

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



Property Reference	4907-0015-3817-161			Issued on Date	15/03/2018
Assessment Reference	As Built	Prop Type Ref	P508 - Det (As)		
Property	79, Appleby Drive, Botley, SOUTHAMPTON, SO32 2GE				
SAP Rating	88 B	DER	12.56	TER	15.12
Environmental	88 B	% DER<TER	16.91		
CO ₂ Emissions (t/year)	1.48	DFEE	45.60	TFEE	52.06
General Requirements Compliance	Pass	% DFEE<TFEE	12.40		
Assessor Details	Mr. Fraser Browning, Fraser Browning, Tel: 01884 242050, Fraser.browning@aessc.co.uk			Assessor ID	T511-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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DWELLING AS BUILT

Detached House, total floor area 145 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) 15.12 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.56 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)52.1 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)45.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.25 (max. 0.70)	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.36 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	4.59 (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

Potterton Ultra 15 Heat 15

Efficiency: 89.2% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 1.42 kWh/day

Permitted by DBSCG 2.30 OK

Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK

Independent timer for DHW OK

Boiler interlock

Yes OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%

Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average

Windows facing North East: 10.10 m², No overhang

Windows facing South East: 1.13 m², No overhang

Windows facing South: 3.21 m², No overhang

Windows facing South West: 8.16 m², No overhang

Windows facing West: 3.21 m², No overhang

Windows facing North West: 0.57 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Door U-value 0.90 W/m²K

Thermal bridging y-value 0.038 W/m²K

Photovoltaic array 0.81 kW

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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	72.7200 (1b)	x 2.3100 (2b)	= 167.9832 (1b) - (3b)
First floor	72.7200 (1c)	x 2.4800 (2c)	= 180.3456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.3288 (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) = 0.1148 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3443 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.2927 (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	0.3732	0.3659	0.3585	0.3220	0.3146	0.2780	0.2780	0.2707	0.2927	0.3146	0.3293	0.3439 (22b)
Effective ac	0.5696	0.5669	0.5643	0.5518	0.5495	0.5387	0.5387	0.5366	0.5428	0.5495	0.5542	0.5591 (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			2.1300	0.9000	1.9170		(26)
Window (Uw = 1.40)			22.2800	1.3258	29.5379		(27)
French (Uw = 1.40)			4.1000	1.3258	5.4356		(27)
Heat Loss Floor 1			72.7200	0.1500	10.9080	75.0000	5454.0000 (28a)
100mm Knauf Supafil	170.0500	28.5100	141.5400	0.2500	35.3850	60.0000	8492.4000 (29a)
External Roof 1	72.7200		72.7200	0.1300	9.4536	9.0000	654.4800 (30)
Total net area of external elements Aum(A, m ²)			315.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.6371		(33)
Internal Floor 1			72.7200			18.0000	1308.9600 (32d)
Internal Floor 1			72.7200			18.0000	1308.9600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17218.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							118.3911 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0183 (36)
Total fabric heat loss						(33) + (36) =	104.6554 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	65.4780	65.1672	64.8625	63.4316	63.1639	61.9177	61.9177	61.6869	62.3977	63.1639	63.7055	64.2717 (38)
Heat transfer coeff	170.1333	169.8226	169.5179	168.0870	167.8193	166.5731	166.5731	166.3423	167.0531	167.8193	168.3609	168.9271 (39)
Average = Sum(39)m / 12 =												168.0858 (39)
HLP	1.1698	1.1676	1.1656	1.1557	1.1539	1.1453	1.1453	1.1437	1.1486	1.1539	1.1576	1.1615 (40)
HLP (average)												1.1557 (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												2.9268 (42)
Average daily hot water use (litres/day)												103.7116 (43)
Daily hot water use	114.0828	109.9343	105.7858	101.6374	97.4889	93.3405	93.3405	97.4889	101.6374	105.7858	109.9343	114.0828 (44)
Energy conte	169.1815	147.9672	152.6889	133.1179	127.7298	110.2211	102.1360	117.2026	118.6024	138.2196	150.8775	163.8432 (45)
Energy content (annual)												Total = Sum(45)m = 1631.7876 (45)
Distribution loss (46)m = 0.15 x (45)m	25.3772	22.1951	22.9033	19.9677	19.1595	16.5332	15.3204	17.5804	17.7904	20.7329	22.6316	24.5765 (46)

AES
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Water storage loss:									210.0000	(47)	
Store volume											
a) If manufacturer declared loss factor is known (kWh/day):									1.4200	(48)	
Temperature factor from Table 2b									0.5400	(49)	
Enter (49) or (54) in (55)									0.7668	(55)	
Total storage loss											
23.7708 21.4704 23.7708 23.0040 23.7708 23.0040 23.7708 23.7708 23.0040 23.7708 23.0040 23.7708									(56)		
If cylinder contains dedicated solar storage											
23.7708 21.4704 23.7708 23.0040 23.7708 23.0040 23.7708 23.7708 23.0040 23.7708 23.0040 23.7708									(57)		
Primary loss											
23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624									(59)		
Total heat required for water heating calculated for each month											
216.2147 190.4488 199.7221 178.6339 174.7630 155.7371 149.1692 164.2358 164.1184 185.2528 196.3935 210.8764									(62)		
Solar input											
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000									(63)		
									Solar input (sum of months) = Sum(63)m =	0.0000	(63)
Output from w/h											
216.2147 190.4488 199.7221 178.6339 174.7630 155.7371 149.1692 164.2358 164.1184 185.2528 196.3935 210.8764									(64)		
									Total per year (kWh/year) = Sum(64)m =	2185.5656	(64)
Heat gains from water heating, kWh/month											
93.8794 83.1844 88.3956 80.6745 80.0967 73.0613 71.5868 76.5964 75.8481 83.5846 86.5796 92.1044									(65)		

[illegible]

AES
Sustainability
Consultants

Space heating per m2

$$(98) / (4) = 37.5156 \quad (99)$$

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)

0.0000 (201)

Fraction of space heat from main system(s)

1.0000 (202)

Efficiency of main space heating system 1 (in %)

90.2000 (206)

Efficiency of secondary/supplementary heating system, %

0.0000 (208)

Space heating requirement

6049.0764 (211)

[illegible]

Water heating

Water heating requirement	216.2147	190.4488	199.7221	178.6339	174.7630	155.7371	149.1692	164.2358	164.1184	185.2528	196.3935	210.8764	(64)
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Efficiency of water heater	79.5000	(216)
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(217)m	88.1721	87.9743	87.5755	86.7207	85.0313	79.5000	79.5000	79.5000	79.5000	86.6423	87.7681	88.2519 (217)
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Fuel for water heating, kWh/month

	245.2188	216.4824	228.0571	205.9875	205.5278	195.8957	187.6342	206.5859	206.4382	213.8133	223.7640	238.9484	(219)
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Water heating fuel used	2574.3533	(219)
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Annual totals kWh/year

Space heating fuel - main system	6049.0764	(211)
Space heating fuel - secondary	0.0000	(215)

Space heating fuel - secondary	0.0000	(215)
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Electricity for pumps and fans:		
central heating pump	30.0000	(230c)

central heating pump	38.0000	(2300)
main heating flue fan	45.0000	(2300)

Total electricity for the above, kWh/year	75.0000	(231)
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Electricity for lighting (calculated in Appendix L)	506.7557 (232)
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Energy saving/generation technologies (Appendices M ,N and Q)

PV Unit 0 (0.80 * 0.81 * 1004 * 1.00) = -650.5895 -650.5895 (233)

Total delivered energy for all uses	8554.5959 (238)
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12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	6049.0764	0.2160	1306.6005 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2574.3533	0.2160	556.0603 (264)
Space and water heating			1862.6608 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	506.7557	0.5190	263.0062 (268)

Energy saving/generation technologies				
PV Unit	-650.5895	0.5190	-337.6560	(269)
Total CO2, kg/year			1826.9361	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.5600	(273)

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

ER		12.5600	ZC1
Total Floor Area	TFA	145.4400	
Assumed number of occupants	N	2.9268	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		12.8554	ZC2
CO2 emissions from cooking, equation (L16)		1.3012	ZC3
Total CO2 emissions		26.7166	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		26.7166	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7200 (1b)	x 2.3100 (2b)	= 167.9832 (1b) - (3b)
First floor	72.7200 (1c)	x 2.4800 (2c)	= 180.3456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.3288 (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) =	0.1148 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3648 (18)							
Number of sides sheltered										2 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.8500 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3101 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
	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	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644 (22b)					
Effective ac	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664 (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			2.1300	1.0000	2.1300		(26)					
TER Opening Type (Uw = 1.40)			26.3800	1.3258	34.9735		(27)					
Heat Loss Floor 1			72.7200	0.1300	9.4536		(28a)					
100mm Knauf Supafil	170.0500	28.5100	141.5400	0.1800	25.4772		(29a)					
External Roof 1	72.7200		72.7200	0.1300	9.4536		(30)					
Total net area of external elements Aum(A, m2)			315.4900				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	81.4879		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9011 (36)					
Total fabric heat loss						(33) + (36) =	95.3890 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 66.4593	Feb 66.1104	Mar 65.7684	Apr 64.1621	May 63.8616	Jun 62.4625	Jul 62.4625	Aug 62.2034	Sep 63.0014	Oct 63.8616	Nov 64.4696	Dec 65.1052 (38)
Heat transfer coeff	161.8483	161.4994	161.1574	159.5511	159.2506	157.8515	157.8515	157.5924	158.3904	159.2506	159.8585	160.4942 (39)
Average = Sum(39)m / 12 =												159.5497 (39)
HLP	Jan 1.1128	Feb 1.1104	Mar 1.1081	Apr 1.0970	May 1.0950	Jun 1.0853	Jul 1.0853	Aug 1.0836	Sep 1.0890	Oct 1.0950	Nov 1.0991	Dec 1.1035 (40)
HLP (average)												1.0970 (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												2.9268 (42)
Average daily hot water use (litres/day)												103.7116 (43)
Daily hot water use	Jan 114.0828	Feb 109.9343	Mar 105.7858	Apr 101.6374	May 97.4889	Jun 93.3405	Jul 93.3405	Aug 97.4889	Sep 101.6374	Oct 105.7858	Nov 109.9343	Dec 114.0828 (44)
Energy conte	169.1815	147.9672	152.6889	133.1179	127.7298	110.2211	102.1360	117.2026	118.6024	138.2196	150.8775	163.8432 (45)
Energy content (annual)										Total = Sum(45)m =		1631.7876 (45)
Distribution loss (46)m = 0.15 x (45)m												
25.3772	22.1951	22.9033	19.9677	19.1595	16.5332	15.3204	17.5804	17.7904	20.7329	22.6316		24.5765 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.9188 (55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	220.9281	194.7060	204.4355	183.1952	179.4764	160.2984	153.8826	168.9492	168.6797	189.9662	200.9549	215.5898 (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	220.9281	194.7060	204.4355	183.1952	179.4764	160.2984	153.8826	168.9492	168.6797	189.9662	200.9549	215.5898 (64)
Heat gains from water heating, kWh/month	97.6501	86.5902	92.1663	84.3236	83.8674	76.7104	75.3575	80.3671	79.4972	87.3553	90.2286	95.8751 (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	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.6946	25.4863	20.7268	15.6916	11.7296	9.9026	10.7002	13.9085	18.6679	23.7032	27.6651	29.4921	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	315.5169	318.7910	310.5404	292.9759	270.8039	249.9654	236.0439	232.7698	241.0204	258.5849	280.7569	301.5955	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	(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)	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	(71)
Water heating gains (Table 5)	131.2501	128.8544	123.8795	117.1161	112.7250	106.5422	101.2870	108.0203	110.4127	117.4130	125.3176	128.8644	(72)
Total internal gains	545.3638	543.0338	525.0488	495.6856	465.1607	436.3123	417.9331	424.6007	440.0031	469.6032	503.6417	529.8541	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g Specific data or Table 6c	FF Access factor Table 6d	Gains W	
Northeast	10.1000	11.2829	0.6300	0.7000	0.7700	34.8270	(75)
Southeast	1.1300	36.7938	0.6300	0.7000	0.7700	12.7065	(77)
South	3.2100	46.7521	0.6300	0.7000	0.7700	45.8646	(78)
Southwest	8.1600	36.7938	0.6300	0.7000	0.7700	91.7565	(79)
West	3.2100	19.6403	0.6300	0.7000	0.7700	19.2674	(80)
Northwest	0.5700	11.2829	0.6300	0.7000	0.7700	1.9655	(81)

Solar gains	206.3875	365.6369	536.1503	721.9308	859.3945	875.0277	834.5637	728.9902	600.1805	413.9265	249.8065	174.9210	(83)
Total gains	751.7513	908.6707	1061.1991	1217.6164	1324.5551	1311.3400	1252.4968	1153.5910	1040.1836	883.5297	753.4482	704.7751	(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	62.4041	62.5389	62.6716	63.3026	63.4221	63.9842	63.9842	64.0894	63.7665	63.4221	63.1809	62.9306
alpha	5.1603	5.1693	5.1781	5.2202	5.2281	5.2656	5.2656	5.2726	5.2511	5.2281	5.2121	5.1954
util living area	0.9990	0.9972	0.9908	0.9647	0.8824	0.7148	0.5432	0.6071	0.8600	0.9822	0.9976	0.9993 (86)
MIT	19.7310	19.8981	20.1636	20.5071	20.7963	20.9523	20.9907	20.9839	20.8705	20.4857	20.0417	19.7027 (87)
Th 2	19.9904	19.9923	19.9942	20.0033	20.0050	20.0128	20.0128	20.0143	20.0098	20.0050	20.0015	19.9980 (88)
util rest of house	0.9987	0.9962	0.9874	0.9511	0.8388	0.6260	0.4272	0.4876	0.7927	0.9730	0.9967	0.9991 (89)
MIT 2	18.2871	18.5327	18.9203	19.4174	19.8029	19.9808	20.0094	20.0075	19.9031	19.3954	18.7496	18.2511 (90)
Living area fraction	18.4819	18.7169	19.0880	19.5644	19.9369	20.1118	20.1417	20.1392	20.0336	19.5425	18.9239	18.4469 (91)
MIT	18.4819	18.7169	19.0880	19.5644	19.9369	20.1118	20.1417	20.1392	20.0336	19.5425	18.9239	18.4469 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4819	18.7169	19.0880	19.5644	19.9369	20.1118	20.1417	20.1392	20.0336	19.5425	18.9239	18.4469 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9979	0.9943	0.9830	0.9434	0.8353	0.6356	0.4428	0.5035	0.7946	0.9670	0.9950	0.9985	(94)
Ext temp.	750.1566	903.4696	1043.2084	1148.6444	1106.4364	833.4976	554.6132	580.8022	826.4999	854.3927	749.6835	703.6967	(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	2295.3191	2231.4183	2028.6479	1701.5173	1311.7301	870.0520	559.0684	589.2757	939.8282	1424.0943	1890.1461	2286.5500	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating	1149.6009	892.3816	733.1670	398.0685	152.7385	0.0000	0.0000	0.0000	0.0000	423.8580	821.1330	1177.6429	(98)
Space heating per m ²												5748.5904	(98)
												39.5255	(99)

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8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													93.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													6148.2251	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	1149.6009	892.3816	733.1670	398.0685	152.7385	0.0000	0.0000	0.0000	0.0000	423.8580	821.1330	1177.6429	(98)	
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)	
Space heating fuel (main heating system)	1229.5197	954.4188	784.1358	425.7417	163.3567	0.0000	0.0000	0.0000	0.0000	453.3241	878.2172	1259.5111	(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	220.9281	194.7060	204.4355	183.1952	179.4764	160.2984	153.8826	168.9492	168.6797	189.9662	200.9549	215.5898	(64)	
Efficiency of water heater (217)m	88.5853	88.3775	87.9293	86.8306	84.3871	79.8000	79.8000	79.8000	79.8000	86.8942	88.1755	88.6604	(216)	
Fuel for water heating, kWh/month	249.3959	220.3117	232.4998	210.9800	212.6821	200.8752	192.8354	211.7158	211.3781	218.6179	227.9034	243.1635	(219)	
Water heating fuel used												2632.3587	(219)	
Annual totals kWh/year														
Space heating fuel - main system												6148.2251	(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)													506.7557	(232)
Total delivered energy for all uses													9362.3395	(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	6148.2251	0.2160	1328.0166 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2632.3587	0.2160	568.5895 (264)
Space and water heating			1896.6061 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	506.7557	0.5190	263.0062 (268)
Total CO2, kg/m2/year			2198.5373 (272)
Emissions per m2 for space and water heating			13.0405 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.8083 (272b)
Emissions per m2 for pumps and fans			0.2676 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.0405 * 1.00) + 1.8083 + 0.2676, rounded to 2 d.p.			15.1200 (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	72.7200 (1b)	x 2.3100 (2b)	= 167.9832 (1b) - (3b)
First floor	72.7200 (1c)	x 2.4800 (2c)	= 180.3456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.4400		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 348.3288 (5)
Dwelling volume			

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) = 0.1148 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3443 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2927 (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	0.3732	0.3659	0.3585	0.3220	0.3146	0.2780	0.2780	0.2707	0.2927	0.3146	0.3293	0.3439 (22b)
Effective ac	0.5696	0.5669	0.5643	0.5518	0.5495	0.5387	0.5387	0.5366	0.5428	0.5495	0.5542	0.5591 (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			2.1300	0.9000	1.9170		(26)
Window (Uw = 1.40)			22.2800	1.3258	29.5379		(27)
French (Uw = 1.40)			4.1000	1.3258	5.4356		(27)
Heat Loss Floor 1			72.7200	0.1500	10.9080	75.0000	5454.0000 (28a)
100mm Knauf Supafil	170.0500	28.5100	141.5400	0.2500	35.3850	60.0000	8492.4000 (29a)
External Roof 1	72.7200		72.7200	0.1300	9.4536	9.0000	654.4800 (30)
Total net area of external elements Aum(A, m ²)			315.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.6371		(33)
Internal Floor 1			72.7200			18.0000	1308.9600 (32d)
Internal Floor 1			72.7200			9.0000	654.4800 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 16564.3200 (34)
113.8911 (35)
12.0183 (36)
(33) + (36) = 104.6554 (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	65.4780	65.1672	64.8625	63.4316	63.1639	61.9177	61.9177	61.6869	62.3977	63.1639	63.7055	64.2717 (38)
Heat transfer coeff	170.1333	169.8226	169.5179	168.0870	167.8193	166.5731	166.5731	166.3423	167.0531	167.8193	168.3609	168.9271 (39)
Average = Sum(39)m / 12 =												168.0858 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1698	1.1676	1.1656	1.1557	1.1539	1.1453	1.1453	1.1437	1.1486	1.1539	1.1576	1.1615 (40)
HLP (average)												1.1557 (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												2.9268 (42)
Average daily hot water use (litres/day)												103.7116 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.0828	109.9343	105.7858	101.6374	97.4889	93.3405	93.3405	97.4889	101.6374	105.7858	109.9343	114.0828 (44)
Energy conte	169.1815	147.9672	152.6889	133.1179	127.7298	110.2211	102.1360	117.2026	118.6024	138.2196	150.8775	163.8432 (45)
Energy content (annual)												Total = Sum(45)m = 1631.7876 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)

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Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	35.9511	31.4430	32.4464	28.2875	27.1426	23.4220	21.7039	24.9055	25.2030	29.3717	32.0615	34.8167	(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	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.6946	25.4863	20.7268	15.6916	11.7296	9.9026	10.7002	13.9085	18.6679	23.7032	27.6651	29.4921	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	315.5169	318.7910	310.5404	292.9759	270.8039	249.9654	236.0439	232.7698	241.0204	258.5849	280.7569	301.5955	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	(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)	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	(71)
Water heating gains (Table 5)	48.3213	46.7902	43.6107	39.2883	36.4820	32.5305	29.1719	33.4752	35.0042	39.4780	44.5298	46.7966	(72)
Total internal gains	459.4349	457.9696	441.7801	414.8578	385.9176	359.3006	342.8181	347.0556	361.5946	388.6682	419.8540	444.7863	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Northeast					6.0000	11.2829	0.7100	0.7000			0.7700			23.3165 (75)
Southeast					1.1300	36.7938	0.7100	0.7000			0.7700			14.3200 (77)
South					3.2100	46.7521	0.7100	0.7000			0.7700			51.6887 (78)
Southwest					8.1600	36.7938	0.7100	0.7000			0.7700			103.4082 (79)
West					3.2100	19.6403	0.7100	0.7000			0.7700			21.7141 (80)
Northwest					0.5700	11.2829	0.7100	0.7000			0.7700			2.2151 (81)
Northeast					4.1000	11.2829	0.7100	0.7000			0.7700			15.9329 (75)
Solar gains	232.5954	412.0669	604.2329	813.6045	968.5239	986.1423	940.5401	821.5604	676.3939	466.4886	281.5279	197.1332	(83)	
Total gains	692.0304	870.0365	1046.0130	1228.4624	1354.4415	1345.4429	1283.3581	1168.6160	1037.9885	855.1568	701.3819	641.9195	(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	27.0447	27.0942	27.1429	27.3739	27.4176	27.6227	27.6227	27.6610	27.5433	27.4176	27.3294	27.2378		
alpha	2.8030	2.8063	2.8095	2.8249	2.8278	2.8415	2.8415	2.8441	2.8362	2.8278	2.8220	2.8159		
util living area	0.9855	0.9722	0.9458	0.8885	0.7886	0.6487	0.5147	0.5704	0.7767	0.9274	0.9764	0.9882		(86)
MIT	18.5675	18.8713	19.3433	19.9336	20.4423	20.7805	20.9178	20.8880	20.6071	19.9218	19.1279	18.5110		(87)
Th 2	19.9442	19.9460	19.9477	19.9556	19.9571	19.9640	19.9640	19.9653	19.9613	19.9571	19.9541	19.9509		(88)
util rest of house	0.9829	0.9674	0.9361	0.8675	0.7471	0.5761	0.4123	0.4683	0.7174	0.9095	0.9715	0.9861		(89)
MIT 2	17.7121	18.0144	18.4806	19.0587	19.5339	19.8296	19.9285	19.9132	19.6954	19.0597	18.2772	17.6605		(90)
Living area fraction	17.8275	18.1300	18.5970	19.1767	19.6564	19.9579	20.0620	20.0447	19.8184	19.1760	18.3920	17.7753		(91)
MIT	17.8275	18.1300	18.5970	19.1767	19.6564	19.9579	20.0620	20.0447	19.8184	19.1760	18.3920	17.7753		(92)
Temperature adjustment	17.8275	18.1300	18.5970	19.1767	19.6564	19.9579	20.0620	20.0447	19.8184	19.1760	18.3920	17.7753		(93)
adjusted MIT	17.8275	18.1300	18.5970	19.1767	19.6564	19.9579	20.0620	20.0447	19.8184	19.1760	18.3920	17.7753		(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	675.1846	831.7989	962.2498	1042.5008	993.4285	774.5117	542.3789	557.2118	734.7911	762.9616	674.2375	629.0022	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2301.4858	2246.7457	2050.6609	1727.3858	1335.2421	892.4822	576.6704	606.2757	955.2685	1439.2221	1901.1282	2293.2304	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	1209.9681	950.8443	809.7778	493.1172	254.3093	0.0000	0.0000	0.0000	0.0000	503.1378	883.3613	1238.1858	(98)
Space heating												6342.7018	(98)
Space heating per m2												43.6104	(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													

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Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1565.7868	1232.6407	1264.2013	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7687	0.8311	0.7972	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1203.5818	1024.3947	1007.8430	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1697.0274	1621.5829	1489.9532	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	355.2808	444.3081	358.6900	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												1158.2789 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	88.8202	111.0770	89.6725	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												289.5697 (107)
Energy for space heating												1.9910 (108)
Energy for space cooling												43.6104 (99)
Total												1.9910 (108)
Dwelling Fabric Energy Efficiency (DFEE)												45.6014 (109)
												45.6 (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	72.7200 (1b)	x 2.3100 (2b)	= 167.9832 (1b) - (3b)
First floor	72.7200 (1c)	x 2.4800 (2c)	= 180.3456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.3288 (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) = 0.1148 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3648 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3101 (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	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644 (22b)
Effective ac	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1300	1.0000	2.1300		(26)
TER Opening Type (Uw = 1.40)			26.3800	1.3258	34.9735		(27)
Heat Loss Floor 1			72.7200	0.1300	9.4536		(28a)
100mm Knauf Supafil	170.0500	28.5100	141.5400	0.1800	25.4772		(29a)
External Roof 1	72.7200		72.7200	0.1300	9.4536		(30)
Total net area of external elements Aum(A, m ²)			315.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	81.4879		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.9011 (36)
Total fabric heat loss						(33) + (36) =	95.3890 (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	66.4593	66.1104	65.7684	64.1621	63.8616	62.4625	62.4625	62.2034	63.0014	63.8616	64.4696	65.1052 (38)
Heat transfer coeff	161.8483	161.4994	161.1574	159.5511	159.2506	157.8515	157.8515	157.5924	158.3904	159.2506	159.8585	160.4942 (39)
Average = Sum(39)m / 12 =												159.5497 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1128	1.1104	1.1081	1.0970	1.0950	1.0853	1.0853	1.0836	1.0890	1.0950	1.0991	1.1035 (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												2.9268 (42)
Average daily hot water use (litres/day)												103.7116 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.0828	109.9343	105.7858	101.6374	97.4889	93.3405	93.3405	97.4889	101.6374	105.7858	109.9343	114.0828 (44)
Energy conte	169.1815	147.9672	152.6889	133.1179	127.7298	110.2211	102.1360	117.2026	118.6024	138.2196	150.8775	163.8432 (45)
Energy content (annual)										Total = Sum(45)m =		1631.7876 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	35.9511	31.4430	32.4464	28.2875	27.1426	23.4220	21.7039	24.9055	25.2030	29.3717	32.0615	34.8167 (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	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	146.3402	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.6946	25.4863	20.7268	15.6916	11.7296	9.9026	10.7002	13.9085	18.6679	23.7032	27.6651	29.4921	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	315.5169	318.7910	310.5404	292.9759	270.8039	249.9654	236.0439	232.7698	241.0204	258.5849	280.7569	301.5955	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	37.6340	(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)	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	-117.0722	(71)
Water heating gains (Table 5)	48.3213	46.7902	43.6107	39.2883	36.4820	32.5305	29.1719	33.4752	35.0042	39.4780	44.5298	46.7966	(72)
Total internal gains	459.4349	457.9696	441.7801	414.8578	385.9176	359.3006	342.8181	347.0556	361.5946	388.6682	419.8540	444.7863	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	10.1000	11.2829	0.6300	0.7000	0.7700	34.8270	(75)
Southeast	1.1300	36.7938	0.6300	0.7000	0.7700	12.7065	(77)
South	3.2100	46.7521	0.6300	0.7000	0.7700	45.8646	(78)
Southwest	8.1600	36.7938	0.6300	0.7000	0.7700	91.7565	(79)
West	3.2100	19.6403	0.6300	0.7000	0.7700	19.2674	(80)
Northwest	0.5700	11.2829	0.6300	0.7000	0.7700	1.9655	(81)

Solar gains	206.3875	365.6369	536.1503	721.9308	859.3945	875.0277	834.5637	728.9902	600.1805	413.9265	249.8065	174.9210	(83)
Total gains	665.8224	823.6065	977.9304	1136.7886	1245.3121	1234.3283	1177.3818	1076.0458	961.7751	802.5947	669.6604	619.7073	(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	62.4041	62.5389	62.6716	63.3026	63.4221	63.9842	63.9842	64.0894	63.7665	63.4221	63.1809	62.9306		
alpha	5.1603	5.1693	5.1781	5.2202	5.2281	5.2656	5.2656	5.2726	5.2511	5.2281	5.2121	5.1954		
util living area	0.9995	0.9982	0.9936	0.9731	0.9026	0.7461	0.5743	0.6438	0.8885	0.9882	0.9987	0.9996	(86)	
MIT	19.6754	19.8435	20.1117	20.4625	20.7671	20.9416	20.9880	20.9790	20.8444	20.4370	19.9876	19.6475	(87)	
Th 2	19.9904	19.9923	19.9942	20.0033	20.0050	20.0128	20.0128	20.0143	20.0098	20.0050	20.0015	19.9980	(88)	
util rest of house	0.9993	0.9976	0.9912	0.9623	0.8636	0.6581	0.4535	0.5205	0.8284	0.9818	0.9981	0.9995	(89)	
MIT 2	18.7719	18.9414	19.2099	19.5614	19.8438	19.9853	20.0097	20.0080	19.9188	19.5420	19.0929	18.7501	(90)	
Living area fraction														
MIT	18.8938	19.0631	19.3315	19.6830	19.9683	20.1143	20.1417	20.1390	20.0437	19.6628	19.2136	18.8712	(92)	
Temperature adjustment														
adjusted MIT	18.8938	19.0631	19.3315	19.6830	19.9683	20.1143	20.1417	20.1390	20.0437	19.6628	19.2136	18.8712	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9990	0.9967	0.9890	0.9578	0.8619	0.6680	0.4698	0.5370	0.8309	0.9788	0.9974	0.9993	(94)
Useful gains	665.1274	820.9179	967.1550	1088.8054	1073.3306	824.5066	553.1873	577.8426	799.1494	785.5811	667.9283	619.2629	(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	2361.9837	2287.3288	2067.8973	1720.4344	1316.7354	870.4437	559.0573	589.2420	941.4238	1443.2488	1936.4666	2354.6370	(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	1262.4611	985.4281	818.9523	454.7729	181.0932	0.0000	0.0000	0.0000	0.0000	489.3048	913.3475	1291.1183	(98)
Space heating												6396.4782	(98)
Space heating per m2												(98) / (4) =	43.9802 (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	1483.8041	1168.1011	1197.7023	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8624	0.9247	0.8941	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1279.6970	1080.1197	1070.8936	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1567.1531	1497.7145	1381.7543	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	206.9684	310.6905	231.2803	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												748.9393 (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	51.7421	77.6726	57.8201	0.0000	0.0000	0.0000	0.0000 (107)	
Space cooling												187.2348 (107)
Space cooling per m2												1.2874 (108)
Energy for space heating												43.9802 (99)
Energy for space cooling												1.2874 (108)
Total												45.2676 (109)
Target Fabric Energy Efficiency (TFEE)												52.1 (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	72.7200 (1b)	x 2.3100 (2b)	= 167.9832 (1b) - (3b)
First floor	72.7200 (1c)	x 2.4800 (2c)	= 180.3456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.3288 (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) = 0.1148 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3443 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2927 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000 (22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250 (22a)
Adj infilt rate	0.3073	0.2854	0.2927	0.2780	0.2780	0.2707	0.2634	0.2561	0.2488	0.2707	0.2561	0.2707 (22b)
Effective ac	0.5472	0.5407	0.5428	0.5387	0.5387	0.5366	0.5347	0.5328	0.5309	0.5366	0.5328	0.5366 (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			2.1300	0.9000	1.9170		(26)
Window (Uw = 1.40)			22.2800	1.3258	29.5379		(27)
French (Uw = 1.40)			4.1000	1.3258	5.4356		(27)
Heat Loss Floor 1			72.7200	0.1500	10.9080	75.0000	5454.0000 (28a)
100mm Knauf Supafil	170.0500	28.5100	141.5400	0.2500	35.3850	60.0000	8492.4000 (29a)
External Roof 1	72.7200		72.7200	0.1300	9.4536	9.0000	654.4800 (30)
Total net area of external elements Aum(A, m ²)			315.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.6371		(33)
Internal Floor 1			72.7200			18.0000	1308.9600 (32d)
Internal Floor 1			72.7200			18.0000	1308.9600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17218.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							118.3911 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0183 (36)
Total fabric heat loss						(33) + (36) =	104.6554 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	62.9024	62.1546	62.3977	61.9177	61.9177	61.6869	61.4623	61.2438	61.0315	61.6869	61.2438	61.6869 (38)
Heat transfer coeff	167.5578	166.8100	167.0531	166.5731	166.5731	166.3423	166.1176	165.8992	165.6868	166.3423	165.8992	166.3423 (39)
Average = Sum(39)m / 12 =												166.4331 (39)
HLP	1.1521	1.1469	1.1486	1.1453	1.1453	1.1437	1.1422	1.1407	1.1392	1.1437	1.1407	1.1437 (40)
HLP (average)												1.1443 (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												2.9268 (42)
Average daily hot water use (litres/day)												103.7116 (43)
Daily hot water use	114.0828	109.9343	105.7858	101.6374	97.4889	93.3405	93.3405	97.4889	101.6374	105.7858	109.9343	114.0828 (44)
Energy conte	169.1815	147.9672	152.6889	133.1179	127.7298	110.2211	102.1360	117.2026	118.6024	138.2196	150.8775	163.8432 (45)
Energy content (annual)										Total = Sum(45)m =		1631.7876 (45)
Distribution loss (46)m = 0.15 x (45)m	25.3772	22.1951	22.9033	19.9677	19.1595	16.5332	15.3204	17.5804	17.7904	20.7329	22.6316	24.5765 (46)

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Space heating	4179.1237 (98)
RHI space heating demand	4179 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7200 (1b)	x 2.3100 (2b)	= 167.9832 (1b) - (3b)
First floor	72.7200 (1c)	x 2.4800 (2c)	= 180.3456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.4400		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 348.3288 (5)
Dwelling volume			

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) = 0.1148 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3443 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2927 (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	0.3732	0.3659	0.3585	0.3220	0.3146	0.2780	0.2780	0.2707	0.2927	0.3146	0.3293	0.3439 (22b)
Effective ac	0.5696	0.5669	0.5643	0.5518	0.5495	0.5387	0.5387	0.5366	0.5428	0.5495	0.5542	0.5591 (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			2.1300	0.9000	1.9170		(26)
Window (Uw = 1.40)			22.2800	1.3258	29.5379		(27)
French (Uw = 1.40)			4.1000	1.3258	5.4356		(27)
Heat Loss Floor 1			72.7200	0.1500	10.9080	75.0000	5454.0000 (28a)
100mm Knauf Supafil	170.0500	28.5100	141.5400	0.2500	35.3850	60.0000	8492.4000 (29a)
External Roof 1	72.7200		72.7200	0.1300	9.4536	9.0000	654.4800 (30)
Total net area of external elements Aum(A, m ²)			315.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.6371		(33)
Internal Floor 1			72.7200			18.0000	1308.9600 (32d)
Internal Floor 1			72.7200			18.0000	1308.9600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17218.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							118.3911 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0183 (36)
Total fabric heat loss						(33) + (36) =	104.6554 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	65.4780	65.1672	64.8625	63.4316	63.1639	61.9177	61.9177	61.6869	62.3977	63.1639	63.7055	64.2717 (38)
Heat transfer coeff	170.1333	169.8226	169.5179	168.0870	167.8193	166.5731	166.5731	166.3423	167.0531	167.8193	168.3609	168.9271 (39)
Average = Sum(39)m / 12 =												168.0858 (39)
HLP	1.1698	1.1676	1.1656	1.1557	1.1539	1.1453	1.1453	1.1437	1.1486	1.1539	1.1576	1.1615 (40)
HLP (average)												1.1557 (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												2.9268 (42)
Average daily hot water use (litres/day)												103.7116 (43)
Daily hot water use	114.0828	109.9343	105.7858	101.6374	97.4889	93.3405	93.3405	97.4889	101.6374	105.7858	109.9343	114.0828 (44)
Energy conte	169.1815	147.9672	152.6889	133.1179	127.7298	110.2211	102.1360	117.2026	118.6024	138.2196	150.8775	163.8432 (45)
Energy content (annual)										Total = Sum(45)m =		1631.7876 (45)
Distribution loss (46)m = 0.15 x (45)m	25.3772	22.1951	22.9033	19.9677	19.1595	16.5332	15.3204	17.5804	17.7904	20.7329	22.6316	24.5765 (46)

Water storage loss:											
Store volume											210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):											
Temperature factor from Table 2b											1.4200 (48)
Enter (49) or (54) in (55)											0.5400 (49)
Total storage loss											0.7668 (55)
If cylinder contains dedicated solar storage											23.7708 (56)
Primary loss											23.7708 (57)
Total heat required for water heating calculated for each month											23.2624 (59)
Solar input											210.8764 (62)
Output from w/h											210.8764 (64)
Heat gains from water heating, kWh/month											2185.5656 (64)
											92.1044 (65)

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Space heating per m2

(98) / (4) = 33.0015 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5321.2233 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	935.9797	730.2656	612.7811	362.5193	177.4379	0.0000	0.0000	0.0000	0.0000	355.2339	663.7973	961.7286	(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)	1037.6715	809.6071	679.3582	401.9061	196.7161	0.0000	0.0000	0.0000	0.0000	393.8292	735.9171	1066.2180	(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	216.2147	190.4488	199.7221	178.6339	174.7630	155.7371	149.1692	164.2358	164.1184	185.2528	196.3935	210.8764	(64)
Efficiency of water heater (217)m	87.9780	87.7568	87.3114	86.3630	84.5532	79.5000	79.5000	79.5000	79.5000	86.2224	87.5109	79.5000	(216)
Fuel for water heating, kWh/month	245.7600	217.0187	228.7469	206.8407	206.6900	195.8957	187.6342	206.5859	206.4382	214.8545	224.4218	239.4463	(219)
Water heating fuel used												2580.3330	(219)
Annual totals kWh/year													
Space heating fuel - main system												5321.2233	(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)												506.7557	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.81 * 1004 * 1.00) =										-650.5895		-650.5895	(233)
Total delivered energy for all uses												7832.7225	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5321.2233	3.4800	185.1786 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2580.3330	3.4800	89.7956 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	506.7557	13.1900	66.8411 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-650.5895	13.1900	-85.8128 (252)
Total energy cost			385.8950 (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] =	0.8511 (257)
SAP value		88.1277
SAP rating (Section 12)		88 (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	5321.2233	0.2160	1149.3842 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2580.3330	0.2160	557.3519 (264)
Space and water heating			1706.7362 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	506.7557	0.5190	263.0062 (268)
Energy saving/generation technologies			
PV Unit	-650.5895	0.5190	-337.6560 (269)
Total kg/year			1671.0114 (272)
CO2 emissions per m2			11.4900 (273)
EI value			88.2422
EI rating			88 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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	$3.48 / 0.8448 = 4.119$, stars = 4
Water heating environmental impact	$0.216 / 0.8448 = 0.2557$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7200 (1b)	x 2.3100 (2b)	= 167.9832 (1b) - (3b)
First floor	72.7200 (1c)	x 2.4800 (2c)	= 180.3456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.3288 (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) = 0.1148 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3443 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.2927 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000 (22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250 (22a)
Adj infilt rate												
Effective ac	0.3073	0.2854	0.2927	0.2780	0.2780	0.2707	0.2634	0.2561	0.2488	0.2707	0.2561	0.2707 (22b)
	0.5472	0.5407	0.5428	0.5387	0.5387	0.5366	0.5347	0.5328	0.5309	0.5366	0.5328	0.5366 (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			2.1300	0.9000	1.9170		(26)
Window (Uw = 1.40)			22.2800	1.3258	29.5379		(27)
French (Uw = 1.40)			4.1000	1.3258	5.4356		(27)
Heat Loss Floor 1			72.7200	0.1500	10.9080	75.0000	5454.0000 (28a)
100mm Knauf Supafil	170.0500	28.5100	141.5400	0.2500	35.3850	60.0000	8492.4000 (29a)
External Roof 1	72.7200		72.7200	0.1300	9.4536	9.0000	654.4800 (30)
Total net area of external elements Aum(A, m ²)			315.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.6371		(33)
Internal Floor 1			72.7200			18.0000	1308.9600 (32d)
Internal Floor 1			72.7200			18.0000	1308.9600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17218.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							118.3911 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0183 (36)
Total fabric heat loss						(33) + (36) =	104.6554 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	62.9024	62.1546	62.3977	61.9177	61.9177	61.6869	61.4623	61.2438	61.0315	61.6869	61.2438	61.6869 (38)
Heat transfer coeff	167.5578	166.8100	167.0531	166.5731	166.5731	166.3423	166.1176	165.8992	165.6868	166.3423	165.8992	166.3423 (39)
Average = Sum(39)m / 12 =												166.4331 (39)
HLP	1.1521	1.1469	1.1486	1.1453	1.1453	1.1437	1.1422	1.1407	1.1392	1.1437	1.1407	1.1437 (40)
HLP (average)												1.1443 (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												2.9268 (42)
Average daily hot water use (litres/day)												103.7116 (43)
Daily hot water use	114.0828	109.9343	105.7858	101.6374	97.4889	93.3405	93.3405	97.4889	101.6374	105.7858	109.9343	114.0828 (44)
Energy conte	169.1815	147.9672	152.6889	133.1179	127.7298	110.2211	102.1360	117.2026	118.6024	138.2196	150.8775	163.8432 (45)
Energy content (annual)										Total = Sum(45)m =		1631.7876 (45)
Distribution loss (46)m = 0.15 x (45)m	25.3772	22.1951	22.9033	19.9677	19.1595	16.5332	15.3204	17.5804	17.7904	20.7329	22.6316	24.5765 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Space heating per m2 (98) / (4) = 28.7343 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4633.1749 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	841.7495	672.9389	544.1356	300.2842	129.5406	0.0000	0.0000	0.0000	0.0000	274.8021	560.8889	854.7839	(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)	933.2035	746.0520	603.2545	332.9093	143.6148	0.0000	0.0000	0.0000	0.0000	304.6587	621.8281	947.6540	(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	216.2147	190.4488	199.7221	178.6339	174.7630	155.7371	149.1692	164.2358	164.1184	185.2528	196.3935	210.8764	(64)
Efficiency of water heater (217)m	87.7854	87.5993	87.0541	85.8883	83.7281	79.5000	79.5000	79.5000	79.5000	85.5628	87.1578	79.5000	(216)
Fuel for water heating, kWh/month	246.2992	217.4090	229.4229	207.9840	208.7267	195.8957	187.6342	206.5859	206.4382	216.5110	225.3310	240.0141	(219)
Water heating fuel used												2588.2521	(219)
Annual totals kWh/year													
Space heating fuel - main system												4633.1749	(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)												506.7557	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.81 * 1122 * 1.00) =										-727.0046		-727.0046	(233)
Total delivered energy for all uses												7076.1781	(238)

10a. Fuel costs - using BEDF prices (450)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4633.1749	3.9300	182.0838 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2588.2521	3.9300	101.7183 (247)
Pumps and fans for heating	75.0000	17.5600	13.1700 (249)
Energy for lighting	506.7557	17.5600	88.9863 (250)
Additional standing charges			88.0000 (251)
Energy saving/generation technologies			
PV Unit	-727.0046	17.5600	-127.6620 (252)
Total energy cost			346.2964 (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	4633.1749	0.2160	1000.7658 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2588.2521	0.2160	559.0625 (264)
Space and water heating			1559.8282 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	506.7557	0.5190	263.0062 (268)
Energy saving/generation technologies			
PV Unit	-727.0046	0.5190	-377.3154 (269)
Total kg/year			1484.4441 (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	4633.1749	1.2200	5652.4733 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2588.2521	1.2200	3157.6675 (264)
Space and water heating			8810.1409 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	506.7557	3.0700	1555.7400 (268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy saving/generation technologies			
PV Unit	-727.0046	3.0700	-2231.9040 (269)
Primary energy kWh/year			8364.2268 (272)
Primary energy kWh/m2/year			57.5098 (273)

SAP 2012 EPC IMPROVEMENTS

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

(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	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
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
N Solar water heating	+ 1.2	-£ 45	-270 kg (18.2%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£45 1.85 kg/m²	B 89	B 90
Total Savings	£45 1.85 kg/m²		

Potential energy efficiency rating:	B 89
Potential environmental impact rating:	B 90

Fuel prices for cost data on this page from database revision number 450 TEST (30 Oct 2019)
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	£102	£111	-£9
Mains gas	£372	£318	£54
Space heating	£283	£284	-£1
Water heating	£102	£56	£46
Lighting	£89	£89	£0
Generated (PV)	-£128	-£128	£0
Total cost of fuels	£346	£301	£45
Total cost of uses	£346	£301	£45
Delivered energy	49 kWh/m²	40 kWh/m²	9 kWh/m²
Carbon dioxide emissions	1.5 tonnes	1.2 tonnes	0.3 tonnes
CO2 emissions per m²	10 kg/m²	8 kg/m²	2 kg/m²
Primary energy	58 kWh/m²	47 kWh/m²	10 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	72.7200 (1b)	x 2.3100 (2b)	= 167.9832 (1b) - (3b)
First floor	72.7200 (1c)	x 2.4800 (2c)	= 180.3456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.3288 (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) = 0.1148 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3443 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2927 (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	0.3732	0.3659	0.3585	0.3220	0.3146	0.2780	0.2780	0.2707	0.2927	0.3146	0.3293	0.3439 (22b)
Effective ac	0.5696	0.5669	0.5643	0.5518	0.5495	0.5387	0.5387	0.5366	0.5428	0.5495	0.5542	0.5591 (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			2.1300	0.9000	1.9170		(26)
Window (Uw = 1.40)			22.2800	1.3258	29.5379		(27)
French (Uw = 1.40)			4.1000	1.3258	5.4356		(27)
Heat Loss Floor 1			72.7200	0.1500	10.9080	75.0000	5454.0000 (28a)
100mm Knauf Supafil	170.0500	28.5100	141.5400	0.2500	35.3850	60.0000	8492.4000 (29a)
External Roof 1	72.7200		72.7200	0.1300	9.4536	9.0000	654.4800 (30)
Total net area of external elements Aum(A, m ²)			315.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.6371		(33)
Internal Floor 1			72.7200			18.0000	1308.9600 (32d)
Internal Floor 1			72.7200			18.0000	1308.9600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17218.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							118.3911 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0183 (36)
Total fabric heat loss						(33) + (36) =	104.6554 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	65.4780	65.1672	64.8625	63.4316	63.1639	61.9177	61.9177	61.6869	62.3977	63.1639	63.7055	64.2717 (38)
Heat transfer coeff	170.1333	169.8226	169.5179	168.0870	167.8193	166.5731	166.5731	166.3423	167.0531	167.8193	168.3609	168.9271 (39)
Average = Sum(39)m / 12 =												168.0858 (39)
HLP	1.1698	1.1676	1.1656	1.1557	1.1539	1.1453	1.1453	1.1437	1.1486	1.1539	1.1576	1.1615 (40)
HLP (average)												1.1557 (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												2.9268 (42)
Average daily hot water use (litres/day)												103.7116 (43)
Daily hot water use	114.0828	109.9343	105.7858	101.6374	97.4889	93.3405	93.3405	97.4889	101.6374	105.7858	109.9343	114.0828 (44)
Energy conte	169.1815	147.9672	152.6889	133.1179	127.7298	110.2211	102.1360	117.2026	118.6024	138.2196	150.8775	163.8432 (45)
Energy content (annual)												1631.7876 (45)
Distribution loss (46)m = 0.15 x (45)m	25.3772	22.1951	22.9033	19.9677	19.1595	16.5332	15.3204	17.5804	17.7904	20.7329	22.6316	24.5765 (46)

Water storage loss:												
Store volume											210.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):											1.4200 (48)	
Temperature factor from Table 2b											0.5400 (49)	
Enter (49) or (54) in (55)											0.7668 (55)	
Total storage loss												
23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708 (56)	
If cylinder contains dedicated solar storage												
15.2812	13.8024	15.2812	14.7883	15.2812	14.7883	15.2812	15.2812	14.7883	15.2812	14.7883	15.2812 (57)	
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
207.7251	182.7808	189.8368	163.6646	153.4791	134.9146	127.6527	143.6498	150.4998	175.3675	188.1778	202.3868 (62)	
Aperture area of solar collector											3.0000 (H1)	
Zero-loss collector efficiency											0.7000 (H2)	
Collector heat loss coefficient											1.8000 (H3)	
Collector 2nd order heat loss coefficient											0.0050 (H3a)	
Collector effective heat loss coefficient											1.8063 (H3b)	
Collector performance ratio											2.5804 (H4)	
Annual solar radiation per m ²											1079.5246 (H5)	
Overshading factor											0.8000 (H6)	
Solar energy available											1813.6014 (H7)	
Adjustment factor for showers											1.0000 (H7a)	
Solar-to-load ratio											1.1114 (H8)	
Utilisation factor											0.5933 (H9)	
Collector performance factor											0.8793 (H10)	
Dedicated solar storage volume											75.0000 (H11)	
Effective solar volume											115.5000 (H13)	
Daily hot water demand											103.7116 (H14)	
Volume ratio Veff/V											1.1137 (H15)	
Solar storage volume factor											1.0000 (H16)	
Solar input											-946.1739 (H17)	
Solar input	-27.4372	-45.7847	-77.9766	-104.5041	-129.1060	-126.9317	-125.2543	-109.4353	-85.7098	-58.5297	-32.5444	-22.9602 (63)
											Solar input (sum of months) = Sum(63)m = -946.1739 (63)	
Output from w/h												
180.2879	136.9961	111.8601	59.1605	24.3731	7.9829	2.3984	34.2145	64.7900	116.8378	155.6334	179.4266 (64)	
											Total per year (kWh/year) = Sum(64)m = 1073.9614 (64)	
Heat gains from water heating, kWh/month												
87.0877	77.0500	80.4874	68.6990	63.0696	56.4034	54.3736	60.1276	64.9532	75.6763	80.0070	85.3128 (65)	

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	6.0000	11.2829	0.7100	0.7000	0.7700	23.3165 (75)
Southeast	1.1300	36.7938	0.7100	0.7000	0.7700	14.3200 (77)
South	3.2100	46.7521	0.7100	0.7000	0.7700	51.6887 (78)
Southwest	8.1600	36.7938	0.7100	0.7000	0.7700	103.4082 (79)
West	3.2100	19.6403	0.7100	0.7000	0.7700	21.7141 (80)
Northwest	0.5700	11.2829	0.7100	0.7000	0.7700	2.2151 (81)
Northeast	4.1000	11.2829	0.7100	0.7000	0.7700	15.9329 (75)

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	28.1132	28.1647	28.2153	28.4555	28.5009	28.7141	28.7141	28.7540	28.6316	28.5009	28.4092	28.3140
alpha	2.8742	2.8776	2.8810	2.8970	2.9001	2.9143	2.9143	2.9169	2.9088	2.9001	2.8939	2.8876
util living area	0.9665	0.9470	0.9118	0.8431	0.7334	0.5861	0.4532	0.4991	0.7009	0.8775	0.9495	0.9712 (86)
MIT	18.9491	19.2251	19.6441	20.1532	20.5752	20.8445	20.9460	20.9273	20.7251	20.1678	19.4632	18.8920 (87)
Th 2	19.9442	19.9460	19.9477	19.9556	19.9571	19.9640	19.9640	19.9653	19.9613	19.9571	19.9541	19.9509 (88)
util rest of house	0.9608	0.9383	0.8971	0.8163	0.6870	0.5134	0.3579	0.4026	0.6347	0.8505	0.9397	0.9663 (89)
MIT 2	17.2204	17.6181	18.2174	18.9340	19.4978	19.8299	19.9315	19.9185	19.7014	18.9720	17.9720	17.1420 (90)
Living area fraction									fLA = Living area / (4) =			0.1349 (91)
MIT	17.4536	17.8349	18.4099	19.0985	19.6432	19.9668	20.0684	20.0546	19.8395	19.1333	18.1732	17.3781 (92)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Temperature adjustment													-0.1500
adjusted MIT	17.3036	17.6849	18.2599	18.9485	19.4932	19.8168	19.9184	19.9046	19.6895	18.9833	18.0232		17.2281 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9401	0.9123	0.8663	0.7851	0.6637	0.5022	0.3535	0.3965	0.6150	0.8185	0.9141	0.9474	(94)
Useful gains	948.9156	1079.5450	1164.9660	1179.7047	1064.4201	793.1331	533.6318	555.7329	793.3275	925.2345	912.1459	902.6125	(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	2212.3506	2171.1682	1993.5137	1689.0209	1307.8474	868.9738	552.7496	582.9612	933.7399	1406.8792	1839.0370	2200.7997	(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	939.9956	733.5708	616.4395	366.7076	181.1100	0.0000	0.0000	0.0000	0.0000	358.3437	667.3616	965.8513	(98)
Space heating												4829.3800	(98)
Space heating per m2											(98) / (4) =	33.2053	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5354.0798 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	939.9956	733.5708	616.4395	366.7076	181.1100	0.0000	0.0000	0.0000	0.0000	358.3437	667.3616	965.8513	(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)	1042.1238	813.2714	683.4140	406.5495	200.7871	0.0000	0.0000	0.0000	0.0000	397.2768	739.8687	1070.7885	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	180.2879	136.9961	111.8601	59.1605	24.3731	7.9829	2.3984	34.2145	64.7900	116.8378	155.6334	179.4266	(64)
Efficiency of water heater (217)m	88.2877	88.3292	88.3732	88.5445	88.7826	79.5000	79.5000	79.5000	79.5000	87.3106	87.9612	79.5000	(216)
Fuel for water heating, kWh/month	204.2050	155.0971	126.5771	66.8144	27.4526	10.0414	3.0169	43.0371	81.4968	133.8186	176.9341	203.1153	(219)
Water heating fuel used												1231.6065	(219)
Annual totals kWh/year													
Space heating fuel - main system												5354.0798	(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)
pump for solar water heating												50.0000	(230g)
Total electricity for the above, kWh/year												125.0000	(231)
Electricity for lighting (calculated in Appendix L)												506.7557	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.81 * 1004 * 1.00) =										-650.5895		-650.5895	(233)
Total delivered energy for all uses												6566.8525	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5354.0798	3.4800	186.3220	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1231.6065	3.4800	42.8599	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	506.7557	13.1900	66.8411	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-650.5895	13.1900	-85.8128	(252)
Total energy cost			346.6977	(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] =	0.7646	(257)
SAP value			89.3336	
SAP rating (Section 12)			89	(258)
SAP band			B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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	5354.0798	0.2160	1156.4812 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1231.6065	0.2160	266.0270 (264)
Space and water heating			1422.5082 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	506.7557	0.5190	263.0062 (268)
Energy saving/generation technologies			
PV Unit	-650.5895	0.5190	-337.6560 (269)
Total kg/year			1412.7335 (272)
CO2 emissions per m2			9.7100 (273)
EI value			90.0595
EI rating			90 (274)
EI band			B

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	72.7200 (1b)	x 2.3100 (2b)	= 167.9832 (1b) - (3b)
First floor	72.7200 (1c)	x 2.4800 (2c)	= 180.3456 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 348.3288 (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) =	0.1148 (8)
Pressure test					Yes
Measured/design AP50					4.5900
Infiltration rate					0.3443 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2927 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	3.9000	4.0000	3.8000	3.8000	3.7000	3.6000	3.5000	3.4000	3.7000	3.5000	3.7000 (22)
Wind factor	1.0500	0.9750	1.0000	0.9500	0.9500	0.9250	0.9000	0.8750	0.8500	0.9250	0.8750	0.9250 (22a)
Adj infilt rate												
Effective ac	0.3073	0.2854	0.2927	0.2780	0.2780	0.2707	0.2634	0.2561	0.2488	0.2707	0.2561	0.2707 (22b)
	0.5472	0.5407	0.5428	0.5387	0.5387	0.5366	0.5347	0.5328	0.5309	0.5366	0.5328	0.5366 (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			2.1300	0.9000	1.9170		(26)
Window (Uw = 1.40)			22.2800	1.3258	29.5379		(27)
French (Uw = 1.40)			4.1000	1.3258	5.4356		(27)
Heat Loss Floor 1			72.7200	0.1500	10.9080	75.0000	5454.0000 (28a)
100mm Knauf Supafil	170.0500	28.5100	141.5400	0.2500	35.3850	60.0000	8492.4000 (29a)
External Roof 1	72.7200		72.7200	0.1300	9.4536	9.0000	654.4800 (30)
Total net area of external elements Aum(A, m ²)			315.4900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	92.6371		(33)
Internal Floor 1			72.7200			18.0000	1308.9600 (32d)
Internal Floor 1			72.7200			18.0000	1308.9600 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17218.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							118.3911 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0183 (36)
Total fabric heat loss						(33) + (36) =	104.6554 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	62.9024	62.1546	62.3977	61.9177	61.9177	61.6869	61.4623	61.2438	61.0315	61.6869	61.2438	61.6869 (38)
Heat transfer coeff	167.5578	166.8100	167.0531	166.5731	166.5731	166.3423	166.1176	165.8992	165.6868	166.3423	165.8992	166.3423 (39)
Average = Sum(39)m / 12 =												166.4331 (39)
HLP	1.1521	1.1469	1.1486	1.1453	1.1453	1.1437	1.1422	1.1407	1.1392	1.1437	1.1407	1.1437 (40)
HLP (average)												1.1443 (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												2.9268 (42)
Average daily hot water use (litres/day)												103.7116 (43)
Daily hot water use	114.0828	109.9343	105.7858	101.6374	97.4889	93.3405	93.3405	97.4889	101.6374	105.7858	109.9343	114.0828 (44)
Energy conte	169.1815	147.9672	152.6889	133.1179	127.7298	110.2211	102.1360	117.2026	118.6024	138.2196	150.8775	163.8432 (45)
Energy content (annual)										Total = Sum(45)m =		1631.7876 (45)
Distribution loss (46)m = 0.15 x (45)m	25.3772	22.1951	22.9033	19.9677	19.1595	16.5332	15.3204	17.5804	17.7904	20.7329	22.6316	24.5765 (46)

Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7668 (55)
Total storage loss												
23.7708	21.4704	23.7708	23.0040	23.7708	23.0040	23.7708	23.7708	23.0040	23.7708	23.0040	23.7708	(56)
If cylinder contains dedicated solar storage												
15.2812	13.8024	15.2812	14.7883	15.2812	14.7883	15.2812	15.2812	14.7883	15.2812	14.7883	15.2812	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
207.7251	182.7808	189.8368	163.6646	153.4791	134.9146	127.6527	143.6498	150.4998	175.3675	188.1778	202.3868 (62)	
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m ²												1208.1510 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2029.6937 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2438 (H8)
Utilisation factor												0.5524 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												115.5000 (H13)
Daily hot water demand												103.7116 (H14)
Volume ratio Veff/V												1.1137 (H15)
Solar storage volume factor												1.0000 (H16)
Solar input												-985.9479 (H17)
Solar input	-32.1640	-45.7352	-78.6078	-106.0601	-124.5739	-133.0646	-130.2663	-116.5923	-91.2837	-63.1104	-38.0415	-26.4482 (63)
												Solar input (sum of months) = Sum(63)m = -985.9479 (63)
Output from w/h												
175.5611	137.0456	111.2290	57.6045	28.9051	1.8500	0.0000	27.0575	59.2161	112.2571	150.1363	175.9387 (64)	
												Total per year (kWh/year) = Sum(64)m = 1036.8009 (64)
Heat gains from water heating, kWh/month												
87.0877	77.0500	80.4874	68.6990	63.0696	56.4034	54.3736	60.1276	64.9532	75.6763	80.0070	85.3128 (65)	

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	28.5454	28.6733	28.6316	28.7141	28.7141	28.7540	28.7928	28.8308	28.8677	28.7540	28.8308	28.7540
alpha	2.9030	2.9116	2.9088	2.9143	2.9143	2.9169	2.9195	2.9221	2.9245	2.9169	2.9221	2.9169
util living area	0.9581	0.9405	0.8973	0.8126	0.6876	0.5063	0.3826	0.4049	0.6332	0.8401	0.9324	0.9636 (86)
MIT	19.1467	19.3583	19.7917	20.2944	20.6807	20.9065	20.9695	20.9647	20.8133	20.3458	19.6909	19.1143 (87)
Th 2	19.9585	19.9627	19.9613	19.9640	19.9640	19.9653	19.9665	19.9678	19.9689	19.9653	19.9678	19.9653 (88)
util rest of house	0.9510	0.9307	0.8803	0.7813	0.6345	0.4288	0.2878	0.3058	0.5588	0.8052	0.9192	0.9573 (89)
MIT 2	17.5143	17.8196	18.4343	19.1306	19.6350	19.8930	19.9511	19.9497	19.8058	19.2187	18.3057	17.4726 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.1349 (91)
MIT	17.7345	18.0272	18.6175	19.2876	19.7761	20.0297	20.0885	20.0866	19.9417	19.3708	18.4925	17.6941 (92)

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Temperature adjustment													-0.1500
adjusted MIT	17.5845	17.8772	18.4675	19.1376	19.6261	19.8797	19.9385	19.9366	19.7917	19.2208	18.3425		17.5441 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9279	0.9039	0.8491	0.7520	0.6152	0.4220	0.2851	0.3027	0.5446	0.7745	0.8908	0.9360	(94)
Useful gains	988.8187	1091.8097	1179.6603	1183.1573	1008.9724	719.8698	462.3755	459.9124	753.0597	927.9890	948.8058	932.3607	(95)
Ext temp.	4.9000	5.3000	7.0000	9.5000	12.5000	15.3000	17.1000	17.1000	14.7000	11.4000	7.9000	5.0000	(96)
Heat loss rate W	2125.3947	2098.0011	1915.6732	1605.3655	1187.0178	761.7979	471.5302	470.5974	843.6299	1300.9222	1732.4083	2086.6062	(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	845.6126	676.1607	547.5936	303.9899	132.4658	0.0000	0.0000	0.0000	0.0000	277.4623	564.1938	858.7587	(98)
Space heating												4206.2372	(98)
Space heating per m2										(98) / (4) =		28.9208	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4663.2342 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	845.6126	676.1607	547.5936	303.9899	132.4658	0.0000	0.0000	0.0000	0.0000	277.4623	564.1938	858.7587	(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)	937.4862	749.6238	607.0882	337.0176	146.8579	0.0000	0.0000	0.0000	0.0000	307.6079	625.4920	952.0606	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	175.5611	137.0456	111.2290	57.6045	28.9051	1.8500	0.0000	27.0575	59.2161	112.2571	150.1363	175.9387	(64)
Efficiency of water heater (217)m	88.1601	88.1995	88.1959	88.3066	88.0766	79.5000	79.5000	79.5000	79.5000	86.8336	87.7186	79.5000	(216)
Fuel for water heating, kWh/month	199.1390	155.3815	126.1158	65.2324	32.8182	2.3270	0.0000	34.0346	74.4856	129.2784	171.1567	1189.4871	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system												4663.2342	(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)
pump for solar water heating												50.0000	(230g)
Total electricity for the above, kWh/year												125.0000	(231)
Electricity for lighting (calculated in Appendix L)												506.7557	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.81 * 1122 * 1.00) =										-727.0046		-727.0046	(233)
Total delivered energy for all uses												5757.4724	(238)

10a. Fuel costs - using BEDF prices (450)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4663.2342	3.9300	183.2651	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1189.4871	3.9300	46.7468	(247)
Pumps and fans for heating	75.0000	17.5600	13.1700	(249)
Pump for solar water heating	50.0000	17.5600	8.7800	(249)
Energy for lighting	506.7557	17.5600	88.9863	(250)
Additional standing charges			88.0000	(251)
Energy saving/generation technologies				
PV Unit	-727.0046	17.5600	-127.6620	(252)
Total energy cost			301.2862	(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	4663.2342	0.2160	1007.2586	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1189.4871	0.2160	256.9292	(264)
Space and water heating			1264.1878	(265)

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Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	506.7557	0.5190	263.0062 (268)
Energy saving/generation technologies			
PV Unit	-727.0046	0.5190	-377.3154 (269)
Total kg/year			1214.7536 (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	4663.2342	1.2200	5689.1457 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1189.4871	1.2200	1451.1743 (264)
Space and water heating			7140.3200 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	506.7557	3.0700	1555.7400 (268)
Energy saving/generation technologies			
PV Unit	-727.0046	3.0700	-2231.9040 (269)
Primary energy kWh/year			6847.9059 (272)
Primary energy kWh/m2/year			47.0841 (273)

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Built) 9.92

Overheating Calculation Input Data

Dwelling type	Detached House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Southern England
Front of dwelling faces	South West
Overshading	Average or unknown
Thermal mass parameter	118.4 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	4.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	459.79 (P1)
Transmission heat loss coefficient	104.66 (37)
Summer heat loss coefficient	564.45 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
North East	0.000	1.000	None
South East	0.000	1.000	None
South	0.000	1.000	None
South West	0.000	1.000	None
West	0.000	1.000	None
North West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North East	1.000	0.90	1.000	0.900 (P8)
South East	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)
South West	1.000	0.90	1.000	0.900 (P8)
West	1.000	0.90	1.000	0.900 (P8)
North West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North East	6.0000	106.0502	0.7100	0.7000	0.9000	256.1558
South East	1.1300	127.3119	0.7100	0.7000	0.9000	57.9147
South	3.2100	118.5567	0.7100	0.7000	0.9000	153.2048
South West	8.1600	127.3119	0.7100	0.7000	0.9000	418.2158
West	3.2100	125.2818	0.7100	0.7000	0.9000	161.8953
North West	0.5700	106.0502	0.7100	0.7000	0.9000	24.3348
North East	4.1000	106.0502	0.7100	0.7000	0.9000	175.0398
total:						1246.7611

	Jun	Jul	Aug	
Solar gains	1340	1247	1109	(P3)
Internal gains	613	589	599	
Total summer gains	1953	1836	1708	(P5)
Summer gain/loss ratio	3.46	3.25	3.03	(P6)
Summer external temperature	15.40	17.30	17.30	
Thermal mass temperature increment (TMP = 118.4)	1.17	1.17	1.17	
Threshold temperature	20.03	21.72	21.50	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

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Assessment of likelihood of high internal temperature: Slight