

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	BD23 6RR Plot 44			Issued on Date	20/07/2022
Assessment Reference	001	Prop Type Ref	Type E		
Property	Plot 44, Phase 4, Shires Lane, Embsay, Skipton, BD23 6RR				
SAP Rating	90 B	DER	10.66	TER	16.87
Environmental	91 B	% DER<TER	36.81		
CO₂ Emissions (t/year)	1.52	DFEE	55.86	TFEE	58.89
General Requirements Compliance	Pass	% DFEE<TFEE	5.14		
Assessor Details	Mr. Jake Eaton, Jake Eaton, Tel: 01400283471, jake@eratech.co.uk			Assessor ID	P711-0001
Client					

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

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DWELLING AS DESIGNED

Detached House, total floor area 141 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) 16.87 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.66 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 58.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 55.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.17 (max. 0.35)	OK
Openings	1.63 (max. 2.00)	1.80 (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: 5.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from manufacturer

rated a

Combi boiler

Efficiency: 89%

Minimum: 88%

OK

Secondary heating system:

Room heaters - Wood Logs

Closed room heater

Efficiency: 65%

Minimum: 65%

OK

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

Minimum 75%

OK

8 Mechanical ventilation

Continuous extract system (decentralised)

Specific fan power: 0.1600 0.1600

Maximum 0.7

OK

9 Summertime temperature

Overheating risk (North East England): Not significant OK

Based on:

Overshading: Average

Windows facing North East: 5.26 m², No overhang

Windows facing South East: 4.48 m², No overhang

Windows facing South West: 9.69 m², No overhang

Windows facing North West: 6.04 m², No overhang

Air change rate: 2.50 ach

Blinds/curtains: Light-coloured curtain or roller blind, closed 50% of daylight hours

10 Key features

Secondary heating (wood logs)

Secondary heating fuel: wood logs

Photovoltaic array 2.00 kW

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	77.0400 (1b)	2.5000 (2b)	192.6000 (1b) - (3b)
First floor	64.0800 (1c)	2.7200 (2c)	174.2976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	141.1200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 366.8976 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				0 * 10 =	0.0000 (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) =				0.0000 / (5) =	0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.2500 (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) =		0.2125 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5209	0.5156	0.5103	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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					
Opening Type 1			4.0300	1.8000	7.2540		(26)					
Opening Type 2 (Uw = 1.60)			25.4700	1.5038	38.3008		(27)					
Opening Type 3 (Uw = 1.60)			0.8600	1.5038	1.2932		(27a)					
Heat Loss Floor 1			77.0400	0.1300	10.0152	75.0000	5778.0000 (28a)					
External Wall 1	180.0500	29.5000	150.5500	0.1800	27.0990	110.0000	16560.5000 (29a)					
External Roof 2	64.0800		64.0800	0.1300	8.3304	9.0000	576.7200 (30)					
External Roof 2	13.5500	0.8600	12.6900	0.1700	2.1573	0.0000	0.0000 (30)					
Total net area of external elements Aum(A, m ²)			334.7200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	94.4499		(33)					
Internal Wall 1			70.2300			75.0000	5267.2500 (32c)					
Internal Wall 2			104.2100			9.0000	937.8900 (32c)					
Internal Floor 1			64.0800			18.0000	1153.4400 (32d)					
Internal Ceiling 1			64.0800			18.0000	1153.4400 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	31427.2400 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							222.6987 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							25.3232 (36)					
Total fabric heat loss						(33) + (36) =	119.7731 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 63.0731	Feb 62.4299	Mar 61.7867	Apr 60.5381	May 60.5381	Jun 60.5381	Jul 60.5381	Aug 60.5381	Sep 60.5381	Oct 60.5381	Nov 60.5381	Dec 60.5381 (38)
Heat transfer coeff	182.8462	182.2030	181.5598	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112 (39)
Average = Sum(39)m / 12 =												180.7841 (39)
HLP	Jan 1.2957	Feb 1.2911	Mar 1.2866	Apr 1.2777	May 1.2777	Jun 1.2777	Jul 1.2777	Aug 1.2777	Sep 1.2777	Oct 1.2777	Nov 1.2777	Dec 1.2777 (40)
HLP (average)												1.2811 (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												2.9192 (42)
Average daily hot water use (litres/day)												103.5307 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use	113.8837	109.7425	105.6013	101.4601	97.3188	93.1776	93.1776	97.3188	101.4601	105.6013	109.7425	113.8837 (44)
Energy conte	168.8863	147.7090	152.4225	132.8856	127.5069	110.0288	101.9578	116.9981	118.3954	137.9785	150.6143	163.5574 (45)
Energy content (annual)	Total = Sum(45)m = 1628.9406 (45)											
Distribution loss (46)m = 0.15 x (45)m	25.3329	22.1564	22.8634	19.9328	19.1260	16.5043	15.2937	17.5497	17.7593	20.6968	22.5921	24.5336 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.5926	45.9506	47.4823	49.5926	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163 (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	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163 (64)
Heat gains from water heating, kWh/month	68.8944	60.6201	63.4202	56.5132	54.7942	48.0722	45.7716	51.3000	51.6952	58.6176	62.4080	67.1225 (65)
Total per year (kWh/year) = Sum(64)m = 2219.3669 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1088	24.9660	20.3037	15.3712	11.4902	9.7005	10.4817	13.6245	18.2868	23.2193	27.1003	28.8900 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	310.6819	313.9058	305.7816	288.4863	266.6541	246.1348	232.4267	229.2028	237.3270	254.6223	276.4545	296.9738 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959 (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)	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674 (71)
Water heating gains (Table 5)	92.6000	90.2085	85.2422	78.4906	73.6481	66.7670	61.5209	68.9516	71.7990	78.7870	86.6778	90.2185 (72)
Total internal gains	501.1785	498.8680	481.1153	452.1359	421.5801	392.3901	374.2171	381.5668	397.2005	426.4164	460.0205	485.8701 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	FF	Access factor Table 6d	Gains W					
Northeast	5.2600	11.2829	0.7600	0.7000	0.7700	21.8803 (75)						
Southeast	4.4800	36.7938	0.7600	0.7000	0.7700	60.7712 (77)						
Southwest	9.6900	36.7938	0.7600	0.7000	0.7700	131.4449 (79)						
Northwest	6.0400	11.2829	0.7600	0.7000	0.7700	25.1249 (81)						
Southwest	0.8600	34.0172	0.7600	0.7000	1.0000	14.0072 (82)						
Solar gains	253.2285	450.3567	665.1736	903.7723	1083.1358	1105.9778	1053.5508	915.3678	747.2814	511.0932	306.8092	214.4260 (83)
Total gains	754.4069	949.2247	1146.2890	1355.9082	1504.7159	1498.3679	1427.7680	1296.9346	1144.4820	937.5096	766.8297	700.2960 (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	47.7439	47.9124	48.0822	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151
alpha	4.1829	4.1942	4.2055	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277
util living area	0.9978	0.9940	0.9827	0.9447	0.8498	0.6914	0.5341	0.6010	0.8409	0.9726	0.9953	0.9984 (86)
MIT	19.7139	19.8781	20.1346	20.4561	20.7238	20.8731	20.9195	20.9093	20.7859	20.4227	20.0074	19.6947 (87)
Th 2	19.8442	19.8478	19.8514	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583 (88)
util rest of house	0.9971	0.9921	0.9769	0.9258	0.7994	0.5958	0.4058	0.4693	0.7674	0.9598	0.9936	0.9979 (89)
MIT 2	18.1244	18.3666	18.7412	19.2022	19.5554	19.7213	19.7582	19.7529	19.6397	19.1641	18.5641	18.1069 (90)
Living area fraction	FLA = Living area / (4) =											0.3302 (91)
MIT	18.6493	18.8658	19.2013	19.6163	19.9412	20.1017	20.1417	20.1347	20.0182	19.5797	19.0407	18.6312 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4993	18.7158	19.0513	19.4663	19.7912	19.9517	19.9917	19.9847	19.8682	19.4297	18.8907	18.4812 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9960	0.9895	0.9716	0.9176	0.7960	0.6044	0.4215	0.4849	0.7682	0.9532	0.9914	0.9970 (94)
Useful gains	751.3586	939.2692	1113.7074	1244.2232	1197.7743	905.5521	601.7363	628.8383	879.1593	893.6782	760.2191	698.2204 (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	2596.2842	2517.2722	2278.8177	1905.2190	1458.9351	964.9638	611.5549	646.3687	1040.0670	1592.0940	2125.9892	2575.0578 (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	1372.6246	1060.4180	866.8421	475.9170	194.3037	0.0000	0.0000	0.0000	0.0000	519.6214	983.3544	1396.3670 (98)
Space heating												6869.4481 (98)

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Space heating per m2

(98) / (4) = 48.6781 (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)	0.1000 (201)
Fraction of space heat from main system(s)	0.9000 (202)
Efficiency of main space heating system 1 (in %)	91.4000 (206)
Efficiency of secondary/supplementary heating system, %	65.0000 (208)
Space heating requirement	6764.2268 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1372.6246	1060.4180	866.8421	475.9170	194.3037	0.0000	0.0000	0.0000	0.0000	519.6214	983.3544	1396.3670	(98)
Space heating efficiency (main heating system 1)	91.4000	91.4000	91.4000	91.4000	91.4000	0.0000	0.0000	0.0000	0.0000	91.4000	91.4000	91.4000	(210)
Space heating fuel (main heating system)	1351.5998	1044.1753	853.5644	468.6272	191.3275	0.0000	0.0000	0.0000	0.0000	511.6622	968.2921	1374.9784	(211)
Water heating requirement	211.1730	163.1412	133.3603	73.2180	29.8929	0.0000	0.0000	0.0000	0.0000	79.9417	151.2853	214.8257	(215)
Water heating requirement	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163	(64)
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	247.0171	217.6814	228.5184	204.7199	198.9882	175.2577	167.9102	187.1806	188.4388	212.2892	224.6397	241.0295	(219)
Water heating fuel used												2493.6707	(219)
Annual totals kWh/year													
Space heating fuel - main system												6764.2268	(211)
Space heating fuel - secondary												1056.8382	(215)

Electricity for pumps and fans:

(MEV)Decentralised, Database: total watage = 10.6720, total flow = 58.0000, SFP = 0.1840	
mechanical ventilation fans (SFP = 0.1840)	82.3612 (230a)
central heating pump	30.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	157.3612 (231)
Electricity for lighting (calculated in Appendix L)	496.4098 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV Unit 0 (0.80 * 2.00 * 1029 * 1.00) =	-1646.6987	-1646.6987 (233)
Total delivered energy for all uses		9321.8079 (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	6764.2268	0.2160	1461.0730 (261)
Space heating - secondary	1056.8382	0.0190	20.0799 (263)
Water heating (other fuel)	2493.6707	0.2160	538.6329 (264)
Space and water heating			2019.7858 (265)
Pumps and fans	157.3612	0.5190	81.6704 (267)
Energy for lighting	496.4098	0.5190	257.6367 (268)
Energy saving/generation technologies			
PV Unit	-1646.6987	0.5190	-854.6366 (269)
Total CO2, kg/year			1504.4563 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.6600 (273)

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

DER		10.6600	ZC1
Total Floor Area		141.1200	
Assumed number of occupants		2.9192	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		13.0459	ZC2
CO2 emissions from cooking, equation (L16)		1.3397	ZC3
Total CO2 emissions		25.0456	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		25.0456	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	77.0400 (1b)	2.5000 (2b)	192.6000 (1b) - (3b)
First floor	64.0800 (1c)	2.7200 (2c)	174.2976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	141.1200		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 366.8976 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				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) =	0.1090 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3590 (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) =		0.3052 (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												
Effective ac	0.3891	0.3815	0.3738	0.3357	0.3281	0.2899	0.2899	0.2823	0.3052	0.3281	0.3433	0.3586 (22b)
	0.5757	0.5728	0.5699	0.5563	0.5538	0.5420	0.5420	0.5398	0.5466	0.5538	0.5589	0.5643 (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			4.0300	1.0000	4.0300		(26)
TER Opening Type (Uw = 1.40)			25.4700	1.3258	33.7670		(27)
TER Room Window (Uw = 1.70)			0.8600	1.5918	1.3689		(27a)
Heat Loss Floor 1			77.0400	0.1300	10.0152		(28a)
External Wall 1	180.0500	29.5000	150.5500	0.1800	27.0990		(29a)
External Roof 2	64.0800		64.0800	0.1300	8.3304		(30)
External Roof 2	13.5500	0.8600	12.6900	0.1300	1.6497		(30)
Total net area of external elements Aum(A, m ²)			334.7200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	86.2603	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2464 (36)
 Total fabric heat loss (33) + (36) = 101.5067 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	69.7030	69.3472	68.9983	67.3598	67.0533	65.6262	65.6262	65.3619	66.1759	67.0533	67.6734	68.3218 (38)
Heat transfer coeff	171.2097	170.8538	170.5050	168.8665	168.5599	167.1329	167.1329	166.8686	167.6826	168.5599	169.1801	169.8284 (39)
Average = Sum(39)m / 12 =												168.8650 (39)
HLP	1.2132	1.2107	1.2082	1.1966	1.1944	1.1843	1.1843	1.1825	1.1882	1.1944	1.1988	1.2034 (40)
HLP (average)												1.1966 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9192 (42)
Average daily hot water use (litres/day)												103.5307 (43)
Daily hot water use	113.8837	109.7425	105.6013	101.4601	97.3188	93.1776	93.1776	97.3188	101.4601	105.6013	109.7425	113.8837 (44)
Energy conte	168.8863	147.7090	152.4225	132.8856	127.5069	110.0288	101.9578	116.9981	118.3954	137.9785	150.6143	163.5574 (45)
Energy content (annual)												Total = Sum(45)m = 1628.9406 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.3329	22.1564	22.8634	19.9328	19.1260	16.5043	15.2937	17.5497	17.7593	20.6968	22.5921	24.5336 (46)
Water storage loss:												
Total storage loss												

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Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	0.0000	0.0000	(56)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.5926	45.9506	47.4823	49.5926	49.3151	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163	214.5163	214.5163	(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	0.0000	0.0000	(63)
Output from w/h	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163	214.5163	214.5163	(64)
Heat gains from water heating, kWh/month	68.8944	60.6201	63.4202	56.5132	54.7942	48.0722	45.7716	51.3000	51.6952	58.6176	62.4080	67.1225	67.1225	67.1225	(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	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1088	24.9660	20.3037	15.3712	11.4902	9.7005	10.4817	13.6245	18.2868	23.2193	27.1003	28.8900	28.8900	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	310.6819	313.9058	305.7816	288.4863	266.6541	246.1348	232.4267	229.2028	237.3270	254.6223	276.4545	296.9738	296.9738	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	(71)
Water heating gains (Table 5)	92.6000	90.2085	85.2422	78.4906	73.6481	66.7670	61.5209	68.9516	71.7990	78.7870	86.6778	90.2185	90.2185	(72)
Total internal gains	501.1785	498.8680	481.1153	452.1359	421.5801	392.3901	374.2171	381.5668	397.2005	426.4164	460.0205	485.8701	485.8701	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m ²	Table 6a	Specific data	Specific data	factor	W
		W/m ²	or Table 6b	or Table 6c	Table 6d	
Northeast	5.2600	11.2829	0.6300	0.7000	0.7700	18.1376
Southeast	4.4800	36.7938	0.6300	0.7000	0.7700	50.3761
Southwest	9.6900	36.7938	0.6300	0.7000	0.7700	108.9609
Northwest	6.0400	11.2829	0.6300	0.7000	0.7700	20.8272
Southwest	0.8600	34.0172	0.6300	0.7000	1.0000	11.6112
Solar gains	209.9131	373.3220	551.3939	749.1796	897.8625	916.7974
Total gains	711.0915	872.1900	1032.5093	1201.3156	1319.4427	1309.1875

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)															21.0000
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	57.2397	57.3590	57.4763	58.0340	58.1396	58.6360	58.6360	58.7288	58.4438	58.1396	57.9264	57.7053	57.7053		
alpha	4.8160	4.8239	4.8318	4.8689	4.8760	4.9091	4.9091	4.9153	4.8963	4.8760	4.8618	4.8470	4.8470		
util living area	0.9991	0.9973	0.9914	0.9675	0.8927	0.7375	0.5706	0.6383	0.8793	0.9847	0.9979	0.9993	0.9993	(86)	
MIT	19.5863	19.7619	20.0460	20.4186	20.7427	20.9311	20.9844	20.9738	20.8261	20.3953	19.9190	19.5566	19.5566	(87)	
Th 2	19.9094	19.9115	19.9134	19.9227	19.9244	19.9326	19.9326	19.9341	19.9294	19.9244	19.9209	19.9173	19.9173	(88)	
util rest of house	0.9988	0.9964	0.9881	0.9545	0.8497	0.6441	0.4417	0.5072	0.8137	0.9764	0.9970	0.9991	0.9991	(89)	
MIT 2	18.0185	18.2766	18.6916	19.2319	19.6680	19.8860	19.9268	19.9230	19.7840	19.2073	18.5134	17.9806	17.9806	(90)	
Living area fraction									fLA = Living area / (4) =			0.3302	0.3302	(91)	
MIT	18.5362	18.7671	19.1388	19.6238	20.0229	20.2311	20.2760	20.2700	20.1281	19.5996	18.9776	18.5010	18.5010	(92)	
Temperature adjustment												0.0000	0.0000	(93)	
adjusted MIT	18.5362	18.7671	19.1388	19.6238	20.0229	20.2311	20.2760	20.2700	20.1281	19.5996	18.9776	18.5010	18.5010	(93)	

8. Space heating requirement

Utilisation	0.9981	0.9949	0.9849	0.9499	0.8542	0.6723	0.4846	0.5507	0.8280	0.9730	0.9958	0.9986	0.9986	(94)
Useful gains	709.7552	867.7340	1016.9272	1141.0719	1127.0937	880.1256	604.6049	628.0515	841.7892	827.1321	711.3264	662.7217	662.7217	(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	4.2000	(96)
Heat loss rate W	2437.3775	2369.2479	2154.9840	1810.8849	1402.9034	941.1485	614.3873	645.7823	1010.8102	1516.9740	2009.4457	2428.7215	2428.7215	(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	1.0000	(97a)
Space heating kWh	1285.3510	1009.0173	846.7143	482.2654	205.2024	0.0000	0.0000	0.0000	0.0000	513.2424	934.6460	1313.9039	1313.9039	(98)
Space heating												6590.3426	6590.3426	(98)
Space heating per m ²												(98) / (4) =	46.7003	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													7056.0414 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1285.3510	1009.0173	846.7143	482.2654	205.2024	0.0000	0.0000	0.0000	0.0000	513.2424	934.6460	1313.9039	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	1376.1788	1080.3183	906.5463	516.3441	219.7028	0.0000	0.0000	0.0000	0.0000	549.5101	1000.6916	1406.7494	(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	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163	(64)
Efficiency of water heater (217)m	88.7692	88.6049	88.2502	87.3861	85.4227	80.3000	80.3000	80.3000	80.3000	87.4407	88.4398	80.3000	(216)
Fuel for water heating, kWh/month	247.6592	218.6521	230.4601	208.5007	207.3213	194.2458	186.1023	207.4604	208.8549	216.0749	226.0626	241.4858	(219)
Water heating fuel used													2592.8801 (219)
Annual totals kWh/year													
Space heating fuel - main system													7056.0414 (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)													496.4098 (232)
Total delivered energy for all uses													10220.3313 (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	7056.0414	0.2160	1524.1049 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2592.8801	0.2160	560.0621 (264)
Space and water heating			2084.1670 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	496.4098	0.5190	257.6367 (268)
Total CO2, kg/m2/year			2380.7287 (272)
Emissions per m2 for space and water heating			14.7688 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.8257 (272b)
Emissions per m2 for pumps and fans			0.2758 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.7688 * 1.00) + 1.8257 + 0.2758, rounded to 2 d.p.			16.8700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	77.0400 (1b)	x 2.5000 (2b)	= 192.6000 (1b) - (3b)
First floor	64.0800 (1c)	x 2.7200 (2c)	= 174.2976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	141.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 366.8976 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				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) =	0.1090 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3590 (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) =		0.3052 (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												
Effective ac	0.3891	0.3815	0.3738	0.3357	0.3281	0.2899	0.2899	0.2823	0.3052	0.3281	0.3433	0.3586 (22b)
	0.5757	0.5728	0.5699	0.5563	0.5538	0.5420	0.5420	0.5398	0.5466	0.5538	0.5589	0.5643 (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
Opening Type 1			4.0300	1.8000	7.2540		(26)
Opening Type 2 (Uw = 1.60)			25.4700	1.5038	38.3008		(27)
Opening Type 3 (Uw = 1.60)			0.8600	1.5038	1.2932		(27a)
Heat Loss Floor 1			77.0400	0.1300	10.0152	75.0000	5778.0000 (28a)
External Wall 1	180.0500	29.5000	150.5500	0.1800	27.0990	110.0000	16560.5000 (29a)
External Roof 2	64.0800		64.0800	0.1300	8.3304	9.0000	576.7200 (30)
External Roof 2	13.5500	0.8600	12.6900	0.1700	2.1573	0.0000	0.0000 (30)
Total net area of external elements Aum(A, m ²)			334.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	94.4499		(33)
Internal Wall 1			70.2300			75.0000	5267.2500 (32c)
Internal Wall 2			104.2100			9.0000	937.8900 (32c)
Internal Floor 1			64.0800			18.0000	1153.4400 (32d)
Internal Ceiling 1			64.0800			9.0000	576.7200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	30850.5200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							218.6120 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							25.3232 (36)
Total fabric heat loss						(33) + (36) =	119.7731 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	69.7030	69.3472	68.9983	67.3598	67.0533	65.6262	65.6262	65.3619	66.1759	67.0533	67.6734	68.3218 (38)
Average = Sum(39)m / 12 =	189.4761	189.1202	188.7714	187.1329	186.8264	185.3993	185.3993	185.1350	185.9490	186.8264	187.4465	188.0949 (39)
												187.1315 (39)
HLP	1.3427	1.3401	1.3377	1.3261	1.3239	1.3138	1.3138	1.3119	1.3177	1.3239	1.3283	1.3329 (40)
HLP (average)												1.3260 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9192 (42)
Average daily hot water use (litres/day)												103.5307 (43)
Daily hot water use	113.8837	109.7425	105.6013	101.4601	97.3188	93.1776	93.1776	97.3188	101.4601	105.6013	109.7425	113.8837 (44)
Energy conte	168.8863	147.7090	152.4225	132.8856	127.5069	110.0288	101.9578	116.9981	118.3954	137.9785	150.6143	163.5574 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1628.9406 (45)									
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Heat gains from water heating, kWh/month	35.8883	31.3882	32.3898	28.2382	27.0952	23.3811	21.6660	24.8621	25.1590	29.3204	32.0055	34.7559	65)										

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1088	24.9660	20.3037	15.3712	11.4902	9.7005	10.4817	13.6245	18.2868	23.2193	27.1003	28.8900	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	310.6819	313.9058	305.7816	288.4863	266.6541	246.1348	232.4267	229.2028	237.3270	254.6223	276.4545	296.9738	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	(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)	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	(71)
Water heating gains (Table 5)	48.2370	46.7086	43.5346	39.2197	36.4183	32.4738	29.1210	33.4168	34.9431	39.4092	44.4521	46.7150	(72)
Total internal gains	453.8155	452.3681	436.4078	409.8650	381.3503	355.0969	338.8172	343.0319	357.3446	384.0385	414.7948	439.3665	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m2	Table 6a	Specific data	Specific data	factor	W							
		W/m2	or Table 6b	or Table 6c	Table 6d								
Northeast	5.2600	11.2829	0.7600	0.7000	0.7700	21.8803 (75)							
Southeast	4.4800	36.7938	0.7600	0.7000	0.7700	60.7712 (77)							
Southwest	9.6900	36.7938	0.7600	0.7000	0.7700	131.4449 (79)							
Northwest	6.0400	11.2829	0.7600	0.7000	0.7700	25.1249 (81)							
Southwest	0.8600	34.0172	0.7600	0.7000	1.0000	14.0072 (82)							
Solar gains	253.2285	450.3567	665.1736	903.7723	1083.1358	1105.9778	1053.5508	915.3678	747.2814	511.0932	306.8092	214.4260	(83)
Total gains	707.0439	902.7248	1101.5814	1313.6373	1464.4861	1461.0747	1392.3681	1258.3997	1104.6261	895.1317	721.6040	653.7925	(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	45.2278	45.3129	45.3966	45.7941	45.8693	46.2223	46.2223	46.2883	46.0857	45.8693	45.7175	45.5599	
alpha	4.0152	4.0209	4.0264	4.0529	4.0580	4.0815	4.0815	4.0859	4.0724	4.0580	4.0478	4.0373	
util living area	0.9981	0.9947	0.9845	0.9506	0.8643	0.7121	0.5566	0.6253	0.8580	0.9763	0.9960	0.9986	(86)
MIT	19.2516	19.4725	19.8236	20.2755	20.6633	20.8955	20.9708	20.9537	20.7604	20.2370	19.6545	19.2137	(87)
Th 2	19.8076	19.8095	19.8114	19.8205	19.8222	19.8301	19.8301	19.8315	19.8270	19.8222	19.8187	19.8152	(88)
util rest of house	0.9975	0.9930	0.9794	0.9333	0.8163	0.6158	0.4222	0.4890	0.7879	0.9650	0.9945	0.9982	(89)
MIT 2	18.2196	18.4411	18.7907	19.2372	19.5923	19.7801	19.8222	19.8173	19.6880	19.2090	18.6303	18.1875	(90)
Living area fraction	MIT	18.5604	18.7817	19.1318	19.5800	19.9460	20.1484	20.2015	20.1926	20.0421	19.5484	18.9685	0.3302 (91)
Temperature adjustment	adjusted MIT	18.5604	18.7817	19.1318	19.5800	19.9460	20.1484	20.2015	20.1926	20.0421	19.5484	18.9685	18.5264 (92)
adjusted MIT	18.5604	18.7817	19.1318	19.5800	19.9460	20.1484	20.2015	20.1926	20.0421	19.5484	18.9685	18.5264 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9966	0.9910	0.9755	0.9289	0.8221	0.6442	0.4668	0.5340	0.8030	0.9615	0.9929	0.9975	(94)
Useful gains	704.6428	894.5885	1074.5754	1220.2516	1203.9065	941.2896	649.9754	671.9729	886.9733	860.7079	716.4730	652.1638	(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	2702.0031	2625.3139	2384.5223	1998.5871	1540.5701	1028.6733	667.7087	702.1349	1104.9249	1671.8037	2224.7129	2694.7140	(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	1486.0361	1163.0475	974.6005	560.4016	250.4777	0.0000	0.0000	0.0000	0.0000	603.4553	1085.9327	1519.6574	(98)
Space heating													7643.6087 (98)
Space heating per m2													(98) / (4) = 54.1639 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	

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Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1742.7534	1371.9548	1407.0262	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8195	0.8847	0.8474	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1428.1992	1213.7005	1192.3259	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1816.5904	1734.1441	1581.9125	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	279.6416	387.2101	289.8524	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling Cooled fraction												956.7041	(104)
Intermittency factor (Table 10b)												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	69.9104	96.8025	72.4631	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling Space cooling per m2												239.1760	(107)
Energy for space heating												1.6948	(108)
Energy for space cooling												54.1639	(99)
Total												1.6948	(108)
Dwelling Fabric Energy Efficiency (DFEE)												55.8587	(109)
												55.9	(109)

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	77.0400 (1b)	2.5000 (2b)	192.6000 (1b) - (3b)
First floor	64.0800 (1c)	2.7200 (2c)	174.2976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	141.1200		(3a) + (3b) + (3c) + (3d) + (3e)...(3n) = 366.8976 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				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) =	0.1090 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3590 (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) =	0.3052 (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	0.3891	0.3815	0.3738	0.3357	0.3281	0.2899	0.2899	0.2823	0.3052	0.3281	0.3433	0.3586 (22b)
Effective ac	0.5757	0.5728	0.5699	0.5563	0.5538	0.5420	0.5420	0.5398	0.5466	0.5538	0.5589	0.5643 (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			4.0300	1.0000	4.0300		(26)
TER Opening Type (Uw = 1.40)			25.4700	1.3258	33.7670		(27)
TER Room Window (Uw = 1.70)			0.8600	1.5918	1.3689		(27a)
Heat Loss Floor 1			77.0400	0.1300	10.0152		(28a)
External Wall 1	180.0500	29.5000	150.5500	0.1800	27.0990		(29a)
External Roof 2	64.0800		64.0800	0.1300	8.3304		(30)
External Roof 2	13.5500	0.8600	12.6900	0.1300	1.6497		(30)
Total net area of external elements Aum(A, m2)			334.7200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 86.2603		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2464 (36)
 Total fabric heat loss (33) + (36) = 101.5067 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	69.7030	69.3472	68.9983	67.3598	67.0533	65.6262	65.6262	65.3619	66.1759	67.0533	67.6734	68.3218 (38)
Heat transfer coeff	171.2097	170.8538	170.5050	168.8665	168.5599	167.1329	167.1329	166.8686	167.6826	168.5599	169.1801	169.8284 (39)
Average = Sum(39)m / 12 =												168.8650 (39)
HLP	1.2132	1.2107	1.2082	1.1966	1.1944	1.1843	1.1843	1.1825	1.1882	1.1944	1.1988	1.2034 (40)
HLP (average)												1.1966 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9192 (42)
Average daily hot water use (litres/day)												103.5307 (43)
Daily hot water use	113.8837	109.7425	105.6013	101.4601	97.3188	93.1776	93.1776	97.3188	101.4601	105.6013	109.7425	113.8837 (44)
Energy conte	168.8863	147.7090	152.4225	132.8856	127.5069	110.0288	101.9578	116.9981	118.3954	137.9785	150.6143	163.5574 (45)
Energy content (annual)												Total = Sum(45)m = 1628.9406 (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												



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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	0.0000	0.0000	(56)
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	0.0000	0.0000	(57)
Heat gains from water heating, kWh/month	35.8883	31.3882	32.3898	28.2382	27.0952	23.3811	21.6660	24.8621	25.1590	29.3204	32.0055	34.7559	34.7559	34.7559	(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	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	145.9593	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1088	24.9660	20.3037	15.3712	11.4902	9.7005	10.4817	13.6245	18.2868	23.2193	27.1003	28.8900	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	310.6819	313.9058	305.7816	288.4863	266.6541	246.1348	232.4267	229.2028	237.3270	254.6223	276.4545	296.9738	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	37.5959	(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)	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	(71)
Water heating gains (Table 5)	48.2370	46.7086	43.5346	39.2197	36.4183	32.4738	29.1210	33.4168	34.9431	39.4092	44.4521	46.7150	(72)
Total internal gains	453.8155	452.3681	436.4078	409.8650	381.3503	355.0969	338.8172	343.0319	357.3446	384.0385	414.7948	439.3665	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast	5.2600	11.2829	0.6300		0.7000	0.7700	18.1376	(75)					
Southeast	4.4800	36.7938	0.6300		0.7000	0.7700	50.3761	(77)					
Southwest	9.6900	36.7938	0.6300		0.7000	0.7700	108.9609	(79)					
Northwest	6.0400	11.2829	0.6300		0.7000	0.7700	20.8272	(81)					
Southwest	0.8600	34.0172	0.6300		0.7000	1.0000	11.6112	(82)					
Solar gains	209.9131	373.3220	551.3939	749.1796	897.8625	916.7974	873.3382	758.7917	619.4570	423.6693	254.3287	177.7479	(83)
Total gains	663.7285	825.6901	987.8017	1159.0447	1279.2129	1271.8943	1212.1554	1101.8237	976.8016	807.7079	669.1235	617.1144	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000	(85)
tau	57.2397	57.3590	57.4763	58.0340	58.1396	58.6360	58.6360	58.7288	58.4438	58.1396	57.9264	57.7053		
alpha	4.8160	4.8239	4.8318	4.8689	4.8760	4.9091	4.9091	4.9153	4.8963	4.8760	4.8618	4.8470		
util living area	0.9993	0.9979	0.9928	0.9716	0.9021	0.7518	0.5850	0.6561	0.8923	0.9875	0.9984	0.9995	(86)	
MIT	19.5552	19.7317	20.0177	20.3948	20.7269	20.9250	20.9826	20.9705	20.8114	20.3693	19.8895	19.5261	(87)	
Th 2	19.9094	19.9115	19.9134	19.9227	19.9244	19.9326	19.9326	19.9341	19.9294	19.9244	19.9209	19.9173	(88)	
util rest of house	0.9991	0.9971	0.9901	0.9599	0.8614	0.6590	0.4540	0.5234	0.8307	0.9807	0.9977	0.9994	(89)	
MIT 2	18.5874	18.7652	19.0514	19.4286	19.7367	19.8975	19.9281	19.9254	19.8197	19.4098	18.9305	18.5645	(90)	
Living area fraction									fLA = Living area / (4) =				0.3302	(91)
MIT	18.9070	19.0844	19.3705	19.7476	20.0637	20.2368	20.2763	20.2705	20.1472	19.7266	19.2472	18.8820	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.9070	19.0844	19.3705	19.7476	20.0637	20.2368	20.2763	20.2705	20.1472	19.7266	19.2472	18.8820	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9988	0.9963	0.9883	0.9576	0.8675	0.6877	0.4978	0.5678	0.8455	0.9790	0.9971	0.9991	(94)
Useful gains	662.9086	822.6635	976.2115	1109.8534	1109.6832	874.6794	603.4547	625.6568	825.9197	790.7436	667.1924	616.5803	(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	2500.8614	2423.4510	2194.4842	1831.8034	1409.7788	942.0899	614.4387	645.8689	1014.0028	1538.3833	2055.0614	2493.4219	(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	1367.4368	1075.7292	906.3949	519.8040	223.2711	0.0000	0.0000	0.0000	0.0000	556.2439	999.2657	1396.3701	(98)
Space heating												7044.5159	(98)
Space heating per m2												49.9186	(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	1571.0490	1236.7833	1268.2014	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8377	0.9050	0.8694	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1316.1013	1119.2380	1102.6365	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1597.8685	1525.7857	1400.8494	0.0000	0.0000	0.0000	0.0000	(103)

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Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	202.8724	302.4715	221.8704	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling Cooled fraction												727.2143 (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 (107)
Space cooling per m2												181.8036 (107)
Energy for space heating												1.2883 (108)
Energy for space cooling												49.9186 (99)
Total												1.2883 (108)
Target Fabric Energy Efficiency (TFEE)												51.2069 (109)
												58.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	77.0400 (1b)	2.5000 (2b)	192.6000 (1b) - (3b)
First floor	64.0800 (1c)	2.7200 (2c)	174.2976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	141.1200		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 366.8976 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				0 * 10 =	0.0000 (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) =				0.0000 / (5) =	0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.2500 (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) =	0.2125 (21)							
Wind speed	Jan 5.0000	Feb 5.0000	Mar 4.9000	Apr 4.3000	May 4.2000	Jun 3.9000	Jul 3.7000	Aug 3.5000	Sep 3.9000	Oct 4.2000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2500	1.2500	1.2250	1.0750	1.0500	0.9750	0.9250	0.8750	0.9750	1.0500	1.1250	1.1750 (22a)
Adj infilt rate	0.2656	0.2656	0.2603	0.2284	0.2231	0.2072	0.1966	0.1859	0.2072	0.2231	0.2391	0.2497 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5156	0.5156	0.5103	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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					
Opening Type 1			4.0300	1.8000	7.2540		(26)					
Opening Type 2 (Uw = 1.60)			25.4700	1.5038	38.3008		(27)					
Opening Type 3 (Uw = 1.60)			0.8600	1.5038	1.2932		(27a)					
Heat Loss Floor 1			77.0400	0.1300	10.0152	75.0000	5778.0000 (28a)					
External Wall 1	180.0500	29.5000	150.5500	0.1800	27.0990	110.0000	16560.5000 (29a)					
External Roof 2	64.0800		64.0800	0.1300	8.3304	9.0000	576.7200 (30)					
External Roof 2	13.5500	0.8600	12.6900	0.1700	2.1573	0.0000	0.0000 (30)					
Total net area of external elements Aum(A, m2)			334.7200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	94.4499		(33)					
Internal Wall 1			70.2300			75.0000	5267.2500 (32c)					
Internal Wall 2			104.2100			9.0000	937.8900 (32c)					
Internal Floor 1			64.0800			18.0000	1153.4400 (32d)					
Internal Ceiling 1			64.0800			18.0000	1153.4400 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	31427.2400 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							222.6987 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							25.3232 (36)					
Total fabric heat loss						(33) + (36) =	119.7731 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 62.4299	Feb 62.4299	Mar 61.7867	Apr 60.5381	May 60.5381	Jun 60.5381	Jul 60.5381	Aug 60.5381	Sep 60.5381	Oct 60.5381	Nov 60.5381	Dec 60.5381 (38)
Heat transfer coeff	182.2030	182.2030	181.5598	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112 (39)
Average = Sum(39)m / 12 =												180.7305 (39)
HLP	Jan 1.2911	Feb 1.2911	Mar 1.2866	Apr 1.2777	May 1.2777	Jun 1.2777	Jul 1.2777	Aug 1.2777	Sep 1.2777	Oct 1.2777	Nov 1.2777	Dec 1.2777 (40)
HLP (average)												1.2807 (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												2.9192 (42)
Average daily hot water use (litres/day)												103.5307 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Daily hot water use	113.8837	109.7425	105.6013	101.4601	97.3188	93.1776	93.1776	97.3188	101.4601	105.6013	109.7425	113.8837 (44)
Energy conte	168.8863	147.7090	152.4225	132.8856	127.5069	110.0288	101.9578	116.9981	118.3954	137.9785	150.6143	163.5574 (45)
Energy content (annual)	Total = Sum(45)m = 1628.9406 (45)											
Distribution loss (46)m = 0.15 x (45)m	25.3329	22.1564	22.8634	19.9328	19.1260	16.5043	15.2937	17.5497	17.7593	20.6968	22.5921	24.5336 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.5926	45.9506	47.4823	49.5926	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163 (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	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163 (64)
RHI water heating demand	Total per year (kWh/year) = Sum(64)m = 2219.3669 (64)											
Heat gains from water heating, kWh/month	68.8944	60.6201	63.4202	56.5132	54.7942	48.0722	45.7716	51.3000	51.6952	58.6176	62.4080	67.1225 (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	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.2720	62.4149	50.7592	38.4280	28.7254	24.2512	26.2043	34.0613	45.7170	58.0482	67.7508	72.2250 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	463.7043	468.5161	456.3905	430.5766	397.9912	367.3654	346.9056	342.0938	354.2194	380.0333	412.6187	443.2444 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343 (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)	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674 (71)
Water heating gains (Table 5)	92.6000	90.2085	85.2422	78.4906	73.6481	66.7670	61.5209	68.9516	71.7990	78.7870	86.6778	90.2185 (72)
Total internal gains	743.3943	737.9575	709.2100	664.3132	617.1827	575.2016	551.4488	561.9247	588.5533	633.6866	683.8654	722.5060 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m ²	Table 6a	W/m ²	Specific data or Table 6b	Specific data or Table 6c	W						
Northeast	5.2600	10.4427	0.7600	0.7000	0.7700	20.2508 (75)						
Southeast	4.4800	34.4805	0.7600	0.7000	0.7700	56.9504 (77)						
Southwest	9.6900	34.4805	0.7600	0.7000	0.7700	123.1807 (79)						
Northwest	6.0400	10.4427	0.7600	0.7000	0.7700	23.2538 (81)						
Southwest	0.8600	31.5636	0.7600	0.7000	1.0000	12.9969 (82)						
Solar gains	236.6326	421.7251	650.1493	890.7402	1058.4439	1069.8298	1017.3633	872.7365	720.2674	477.3671	272.8858	196.4304 (83)
Total gains	980.0269	1159.6826	1359.3593	1555.0534	1675.6266	1645.0314	1568.8120	1434.6613	1308.8207	1111.0536	956.7511	918.9363 (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	47.9124	47.9124	48.0822	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151
alpha	4.1942	4.1942	4.2055	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277
util living area	0.9950	0.9898	0.9752	0.9357	0.8479	0.7224	0.6211	0.6812	0.8546	0.9655	0.9914	0.9961 (86)
MIT	19.7690	19.8995	20.1440	20.4432	20.7034	20.8486	20.8980	20.8802	20.7441	20.4028	20.0292	19.7426 (87)
Th 2	19.8478	19.8478	19.8514	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583 (88)
util rest of house	0.9935	0.9868	0.9679	0.9165	0.8028	0.6428	0.5170	0.5786	0.7972	0.9517	0.9884	0.9950 (89)
MIT 2	18.2071	18.3967	18.7524	19.1801	19.5256	19.6951	19.7420	19.7288	19.5856	19.1323	18.5949	18.1765 (90)
Living area fraction	fLA = Living area / (4) =											0.3302 (91)
MIT	18.7229	18.8930	19.2119	19.5972	19.9145	20.0760	20.1237	20.1090	19.9682	19.5518	19.0685	18.6937 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.5729	18.7430	19.0619	19.4472	19.7645	19.9260	19.9737	19.9590	19.8182	19.4018	18.9185	18.5437 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	971.4120	1139.9841	1306.9175	1412.0152	1338.0121	1065.9994	828.6510	844.3086	1040.3108	1049.3987	942.3639	912.6592 (95)
Ext temp.	3.6000	4.0000	5.5000	7.8000	10.7000	13.5000	15.2000	15.0000	12.8000	9.5000	6.3000	3.5000 (96)
Heat loss rate W	2728.1058	2686.2171	2462.2993	2100.1137	1634.4389	1158.6822	860.7511	894.1623	1265.4596	1785.4102	2275.2587	2712.5440 (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	1306.9802	1039.0686	859.6041	495.4309	220.5416	0.0000	0.0000	0.0000	0.0000	547.5926	959.6843	1339.1143 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Space heating
RHI space heating demand

6768.0166 (98)
6768 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	77.0400 (1b)	x 2.5000 (2b)	= 192.6000 (1b) - (3b)
First floor	64.0800 (1c)	x 2.7200 (2c)	= 174.2976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	141.1200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 366.8976 (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					0 * 10 = 0.0000 (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)					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.2500 (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) =	0.2125 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5209	0.5156	0.5103	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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					
Opening Type 1			4.0300	1.8000	7.2540		(26)					
Opening Type 2 (Uw = 1.60)			25.4700	1.5038	38.3008		(27)					
Opening Type 3 (Uw = 1.60)			0.8600	1.5038	1.2932		(27a)					
Heat Loss Floor 1			77.0400	0.1300	10.0152	75.0000	5778.0000 (28a)					
External Wall 1	180.0500	29.5000	150.5500	0.1800	27.0990	110.0000	16560.5000 (29a)					
External Roof 2	64.0800		64.0800	0.1300	8.3304	9.0000	576.7200 (30)					
External Roof 2	13.5500	0.8600	12.6900	0.1700	2.1573	0.0000	0.0000 (30)					
Total net area of external elements Aum(A, m2)			334.7200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	94.4499		(33)					
Internal Wall 1			70.2300			75.0000	5267.2500 (32c)					
Internal Wall 2			104.2100			9.0000	937.8900 (32c)					
Internal Floor 1			64.0800			18.0000	1153.4400 (32d)					
Internal Ceiling 1			64.0800			18.0000	1153.4400 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	31427.2400 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							222.6987 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							25.3232 (36)					
Total fabric heat loss						(33) + (36) =	119.7731 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 63.0731	Feb 62.4299	Mar 61.7867	Apr 60.5381	May 60.5381	Jun 60.5381	Jul 60.5381	Aug 60.5381	Sep 60.5381	Oct 60.5381	Nov 60.5381	Dec 60.5381 (38)
Heat transfer coeff	182.8462	182.2030	181.5598	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112 (39)
Average = Sum(39)m / 12 =												180.7841 (39)
HLP	Jan 1.2957	Feb 1.2911	Mar 1.2866	Apr 1.2777	May 1.2777	Jun 1.2777	Jul 1.2777	Aug 1.2777	Sep 1.2777	Oct 1.2777	Nov 1.2777	Dec 1.2777 (40)
HLP (average)												1.2811 (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												2.9192 (42)
Average daily hot water use (litres/day)												103.5307 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Daily hot water use	113.8837	109.7425	105.6013	101.4601	97.3188	93.1776	93.1776	97.3188	101.4601	105.6013	109.7425	113.8837 (44)
Energy conte	168.8863	147.7090	152.4225	132.8856	127.5069	110.0288	101.9578	116.9981	118.3954	137.9785	150.6143	163.5574 (45)
Energy content (annual)	Total = Sum(45)m = 1628.9406 (45)											
Distribution loss (46)m = 0.15 x (45)m	25.3329	22.1564	22.8634	19.9328	19.1260	16.5043	15.2937	17.5497	17.7593	20.6968	22.5921	24.5336 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.5926	45.9506	47.4823	49.5926	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163 (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	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163 (64)
	Total per year (kWh/year) = Sum(64)m = 2219.3669 (64)											
Heat gains from water heating, kWh/month	68.8944	60.6201	63.4202	56.5132	54.7942	48.0722	45.7716	51.3000	51.6952	58.6176	62.4080	67.1225 (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	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.2720	62.4149	50.7592	38.4280	28.7254	24.2512	26.2043	34.0613	45.7170	58.0482	67.7508	72.2250 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	463.7043	468.5161	456.3905	430.5766	397.9912	367.3654	346.9056	342.0938	354.2194	380.0333	412.6187	443.2444 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343 (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)	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674 (71)
Water heating gains (Table 5)	92.6000	90.2085	85.2422	78.4906	73.6481	66.7670	61.5209	68.9516	71.7990	78.7870	86.6778	90.2185 (72)
Total internal gains	743.3943	737.9575	709.2100	664.3132	617.1827	575.2016	551.4488	561.9247	588.5533	633.6866	683.8654	722.5060 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data FF or Table 6c	Access factor Table 6d	Gains W					
Northeast	5.2600	11.2829	0.7600	0.7600	0.7700	21.8803 (75)						
Southeast	4.4800	36.7938	0.7600	0.7600	0.7700	60.7712 (77)						
Southwest	9.6900	36.7938	0.7600	0.7600	0.7700	131.4449 (79)						
Northwest	6.0400	11.2829	0.7600	0.7600	0.7700	25.1249 (81)						
Southwest	0.8600	34.0172	0.7600	0.7600	1.0000	14.0072 (82)						
Solar gains	253.2285	450.3567	665.1736	903.7723	1083.1358	1105.9778	1053.5508	915.3678	747.2814	511.0932	306.8092	214.4260 (83)
Total gains	996.6228	1188.3142	1374.3836	1568.0855	1700.3184	1681.1794	1604.9996	1477.2925	1335.8348	1144.7797	990.6746	936.9320 (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	47.7439	47.9124	48.0822	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151
alpha	4.1829	4.1942	4.2055	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277
util living area	0.9938	0.9864	0.9678	0.9153	0.8031	0.6354	0.4813	0.5389	0.7789	0.9477	0.9880	0.9952 (86)
MIT	19.8400	19.9996	20.2430	20.5383	20.7701	20.8903	20.9248	20.9182	20.8275	20.5149	20.1222	19.8189 (87)
Th 2	19.8442	19.8478	19.8514	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583 (88)
util rest of house	0.9919	0.9824	0.9580	0.8893	0.7461	0.5410	0.3627	0.4157	0.6958	0.9259	0.9836	0.9937 (89)
MIT 2	18.3081	18.5422	18.8945	19.3108	19.6065	19.7344	19.7604	19.7571	19.6796	19.2890	18.7299	18.2880 (90)
Living area fraction	FLA = Living area / (4) =											0.3302 (91)
MIT	18.8140	19.0235	19.3398	19.7162	19.9908	20.1161	20.1449	20.1405	20.0586	19.6938	19.1897	18.7935 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6640	18.8735	19.1898	19.5662	19.8408	19.9661	19.9949	19.9905	19.9086	19.5438	19.0397	18.6435 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9892	0.9777	0.9507	0.8813	0.7451	0.5505	0.3774	0.4306	0.6999	0.9182	0.9794	0.9915 (94)
Useful gains	985.8117	1161.8730	1306.6347	1381.8847	1266.8759	925.4875	605.6602	636.1442	934.9970	1051.1638	970.2250	928.9319 (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	2626.3989	2546.0083	2303.9552	1923.2283	1467.8691	967.5648	612.1356	647.4129	1047.3635	1612.6757	2152.8544	2604.3316 (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	1220.5969	930.1390	742.0065	389.7674	149.5390	0.0000	0.0000	0.0000	0.0000	417.7649	851.4931	1246.4974 (98)
Space heating												5947.8041 (98)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

Space heating per m2 (98) / (4) = 42.1471 (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) 0.1000 (201)
 Fraction of space heat from main system(s) 0.9000 (202)
 Efficiency of main space heating system 1 (in %) 91.4000 (206)
 Efficiency of secondary/supplementary heating system, % 65.0000 (208)
 Space heating requirement 5856.6998 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1220.5969	930.1390	742.0065	389.7674	149.5390	0.0000	0.0000	0.0000	0.0000	417.7649	851.4931	1246.4974	(98)
Space heating efficiency (main heating system 1)	91.4000	91.4000	91.4000	91.4000	91.4000	0.0000	0.0000	0.0000	0.0000	91.4000	91.4000	91.4000	(210)
Space heating fuel (main heating system)	1201.9007	915.8918	730.6409	383.7972	147.2484	0.0000	0.0000	0.0000	0.0000	411.3658	838.4506	1227.4044	(211)
Water heating requirement	187.7841	143.0983	114.1548	59.9642	23.0060	0.0000	0.0000	0.0000	0.0000	64.2715	130.9989	191.7688	(215)
Water heating requirement	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163	(64)
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	247.0171	217.6814	228.5184	204.7199	198.9882	175.2577	167.9102	187.1806	188.4388	212.2892	224.6397	241.0295	(219)
Water heating fuel used												2493.6707	(219)
Annual totals kWh/year													
Space heating fuel - main system													5856.6998 (211)
Space heating fuel - secondary													915.0468 (215)

Electricity for pumps and fans:

(MEV)Decentralised, Database: total watage = 10.6720, total flow = 58.0000, SFP = 0.1840)

mechanical ventilation fans (SFP = 0.1840) 82.3612 (230a)
 central heating pump 30.0000 (230c)
 main heating flue fan 45.0000 (230e)
 Total electricity for the above, kWh/year 157.3612 (231)
 Electricity for lighting (calculated in Appendix L) 496.4098 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV Unit 0 (0.80 * 2.00 * 1029 * 1.00) =

Total delivered energy for all uses -1646.6987 -1646.6987 (233)

8272.4896 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5856.6998	3.4800	203.8132	(240)
Space heating - secondary	915.0468	4.2300	38.7065	(242)
Water heating (other fuel)	2493.6707	3.4800	86.7797	(247)
Mechanical ventilation fans	82.3612	13.1900	10.8634	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	496.4098	13.1900	65.4765	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-1646.6987	13.1900	-217.1996	(252)
Total energy cost			318.3322	(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] = 0.7184 (257)
 SAP value 89.9790
 SAP rating (Section 12) 90 (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	5856.6998	0.2160	1265.0472	(261)
Space heating - secondary	915.0468	0.0190	17.3859	(263)
Water heating (other fuel)	2493.6707	0.2160	538.6329	(264)
Space and water heating			1821.0659	(265)
Pumps and fans	157.3612	0.5190	81.6704	(267)
Energy for lighting	496.4098	0.5190	257.6367	(268)
Energy saving/generation technologies				
PV Unit	-1646.6987	0.5190	-854.6366	(269)
Total kg/year			1305.7364	(272)
CO2 emissions per m2			9.2500	(273)

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EI value 90.5991
EI rating 91 (274)
EI band B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.25) / 0.8900 = 4.194$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.25) / 0.8900 = 0.2603$, stars = 4
Water heating energy efficiency	$3.48 / 0.8900 = 3.910$, stars = 4
Water heating environmental impact	$0.216 / 0.8900 = 0.2427$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	77.0400 (1b)	x 2.5000 (2b)	= 192.6000 (1b) - (3b)
First floor	64.0800 (1c)	x 2.7200 (2c)	= 174.2976 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	141.1200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 366.8976 (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					0 * 10 = 0.0000 (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) =					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.2500 (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) =	0.2125 (21)							
Wind speed	Jan 5.0000	Feb 5.0000	Mar 4.9000	Apr 4.3000	May 4.2000	Jun 3.9000	Jul 3.7000	Aug 3.5000	Sep 3.9000	Oct 4.2000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2500	1.2500	1.2250	1.0750	1.0500	0.9750	0.9250	0.8750	0.9750	1.0500	1.1250	1.1750 (22a)
Adj infilt rate	0.2656	0.2656	0.2603	0.2284	0.2231	0.2072	0.1966	0.1859	0.2072	0.2231	0.2391	0.2497 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5156	0.5156	0.5103	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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					
Opening Type 1			4.0300	1.8000	7.2540		(26)					
Opening Type 2 (Uw = 1.60)			25.4700	1.5038	38.3008		(27)					
Opening Type 3 (Uw = 1.60)			0.8600	1.5038	1.2932		(27a)					
Heat Loss Floor 1			77.0400	0.1300	10.0152	75.0000	5778.0000 (28a)					
External Wall 1	180.0500	29.5000	150.5500	0.1800	27.0990	110.0000	16560.5000 (29a)					
External Roof 2	64.0800		64.0800	0.1300	8.3304	9.0000	576.7200 (30)					
External Roof 2	13.5500	0.8600	12.6900	0.1700	2.1573	0.0000	0.0000 (30)					
Total net area of external elements Aum(A, m2)			334.7200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	94.4499		(33)					
Internal Wall 1			70.2300			75.0000	5267.2500 (32c)					
Internal Wall 2			104.2100			9.0000	937.8900 (32c)					
Internal Floor 1			64.0800			18.0000	1153.4400 (32d)					
Internal Ceiling 1			64.0800			18.0000	1153.4400 (32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 31427.2400 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							222.6987 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							25.3232 (36)					
Total fabric heat loss							(33) + (36) = 119.7731 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 62.4299	Feb 62.4299	Mar 61.7867	Apr 60.5381	May 60.5381	Jun 60.5381	Jul 60.5381	Aug 60.5381	Sep 60.5381	Oct 60.5381	Nov 60.5381	Dec 60.5381 (38)
Heat transfer coeff	182.2030	182.2030	181.5598	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112	180.3112 (39)
Average = Sum(39)m / 12 =												180.7305 (39)
HLP	Jan 1.2911	Feb 1.2911	Mar 1.2866	Apr 1.2777	May 1.2777	Jun 1.2777	Jul 1.2777	Aug 1.2777	Sep 1.2777	Oct 1.2777	Nov 1.2777	Dec 1.2777 (40)
HLP (average)												1.2807 (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												2.9192 (42)
Average daily hot water use (litres/day)												103.5307 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Daily hot water use	113.8837	109.7425	105.6013	101.4601	97.3188	93.1776	93.1776	97.3188	101.4601	105.6013	109.7425	113.8837 (44)
Energy conte	168.8863	147.7090	152.4225	132.8856	127.5069	110.0288	101.9578	116.9981	118.3954	137.9785	150.6143	163.5574 (45)
Energy content (annual)	Total = Sum(45)m = 1628.9406 (45)											
Distribution loss (46)m = 0.15 x (45)m	25.3329	22.1564	22.8634	19.9328	19.1260	16.5043	15.2937	17.5497	17.7593	20.6968	22.5921	24.5336 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.5926	45.9506	47.4823	49.5926	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163 (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	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163 (64)
Heat gains from water heating, kWh/month	68.8944	60.6201	63.4202	56.5132	54.7942	48.0722	45.7716	51.3000	51.6952	58.6176	62.4080	67.1225 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)											Total per year (kWh/year) = Sum(64)m = 2219.3669 (64)	

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512	175.1512 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	70.2720	62.4149	50.7592	38.4280	28.7254	24.2512	26.2043	34.0613	45.7170	58.0482	67.7508	72.2250 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	463.7043	468.5161	456.3905	430.5766	397.9912	367.3654	346.9056	342.0938	354.2194	380.0333	412.6187	443.2444 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343	55.4343 (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)	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674	-116.7674 (71)
Water heating gains (Table 5)	92.6000	90.2085	85.2422	78.4906	73.6481	66.7670	61.5209	68.9516	71.7990	78.7870	86.6778	90.2185 (72)
Total internal gains	743.3943	737.9575	709.2100	664.3132	617.1827	575.2016	551.4488	561.9247	588.5533	633.6866	683.8654	722.5060 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Northeast	5.2600	10.4427	0.7600	0.7600	0.7700	20.2508 (75)						
Southeast	4.4800	34.4805	0.7600	0.7600	0.7700	56.9504 (77)						
Southwest	9.6900	34.4805	0.7600	0.7600	0.7700	123.1807 (79)						
Northwest	6.0400	10.4427	0.7600	0.7600	0.7700	23.2538 (81)						
Southwest	0.8600	31.5636	0.7600	0.7600	1.0000	12.9969 (82)						
Solar gains	236.6326	421.7251	650.1493	890.7402	1058.4439	1069.8298	1017.3633	872.7365	720.2674	477.3671	272.8858	196.4304 (83)
Total gains	980.0269	1159.6826	1359.3593	1555.0534	1675.6266	1645.0314	1568.8120	1434.6613	1308.8207	1111.0536	956.7511	918.9363 (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	47.9124	47.9124	48.0822	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151	48.4151
alpha	4.1942	4.1942	4.2055	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277	4.2277
util living area	0.9950	0.9898	0.9752	0.9357	0.8479	0.7224	0.6211	0.6812	0.8546	0.9655	0.9914	0.9961 (86)
MIT	19.7690	19.8995	20.1440	20.4432	20.7034	20.8486	20.8980	20.8802	20.7441	20.4028	20.0292	19.7426 (87)
Th 2	19.8478	19.8478	19.8514	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583	19.8583 (88)
util rest of house	0.9935	0.9868	0.9679	0.9165	0.8028	0.6428	0.5170	0.5786	0.7972	0.9517	0.9884	0.9950 (89)
MIT 2	18.2071	18.3967	18.7524	19.1801	19.5256	19.6951	19.7420	19.7288	19.5856	19.1323	18.5949	18.1765 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.7229	18.8930	19.2119	19.5972	19.9145	20.0760	20.1237	20.1090	19.9682	19.5518	19.0685	18.6937 (92)
Temperature adjustment												
adjusted MIT	18.5729	18.7430	19.0619	19.4472	19.7645	19.9260	19.9737	19.9590	19.8182	19.4018	18.9185	18.5437 (93)

8. Space heating requirement

Utilisation	0.9912	0.9830	0.9614	0.9080	0.7985	0.6480	0.5282	0.5885	0.7948	0.9445	0.9850	0.9932 (94)
Useful gains	971.4120	1139.9841	1306.9175	1412.0152	1338.0121	1065.9994	828.6510	844.3086	1040.3108	1049.3987	942.3639	912.6592 (95)
Ext temp.	3.6000	4.0000	5.5000	7.8000	10.7000	13.5000	15.2000	15.0000	12.8000	9.5000	6.3000	3.5000 (96)
Heat loss rate W	2728.1058	2686.2171	2462.2993	2100.1137	1634.4389	1158.6822	860.7511	894.1623	1265.4596	1785.4102	2275.2587	2712.5440 (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	1306.9802	1039.0686	859.6041	495.4309	220.5416	0.0000	0.0000	0.0000	0.0000	547.5926	959.6843	1339.1143 (98)
Space heating												6768.0166 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Space heating per m2 (98) / (4) = 47.9593 (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)	0.1000 (201)
Fraction of space heat from main system(s)	0.9000 (202)
Efficiency of main space heating system 1 (in %)	91.4000 (206)
Efficiency of secondary/supplementary heating system, %	65.0000 (208)
Space heating requirement	6664.3489 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1306.9802	1039.0686	859.6041	495.4309	220.5416	0.0000	0.0000	0.0000	0.0000	547.5926	959.6843	1339.1143	(98)
Space heating efficiency (main heating system 1)	91.4000	91.4000	91.4000	91.4000	91.4000	0.0000	0.0000	0.0000	0.0000	91.4000	91.4000	91.4000	(210)
Space heating fuel (main heating system)	1286.9608	1023.1529	846.4373	487.8423	217.1635	0.0000	0.0000	0.0000	0.0000	539.2049	944.9845	1318.6027	(211)
Water heating requirement	201.0739	159.8567	132.2468	76.2201	33.9295	0.0000	0.0000	0.0000	0.0000	84.2450	147.6437	206.0176	(215)
Water heating requirement	219.8452	193.7364	203.3814	182.2007	177.0995	155.9794	149.4401	166.5907	167.7105	188.9374	199.9293	214.5163	(64)
Efficiency of water heater	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	247.0171	217.6814	228.5184	204.7199	198.9882	175.2577	167.9102	187.1806	188.4388	212.2892	224.6397	241.0295	(219)
Water heating fuel used												2493.6707	(219)
Annual totals kWh/year													
Space heating fuel - main system												6664.3489	(211)
Space heating fuel - secondary												1041.2333	(215)

Electricity for pumps and fans:

(MEV)Decentralised, Database: total watage = 10.6720, total flow = 58.0000, SFP = 0.1840)	
mechanical ventilation fans (SFP = 0.1840)	82.3612 (230a)
central heating pump	30.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	157.3612 (231)
Electricity for lighting (calculated in Appendix L)	496.4098 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV Unit 0 (0.80 * 2.00 * 988 * 1.00) =	-1580.6274	-1580.6274 (233)
Total delivered energy for all uses		9272.3966 (238)

10a. Fuel costs - using BEDF prices (500)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6664.3489	3.6300	241.9159	(240)
Space heating - secondary	1041.2333	5.1600	53.7276	(242)
Water heating (other fuel)	2493.6707	3.6300	90.5202	(247)
Mechanical ventilation fans	82.3612	19.4400	16.0110	(249)
Pumps and fans for heating	75.0000	19.4400	14.5800	(249)
Energy for lighting	496.4098	19.4400	96.5021	(250)
Additional standing charges			95.0000	(251)
Energy saving/generation technologies				
PV Unit	-1580.6274	19.4400	-307.2740	(252)
Total energy cost			300.9829	(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	6664.3489	0.2160	1439.4994	(261)
Space heating - secondary	1041.2333	0.0190	19.7834	(263)
Water heating (other fuel)	2493.6707	0.2160	538.6329	(264)
Space and water heating			1997.9157	(265)
Pumps and fans	157.3612	0.5190	81.6704	(267)
Energy for lighting	496.4098	0.5190	257.6367	(268)
Energy saving/generation technologies				
PV Unit	-1580.6274	0.5190	-820.3456	(269)
Total kg/year			1516.8772	(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	6664.3489	1.2200	8130.5057	(261)
Space heating - secondary	1041.2333	1.0400	1082.8827	(263)
Water heating (other fuel)	2493.6707	1.2200	3042.2782	(264)
Space and water heating			12255.6666	(265)

FULL SAP CALCULATION PRINTOUT

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

Pumps and fans	157.3612	3.0700	483.0988 (267)
Energy for lighting	496.4098	3.0700	1523.9782 (268)
Energy saving/generation technologies			
PV Unit	-1580.6274	3.0700	-4852.5260 (269)
Primary energy kWh/year			9410.2176 (272)
Primary energy kWh/m ² /year			66.6824 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 90
 Current environmental impact rating: B 91

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	SAP increase too small
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	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
 (none)

Measures omitted - SAP change or cost saving too small:
 N Solar water heating + 0.9 -£ 26 -185 kg (12.2%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)	Total Savings £0		0.00 kg/m ²

Potential energy efficiency rating: B 90
 Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 500 TEST (30 Jun 2022)
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£127	£127	£0
Mains gas	£427	£427	£0
Wood	£54	£54	£0
Space heating	£421	£421	£0
Water heating	£91	£91	£0
Lighting	£97	£97	£0
Generated (PV)	-£307	-£307	£0
Total cost of fuels	£301	£301	£0
Total cost of uses	£302	£302	£0
Delivered energy	66 kWh/m ²	66 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.5 tonnes	1.5 tonnes	0.0 tonnes
CO2 emissions per m ²	11 kg/m ²	11 kg/m ²	0 kg/m ²
Primary energy	67 kWh/m ²	67 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	Detached House
Number of storeys	2
Cross ventilation possible	No
SAP Region	North East England
Front of dwelling faces	North East
Overshading	Average or unknown
Thermal mass parameter	222.7 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	2.50 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	302.69 (P1)
Transmission heat loss coefficient	119.77 (37)
Summer heat loss coefficient	422.46 (P2)

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

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North East	0.800	0.90	1.000	0.720 (P8)
South East	0.800	0.90	1.000	0.720 (P8)
South West	0.800	0.90	1.000	0.720 (P8)
South West	0.800	1.00	1.000	0.800 (P8)
North West	0.800	0.90	1.000	0.720 (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	5.2600	91.1383	0.7600	0.7000	0.7200	165.2620
South East	4.4800	115.6809	0.7600	0.7000	0.7200	178.6596
South West	9.6900	115.6809	0.7600	0.7000	0.7200	386.4311
North West	6.0400	91.1383	0.7600	0.7000	0.7200	189.7686
South West	0.8600	193.3062	0.7600	0.7000	0.8000	63.6779

total: 983.7992

	Jun	Jul	Aug	
Solar gains	1016	984	847	(P3)
Internal gains	572	548	559	
Total summer gains	1589	1532	1406	(P5)
Summer gain/loss ratio	3.76	3.63	3.33	(P6)
Summer external temperature	13.80	15.80	15.60	
Thermal mass temperature increment (TMP = 222.7)	0.44	0.44	0.44	
Threshold temperature	18.00	19.87	19.37	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	

Assessment of likelihood of high internal temperature: Not significant