208.3513	106.7509	0.0000	0.0000	0.0000	0.0000	165.9380	304.3421	449.0387	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater (217)m	87.0403	86.9294	86.4948	85.4786	83.3443	76.4000	76.4000	76.4000	76.4000	84.5690	86.2562	76.4000	(216)
Fuel for water heating, kWh/month	117.5698	102.6567	106.9933	96.8462	96.6070	92.5669	88.6492	99.8298	100.4158	103.3339	107.8625	113.8849	(219)
Water heating fuel used												1227.2161	(219)
Annual totals kWh/year													
Space heating fuel - main system												2391.5252	(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)												372.4349	(232)
Total delivered energy for all uses												4066.1762	(238)

10a. Fuel costs - using BEDF prices (559)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2391.5252	5.7300	137.0344 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1227.2161	5.7300	70.3195 (247)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Energy for lighting	372.4349	24.1800	90.0548 (250)
Additional standing charges			114.0000 (251)
Total energy cost			429.5436 (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	2391.5252	0.2160	516.5695 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1227.2161	0.2160	265.0787 (264)
Space and water heating			781.6481 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.4349	0.5190	193.2937 (268)
Total kg/year			1013.8668 (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	2391.5252	1.2200	2917.6608 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1227.2161	1.2200	1497.2036 (264)
Space and water heating			4414.8644 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	372.4349	3.0700	1143.3752 (268)
Primary energy kWh/year			5788.4896 (272)
Primary energy kWh/m2/year			73.7199 (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	+ 10.8	-£ 471	-1010 kg (99.6%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.9	-£ 32	-141 kg (13.9%)
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Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar photovoltaic panels	£471	12.87 kg/m²	A 95	A 98
Total Savings	£471	12.87 kg/m²		
Potential energy efficiency rating:			A 95	
Potential environmental impact rating:				A 98

Fuel prices for cost data on this page from database revision number 559 TEST (13 Dec 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	£108	£108	£0
Mains gas	£321	£321	£0
Space heating	£269	£269	£0
Water heating	£70	£70	£0
Lighting	£90	£90	£0
Generated (PV)	-£0	-£471	£471
Total cost of fuels	£429	-£42	£471
Total cost of uses	£429	-£42	£471
Delivered energy	52 kWh/m²	27 kWh/m²	25 kWh/m²
Carbon dioxide emissions	1.0 tonnes	0.0 tonnes	1.0 tonnes
CO2 emissions per m²	13 kg/m²	0 kg/m²	13 kg/m²
Primary energy	74 kWh/m²	-2 kWh/m²	76 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	39.2600 (1b)	x 2.3700 (2b)	= 93.0462 (1b) - (3b)
First floor	39.2600 (1c)	x 2.6200 (2c)	= 102.8612 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 195.9074 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					3.3400
Infiltration rate					0.3712 (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) =	0.3433 (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	0.4378	0.4292	0.4206	0.3777	0.3691	0.3262	0.3262	0.3176	0.3433	0.3691	0.3863	0.4034 (22b)
Effective ac	0.5958	0.5921	0.5884	0.5713	0.5681	0.5532	0.5532	0.5504	0.5589	0.5681	0.5746	0.5814 (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)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss						(33) + (36) =	56.7076 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	38.5192	38.2786	38.0429	36.9354	36.7282	35.7637	35.7637	35.5851	36.1352	36.7282	37.1474	37.5856 (38)
Heat transfer coeff	95.2268	94.9862	94.7505	93.6430	93.4358	92.4713	92.4713	92.2927	92.8428	93.4358	93.8550	94.2932 (39)
Average = Sum(39)m / 12 =												93.6420 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2128	1.2097	1.2067	1.1926	1.1900	1.1777	1.1777	1.1754	1.1824	1.1900	1.1953	1.2009 (40)
HLP (average)												1.1926 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508	146.0508 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7220	46.8272	38.0825	28.8309	21.5514	18.1946	19.6599	25.5547	34.2995	43.5511	50.8305	54.1873 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.8650	326.2153	317.7726	299.7991	277.1107	255.7868	241.5411	238.1908	246.6335	264.6071	287.2955	308.6193 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393	52.0393 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672	-97.3672 (71)
Water heating gains (Table 5)	67.3040	65.1680	60.7322	54.7059	50.7921	45.2851	40.6096	46.6059	48.7407	54.9770	62.0198	65.1804 (72)
Total internal gains	546.6139	541.9334	520.3101	487.0587	453.1770	422.9893	405.5335	414.0743	433.3965	466.8580	503.8686	531.7099 (73)

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
				2,5540	36.7938	0.7300	0.7200	0.7700	34.2282 (77)			
				7,2440	11.2829	0.7300	0.7200	0.7700	29.7707 (81)			
Solar gains	63.9990	118.9025	188.9536	278.1485	351.7341	366.8665	346.3425	288.7420	219.4155	138.4946	78.4568	53.6045 (83)
Total gains	610.6129	660.8359	709.2637	765.2072	804.9112	789.8558	751.8761	702.8163	652.8121	605.3526	582.3255	585.3144 (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	15.3751	15.4140	15.4524	15.6351	15.6698	15.8333	15.8333	15.8639	15.7699	15.6698	15.5998	15.5273
alpha	2.0250	2.0276	2.0302	2.0423	2.0447	2.0556	2.0556	2.0576	2.0513	2.0447	2.0400	2.0352
util living area	0.9061	0.8875	0.8539	0.7911	0.6969	0.5722	0.4582	0.4962	0.6659	0.8123	0.8831	0.9126 (86)
MIT	18.1373	18.3940	18.8737	19.5304	20.1413	20.6080	20.8251	20.7873	20.4241	19.6619	18.8018	18.0866 (87)
Th 2	19.9098	19.9122	19.9146	19.9259	19.9280	19.9379	19.9379	19.9397	19.9341	19.9280	19.9238	19.9193 (88)
util rest of house	0.8957	0.8750	0.8369	0.7652	0.6560	0.5079	0.3690	0.4079	0.6079	0.7837	0.8681	0.9029 (89)
MIT 2	16.1457	16.5110	17.1927	18.1180	18.9529	19.5614	19.8106	19.7766	19.3454	18.3195	17.1037	16.0765 (90)
Living area fraction									fLA = Living area / (4)			0.2028 (91)
MIT	16.5495	16.8928	17.5335	18.4044	19.1939	19.7736	20.0163	19.9816	19.5641	18.5917	17.4480	16.4840 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.3995	16.7428	17.3835	18.2544	19.0439	19.6236	19.8663	19.8316	19.4141	18.4417	17.2980	16.3340 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8478	0.8247	0.7847	0.7155	0.6167	0.4868	0.3624	0.3980	0.5749	0.7332	0.8176	0.8564 (94)
Useful gains	517.6556	544.9761	556.5602	547.4913	496.4050	384.4649	272.4990	279.7294	375.2769	443.8179	476.1322	501.2471 (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	1152.1929	1124.9006	1031.2206	875.9729	686.1806	464.5387	302.0404	316.7070	493.3752	732.6958	957.1317	1144.1566 (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	472.0958	389.7093	353.1474	236.5068	141.1930	0.0000	0.0000	0.0000	0.0000	214.9252	346.3197	478.3247 (98)
Space heating												2632.2219 (98)
Space heating per m2										(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													2918.2061 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	472.0958	389.7093	353.1474	236.5068	141.1930	0.0000	0.0000	0.0000	0.0000	214.9252	346.3197	478.3247	(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)	523.3878	432.0502	391.5160	262.2026	156.5332	0.0000	0.0000	0.0000	0.0000	238.2763	383.9464	530.2935	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater (217)m	87.3880	87.2631	86.9393	86.1647	84.6474	76.4000	76.4000	76.4000	76.4000	85.7241	86.8770	76.4000	(216)
Fuel for water heating, kWh/month	117.1020	102.2640	106.4463	96.0750	95.1199	92.5669	88.6492	99.8298	100.4158	101.9416	107.0918	113.3890	(219)
Water heating fuel used												1220.8912	(219)
Annual totals kWh/year													
Space heating fuel - main system												2918.2061	(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)												372.4349	(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												2859.2928	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2918.2061	3.4800	101.5536 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1220.8912	3.4800	42.4870 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	372.4349	13.1900	49.1242 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			95.2344 (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] =	0.3238 (257)
SAP value		95.4827
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	2918.2061	0.2160	630.3325 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1220.8912	0.2160	263.7125 (264)
Space and water heating			894.0450 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.4349	0.5190	193.2937 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			229.8265 (272)
CO2 emissions per m2			2.9300 (273)
EI value			97.5067
EI rating			98 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AP50					3.3400
Infiltration rate					0.3712 (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) =	0.3433 (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	0.4206	0.3948	0.3863	0.3605	0.3605	0.3519	0.3519	0.3433	0.3433	0.3691	0.3691	0.3777 (22b)
Effective ac	0.5884	0.5779	0.5746	0.5650	0.5650	0.5619	0.5619	0.5589	0.5589	0.5681	0.5681	0.5713 (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)			9.8000	1.3258	12.9792		(27)
Flr - Ground			39.2630	0.1800	7.0673	75.6000	2968.2828 (28a)
Wl - Brick (Timber Frame)	88.6620	11.8870	76.7750	0.2100	16.1228	7.4000	568.1350 (29a)
Rf - Ins Joist	39.2630		39.2630	0.0800	3.1410	7.4000	290.5462 (30)
Total net area of external elements Aum(A, m ²)			167.1810				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.8183		(33)
Party Wall			41.7100	0.0000	0.0000	7.4000	308.6540 (32)
Stud			74.8825			7.4000	554.1306 (32c)
Internal Floor			39.2630			7.4000	290.5462 (32d)
Internal Ceiling			39.2630			7.4000	290.5462 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 5270.8410 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							67.1274 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8893 (36)
Total fabric heat loss							(33) + (36) = 56.7076 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.0429	37.3641	37.1474	36.5258	36.5258	36.3281	36.3281	36.1352	36.1352	36.7282	36.7282	36.9354 (38)
Heat transfer coeff	94.7505	94.0717	93.8550	93.2334	93.2334	93.0357	93.0357	92.8428	92.8428	93.4358	93.4358	93.6430 (39)
Average = Sum(39)m / 12 =												93.4513 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2067	1.1981	1.1953	1.1874	1.1874	1.1849	1.1849	1.1824	1.1824	1.1900	1.1900	1.1926 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4342 (42)
Average daily hot water use (litres/day)												92.0118 (43)

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

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

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												2391.5252	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	406.8461	339.1835	297.6783	187.9329	96.2893	0.0000	0.0000	0.0000	0.0000	149.6761	274.5166	405.0329	(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)	451.0489	376.0350	330.0203	208.3513	106.7509	0.0000	0.0000	0.0000	0.0000	165.9380	304.3421	449.0387	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	102.3331	89.2388	92.5437	82.7828	80.5164	70.7211	67.7280	76.2699	76.7177	87.3884	93.0381	99.1991	(64)
Efficiency of water heater (217)m	87.0403	86.9294	86.4948	85.4786	83.3443	76.4000	76.4000	76.4000	76.4000	84.5690	86.2562	76.4000	(216)
Fuel for water heating, kWh/month	117.5698	102.6567	106.9933	96.8462	96.6070	92.5669	88.6492	99.8298	100.4158	103.3339	107.8625	113.8849	(219)
Water heating fuel used												1227.2161	(219)
Annual totals kWh/year													
Space heating fuel - main system												2391.5252	(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)												372.4349	(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												2119.7303	(238)

10a. Fuel costs - using BEDF prices (559)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2391.5252	5.7300	137.0344 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1227.2161	5.7300	70.3195 (247)
Pumps and fans for heating	75.0000	24.1800	18.1350 (249)
Energy for lighting	372.4349	24.1800	90.0548 (250)
Additional standing charges			114.0000 (251)
Energy saving/generation technologies			
PV Unit	-1946.4459	24.1800	-470.6506 (252)
Total energy cost			-41.1070 (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	2391.5252	0.2160	516.5695 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1227.2161	0.2160	265.0787 (264)
Space and water heating			781.6481 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.4349	0.5190	193.2937 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	0.5190	-1010.2054 (269)
Total kg/year			3.6614 (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	2391.5252	1.2200	2917.6608 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1227.2161	1.2200	1497.2036 (264)
Space and water heating			4414.8644 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	372.4349	3.0700	1143.3752 (268)
Energy saving/generation technologies			
PV Unit	-1946.4459	3.0700	-5975.5890 (269)
Primary energy kWh/year			-187.0994 (272)
Primary energy kWh/m2/year			-2.3828 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Property Reference	061 - PRJ013014				Issued on Date	27/01/2025
Assessment Reference	061			Prop Type Ref	E	
Property	4 Paulet Close, Netley Abbey, Southampton, SO31 5JW					
SAP Rating	85 B	DER	15.41	TER	18.87	
Environmental	88 B	% DER<TER	18.35			
CO ₂ Emissions (t/year)	1.01	DFEE	45.74	TFEE	52.76	
General Requirements Compliance	Pass	% DFEE<TFEE	13.30			
Assessor Details	Mr. Christopher Nicholls, Briary Energy Limited, Tel: 0203 397 1373, chris@briaryenergy.co.uk				Assessor ID	U903-0001
Client						

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.87	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.41	kgCO ₂ /m ²	Pass
	-3.46 (-18.3%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.76	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.74	kWh/m ² /yr	
	-7.1 (-13.4%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.34 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing South East

2.55 m², No overhang

Windows facing North West

7.24 m², No overhang

Air change rate

4.71 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.34 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.08

W/m²K

Air permeability

3.3

m³/m²h

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