

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat 7			Issued on Date	21/06/2023
Assessment Reference	001	Prop Type Ref	7		
Property	Birchwood House, Flat 7, Northwood, HA6 2UZ				
SAP Rating	85 B	DER	8.11	TER	19.39
Environmental	92 A	% DER<TER	58.18		
CO ₂ Emissions (t/year)	0.98	DFEE	37.45	TFEE	44.08
General Requirements Compliance	Pass	% DFEE<TFEE	15.04		
Assessor Details	Mr. Zahid Ashraf, Wires & Wireless Ltd, Tel: 01793 273 981, zahid_153@yahoo.com			Assessor ID	Q076-0001
Client	Westcombe Group, Birchwood House				

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

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 150 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:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 19.39 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 8.11 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)44.1 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)37.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.19 (max. 0.70)	OK
Floor (no floor)			
Roof	0.13 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 0.50 kWh/day

Permitted by DBSCG 0.50 OK

Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinderstat

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system	
Specific fan power:	0.66
Maximum	1.5 OK
MVHR efficiency:	93%
Minimum:	70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average

Windows facing East: 5.18 m², No overhang

Windows facing South: 9.89 m², No overhang

Windows facing West: 6.60 m², No overhang

Air change rate: 0.00 ach

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

10 Key features

External wall U-value 0.10 W/m²K

Roof U-value 0.10 W/m²K

Photovoltaic array 1.37 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	150.4100 (1b)	x 2.6400 (2b)	= 397.0824 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 397.0824 (5)

2. Ventilation rate

					main	secondary	other			total	m3 per hour		
					heating		heating						
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test											Yes		
Measured/design AP50											5.0000		
Infiltration rate											0.2500 (18)		
Number of sides sheltered											1 (19)		
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.9250 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.2313 (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	0.2948	0.2891	0.2833	0.2544	0.2486	0.2197	0.2197	0.2139	0.2313	0.2486	0.2602	0.2717 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation:												0.5000 (23a)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												65.1000 (23c)	
Effective ac	0.4693	0.4636	0.4578	0.4289	0.4231	0.3942	0.3942	0.3884	0.4058	0.4231	0.4347	0.4462 (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					
E Window (Uw = 1.40)			21.6700	1.3258	28.7292		(27)					
S Roof Light (Uw = 1.30)			1.1400	1.2357	1.4087		(27a)					
External Wall -Type 4	95.9300	21.6680	74.2620	0.1900	14.1098		(29a)					
Stud Wall	3.0000		3.0000	0.1008	0.3024		(29a)					
Flat Roof	35.3990		35.3990	0.1000	3.5399		(30)					
Roof Joist	42.3200		42.3200	0.1500	6.3480		(30)					
Roof Rafter	15.6800	1.1380	14.5420	0.1500	2.1813		(30)					
Total net area of external elements Aum(A, m2)			192.3330				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.6193		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.9282 (36)					
Total fabric heat loss						(33) + (36) =	72.5475 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 61.5015	Feb 60.7439	Mar 59.9864	Apr 56.1986	May 55.4410	Jun 51.6532	Jul 51.6532	Aug 50.8957	Sep 53.1683	Oct 55.4410	Nov 56.9561	Dec 58.4713 (38)
Heat transfer coeff	134.0489	133.2914	132.5338	128.7460	127.9885	124.2007	124.2007	123.4431	125.7158	127.9885	129.5036	131.0187 (39)
Average = Sum(39)m / 12 =												128.5566 (39)
HLP	Jan 0.8912	Feb 0.8862	Mar 0.8812	Apr 0.8560	May 0.8509	Jun 0.8257	Jul 0.8257	Aug 0.8207	Sep 0.8358	Oct 0.8509	Nov 0.8610	Dec 0.8711 (40)
HLP (average)												0.8547 (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												2.9348 (42)
Average daily hot water use (litres/day)												103.9021 (43)
Daily hot water use	Jan 114.2923	Feb 110.1363	Mar 105.9802	Apr 101.8241	May 97.6680	Jun 93.5119	Jul 93.5119	Aug 97.6680	Sep 101.8241	Oct 105.9802	Nov 110.1363	Dec 114.2923 (44)
Energy conte	169.4922	148.2390	152.9694	133.3624	127.9644	110.4235	102.3236	117.4179	118.8202	138.4735	151.1547	164.1442 (45)
Energy content (annual)												Total = Sum(45)m = 1634.7851 (45)
Distribution loss (46)m = 0.15 x (45)m												

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25.4238	22.2358	22.9454	20.0044	19.1947	16.5635	15.3485	17.6127	17.8230	20.7710	22.6732	24.6216 (46)
Water storage loss:											
Store volume											10.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):											0.5000 (48)
Temperature factor from Table 2b											1.0000 (49)
Enter (49) or (54) in (55)											0.5000 (55)
Total storage loss											
15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	15.0000	15.5000	15.0000	15.5000 (56)
If cylinder contains dedicated solar storage											
15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	15.0000	15.5000	15.0000	15.5000 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
208.2546	183.2502	191.7318	170.8744	166.7268	147.9355	141.0860	156.1803	156.3322	177.2359	188.6667	202.9066 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h											
208.2546	183.2502	191.7318	170.8744	166.7268	147.9355	141.0860	156.1803	156.3322	177.2359	188.6667	202.9066 (64)
Heat gains from water heating, kWh/month											
87.3661	77.2984	81.8722	74.3526	73.5581	66.7254	65.0325	70.0514	69.5173	77.0524	80.2685	85.5879 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.3981	26.1112	21.2350	16.0763	12.0172	10.1454	10.9625	14.2495	19.1256	24.2844	28.3434	30.2152 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	320.9682	324.2989	315.9058	298.0378	275.4827	254.2841	240.1221	236.7915	245.1846	263.0526	285.6077	306.8063 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931 (71)
Water heating gains (Table 5)	117.4275	115.0274	110.0433	103.2675	98.8684	92.6742	87.4093	94.1551	96.5518	103.5650	111.4841	115.0374 (72)
Total internal gains	534.8163	532.4599	514.2065	484.4040	453.3907	424.1262	405.5164	412.2184	427.8845	457.9243	492.4576	519.0813 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				5.1800	19.6403	0.5400	0.8000	0.7700	30.4575 (76)			
South				9.8880	46.7521	0.5400	0.8000	0.7700	138.3969 (78)			
West				6.6000	19.6403	0.5400	0.8000	0.7700	38.8068 (80)			
South				1.1380	47.0123	0.5000	0.7000	1.0000	16.8525 (82)			
Solar gains	224.5137	392.2292	555.8579	709.7377	806.0528	802.9425	773.1499	702.3067	610.0608	439.3321	270.8659	190.7853 (83)
Total gains	759.3300	924.6891	1070.0645	1194.1417	1259.4435	1227.0686	1178.6663	1114.5251	1037.9453	897.2564	763.3235	709.8666 (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	31.1681	31.3453	31.5244	32.4519	32.6440	33.6396	33.6396	33.8460	33.2341	32.6440	32.2621	31.8890
alpha	3.0779	3.0897	3.1016	3.1635	3.1763	3.2426	3.2426	3.2564	3.2156	3.1763	3.1508	3.1259
util living area												
	0.9760	0.9564	0.9207	0.8496	0.7387	0.5815	0.4423	0.4800	0.6905	0.8847	0.9603	0.9801 (86)
MIT	19.0461	19.3507	19.7734	20.2815	20.6555	20.8911	20.9663	20.9560	20.7990	20.2880	19.5915	19.0206 (87)
Th 2	20.1750	20.1793	20.1836	20.2051	20.2094	20.2311	20.2311	20.2354	20.2224	20.2094	20.2008	20.1922 (88)
util rest of house												
	0.9726	0.9504	0.9098	0.8290	0.7027	0.5264	0.3720	0.4094	0.6393	0.8643	0.9539	0.9773 (89)
MIT 2	17.5196	17.9625	18.5721	19.3032	19.8133	20.1262	20.2064	20.2016	20.0152	19.3275	18.3285	17.4931 (90)
Living area fraction												
	17.7666	18.1871	18.7665	19.4615	19.9496	20.2500	20.3294	20.3237	20.1420	19.4829	18.5328	17.7403 (92)
Temperature adjustment												
	17.7666	18.1871	18.7665	19.4615	19.9496	20.2500	20.3294	20.3237	20.1420	19.4829	18.5328	17.7403 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9585	0.9310	0.8861	0.8066	0.6898	0.5278	0.3812	0.4178	0.6336	0.8417	0.9358	0.9650 (94)
Useful gains	727.8004	860.8829	948.1872	963.2488	868.7866	647.6125	449.3268	465.6610	657.5916	755.2465	714.3373	684.9887 (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												
	1805.1840	1771.0602	1625.7303	1359.7557	1055.8549	701.7300	463.1943	484.3524	759.5780	1136.9144	1480.5949	1774.0284 (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												
	801.5734	611.6392	504.0921	285.4850	139.1788	0.0000	0.0000	0.0000	0.0000	283.9609	551.7055	810.2456 (98)
Space heating												
Space heating per m2												3987.8805 (98)
												(98) / (4) = 26.5134 (99)

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8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1167.4863	919.0850	938.1677	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8572	0.9068	0.8919	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1000.7940	833.4485	836.7739	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1538.9293	1480.2040	1408.5407	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh						1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	387.4574	481.1861	425.3946	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												1294.0381 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			0.5128 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	49.6719	61.6879	54.5354	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												165.8952 (107)
												1.1030 (108)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	1.0000 (303a)
Fraction of total space heat from community Heat pump	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	3987.8805 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	4187.2745 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2091.1811 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2195.7401 (310a)
Electricity used for heat distribution	63.8301 (313)
Cooling System Energy Efficiency Ratio	6.7500 (314)
Space cooling (if there is a fixed cooling system, if not enter 0)	24.5771 (315)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9240)	
mechanical ventilation fans (SFP = 0.9240)	447.6230 (330a)
Total electricity for the above, kWh/year	447.6230 (331)
Electricity for lighting (calculated in Appendix L)	519.1803 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 1.37 * 951 * 0.80) =	-833.5001 (333)
Total delivered energy for all uses	6540.8949 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			300.0000 (367a)
Space heating from Heat pump	2127.6715	0.5190	1104.2615 (367)
Electrical energy for heat distribution	63.8301	0.5190	33.1278 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1137.3894 (373)
Space and water heating			1137.3894 (376)
Space cooling	24.5771	0.5190	12.7555 (377)
Pumps and fans	447.6230	0.5190	232.3164 (378)
Energy for lighting	519.1803	0.5190	269.4546 (379)
Energy saving/generation technologies			
PV Unit	-833.5001	0.5190	-432.5866 (380)
Total CO2, kg/year			1219.3293 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			8.1100 (384)

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

DER	8.1100 ZC1
Total Floor Area	TFA 150.4100
Assumed number of occupants	N 2.9348
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	12.6454 ZC2
CO2 emissions from cooking, equation (L16)	1.2595 ZC3
Total CO2 emissions	22.0148 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	22.0148 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	150.4100 (1b)	x 2.6400 (2b)	= 397.0824 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 397.0824 (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) = 0.1007 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3507 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3244 (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	0.4136	0.4055	0.3974	0.3569	0.3488	0.3082	0.3082	0.3001	0.3244	0.3488	0.3650	0.3812 (22b)
Effective ac	0.5856	0.5822	0.5790	0.5637	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5727 (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 Opening Type (Uw = 1.40)			21.6700	1.3258	28.7292		(27)
TER Room Window (Uw = 1.70)			1.1400	1.5918	1.8146		(27a)
External Wall -Type 4	95.9300	21.6680	74.2620	0.1800	13.3672		(29a)
Stud Wall	3.0000		3.0000	0.1800	0.5400		(29a)
Flat Roof	35.3990		35.3990	0.1300	4.6019		(30)
Roof Joist	42.3200		42.3200	0.1300	5.5016		(30)
Roof Rafter	15.6800	1.1380	14.5420	0.1300	1.8905		(30)
Total net area of external elements Aum(A, m ²)			192.3330				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.4449		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.7403 (36)
Total fabric heat loss						(33) + (36) =	73.1851 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	76.7291	76.2938	75.8671	73.8629	73.4879	71.7424	71.7424	71.4191	72.4147	73.4879	74.2465	75.0396 (38)
Heat transfer coeff	149.9142	149.4789	149.0522	147.0480	146.6731	144.9275	144.9275	144.6042	145.5999	146.6731	147.4316	148.2247 (39)
Average = Sum(39)m / 12 =												147.0462 (39)
HLP	0.9967	0.9938	0.9910	0.9776	0.9752	0.9635	0.9635	0.9614	0.9680	0.9752	0.9802	0.9855 (40)
HLP (average)												0.9776 (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												2.9348 (42)
Average daily hot water use (litres/day)												103.9021 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.2923	110.1363	105.9802	101.8241	97.6680	93.5119	93.5119	97.6680	101.8241	105.9802	110.1363	114.2923 (44)
Energy content (annual)	169.4922	148.2390	152.9694	133.3624	127.9644	110.4235	102.3236	117.4179	118.8202	138.4735	151.1547	164.1442 (45)
Distribution loss (46)m = 0.15 x (45)m	25.4238	22.2358	22.9454	20.0044	19.1947	16.5635	15.3485	17.6127	17.8230	20.7710	22.6732	24.6216 (46)
Water storage loss:												10.0000 (47)
Store volume												0.3712 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

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Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.2005 (55)
Total storage loss												
	6.2141	5.6127	6.2141	6.0136	6.2141	6.0136	6.2141	6.2141	6.0136	6.2141	6.0136	6.2141 (56)
If cylinder contains dedicated solar storage												
	6.2141	5.6127	6.2141	6.0136	6.2141	6.0136	6.2141	6.2141	6.0136	6.2141	6.0136	6.2141 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	198.9687	174.8629	182.4459	161.8880	157.4409	138.9492	131.8002	146.8944	147.3459	167.9500	179.6803	193.6207 (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												
	198.9687	174.8629	182.4459	161.8880	157.4409	138.9492	131.8002	146.8944	147.3459	167.9500	179.6803	193.6207 (64)
Heat gains from water heating, kWh/month												
	79.9374	70.5886	74.4435	67.1635	66.1294	59.5363	57.6038	62.6226	62.3282	69.6236	73.0794	78.1591 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	30.1169	26.7496	21.7542	16.4693	12.3110	10.3935	11.2305	14.5979	19.5932	24.8781	29.0364	30.9539 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	320.9682	324.2989	315.9058	298.0378	275.4827	254.2841	240.1221	236.7915	245.1846	263.0526	285.6077	306.8063 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931 (71)
Water heating gains (Table 5)												
	107.4427	105.0426	100.0585	93.2827	88.8836	82.6894	77.4245	84.1702	86.5670	93.5802	101.4992	105.0526 (72)
Total internal gains												
	528.5503	526.1134	507.7409	477.8122	446.6997	417.3894	398.7996	405.5820	421.3672	451.5332	486.1657	512.8352 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East					5.1800	19.6403		0.6300	0.7000	0.7700	31.0920 (76)	
South					9.8880	46.7521		0.6300	0.7000	0.7700	141.2801 (78)	
West					6.6000	19.6403		0.6300	0.7000	0.7700	39.6153 (80)	
South					1.1380	47.0123		0.6300	0.7000	1.0000	21.2342 (82)	

Solar gains	233.2216	407.5936	577.9600	738.3906	838.9104	835.7936	804.7334	730.7873	634.4735	456.6363	281.4009	198.1652 (83)
Total gains	761.7719	933.7071	1085.7009	1216.2028	1285.6101	1253.1829	1203.5330	1136.3693	1055.8407	908.1695	767.5666	711.0005 (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	69.6741	69.8770	70.0770	71.0322	71.2138	72.0715	72.0715	72.2326	71.7387	71.2138	70.8473	70.4683
alpha	5.6449	5.6585	5.6718	5.7355	5.7476	5.8048	5.8048	5.8155	5.7826	5.7476	5.7232	5.6979
util living area	0.9992	0.9971	0.9899	0.9613	0.8758	0.7016	0.5235	0.5743	0.8306	0.9788	0.9977	0.9994 (86)
MIT	19.8808	20.0517	20.3013	20.6067	20.8464	20.9688	20.9951	20.9919	20.9175	20.5895	20.1730	19.8545 (87)
Th 2	20.0861	20.0885	20.0909	20.1020	20.1041	20.1138	20.1138	20.1156	20.1101	20.1041	20.0999	20.0955 (88)
util rest of house	0.9989	0.9961	0.9863	0.9472	0.8333	0.6199	0.4215	0.4696	0.7623	0.9686	0.9968	0.9992 (89)
MIT 2	18.5755	18.8269	19.1915	19.6344	19.9517	20.0927	20.1119	20.1122	20.0436	19.6182	19.0132	18.5440 (90)
Living area fraction									fLA = Living area / (4) =			0.1618 (91)
MIT	18.7867	19.0251	19.3711	19.7918	20.0965	20.2345	20.2548	20.2545	20.1851	19.7754	19.2009	18.7561 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7867	19.0251	19.3711	19.7918	20.0965	20.2345	20.2548	20.2545	20.1851	19.7754	19.2009	18.7561 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9982	0.9945	0.9824	0.9412	0.8329	0.6316	0.4380	0.4865	0.7687	0.9635	0.9954	0.9988 (94)
Useful gains	760.4345	928.5377	1066.6110	1144.6468	1070.7749	791.5575	527.1478	552.8345	811.6755	875.0377	764.0513	710.1462 (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												
	2171.7663	2111.4038	1918.4659	1601.6144	1231.5359	816.5921	529.6871	557.3798	885.9837	1345.7825	1784.0543	2157.5677 (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												
	1050.0309	794.8860	633.7800	329.0167	119.6062	0.0000	0.0000	0.0000	0.0000	350.2341	734.4022	1076.8816 (98)
Space heating												5088.8377 (98)
Space heating per m2												33.8331 (99)
										(98) / (4) =		

8c. Space cooling requirement

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5442.6071 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1050.0309	794.8860	633.7800	329.0167	119.6062	0.0000	0.0000	0.0000	0.0000	350.2341	734.4022	1076.8816	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1123.0277	850.1455	677.8396	351.8895	127.9211	0.0000	0.0000	0.0000	0.0000	374.5819	785.4569	1151.7450	(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	198.9687	174.8629	182.4459	161.8880	157.4409	138.9492	131.8002	146.8944	147.3459	167.9500	179.6803	193.6207	(64)
Efficiency of water heater (217)m	88.6073	88.3636	87.8665	86.6677	84.0923	79.8000	79.8000	79.8000	79.8000	86.7308	88.1759	79.8000	(216)
Fuel for water heating, kWh/month	224.5511	197.8903	207.6398	186.7916	187.2239	174.1218	165.1631	184.0782	184.6439	193.6452	203.7748	218.3173	(219)
Water heating fuel used												2327.8410	(219)
Annual totals kWh/year													
Space heating fuel - main system												5442.6071	(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)												531.8740	(232)
Total delivered energy for all uses												8377.3221	(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	5442.6071	0.2160	1175.6031	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2327.8410	0.2160	502.8137	(264)
Space and water heating			1678.4168	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	531.8740	0.5190	276.0426	(268)
Total CO2, kg/m2/year			1993.3844	(272)
Emissions per m2 for space and water heating			11.1589	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			1.8353	(272b)
Emissions per m2 for pumps and fans			0.2588	(272c)
Target Carbon Dioxide Emission Rate (TER) = (11.1589 * 1.55) + 1.8353 + 0.2588, rounded to 2 d.p.			19.3900	(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	150.4100 (1b)	x 2.6400 (2b)	= 397.0824 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 397.0824 (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) =				Air changes per hour
Pressure test					40.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3507 (18)
					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3244 (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	0.4136	0.4055	0.3974	0.3569	0.3488	0.3082	0.3082	0.3001	0.3244	0.3488	0.3650	0.3812 (22b)
	0.5856	0.5822	0.5790	0.5637	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5727 (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
E Window (Uw = 1.40)			21.6700	1.3258	28.7292		(27)
S Roof Light (Uw = 1.30)			1.1400	1.2357	1.4087		(27a)
External Wall -Type 4	95.9300	21.6680	74.2620	0.1900	14.1098		(29a)
Stud Wall	3.0000		3.0000	0.1008	0.3024		(29a)
Flat Roof	35.3990		35.3990	0.1000	3.5399		(30)
Roof Joist	42.3200		42.3200	0.1500	6.3480		(30)
Roof Rafter	15.6800	1.1380	14.5420	0.1500	2.1813		(30)
Total net area of external elements Aum(A, m ²)			192.3330				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.6193		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.9282 (36)
Total fabric heat loss						(33) + (36) =	72.5475 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	76.7291	76.2938	75.8671	73.8629	73.4879	71.7424	71.7424	71.4191	72.4147	73.4879	74.2465	75.0396 (38)
Heat transfer coeff	149.2766	148.8413	148.4146	146.4104	146.0354	144.2898	144.2898	143.9666	144.9622	146.0354	146.7940	147.5870 (39)
Average = Sum(39)m / 12 =												146.4086 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9925	0.9896	0.9867	0.9734	0.9709	0.9593	0.9593	0.9572	0.9638	0.9709	0.9760	0.9812 (40)
HLP (average)												0.9734 (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												2.9348 (42)
Average daily hot water use (litres/day)												103.9021 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.2923	110.1363	105.9802	101.8241	97.6680	93.5119	93.5119	97.6680	101.8241	105.9802	110.1363	114.2923 (44)
Energy conte	169.4922	148.2390	152.9694	133.3624	127.9644	110.4235	102.3236	117.4179	118.8202	138.4735	151.1547	164.1442 (45)
Energy content (annual)										Total = Sum(45)m =		1634.7851 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 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 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	36.0171	31.5008	32.5060	28.3395	27.1924	23.4650	21.7438	24.9513	25.2493	29.4256	32.1204	34.8806 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.3981	26.1112	21.2350	16.0763	12.0172	10.1454	10.9625	14.2495	19.1256	24.2844	28.3434	30.2152	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	320.9682	324.2989	315.9058	298.0378	275.4827	254.2841	240.1221	236.7915	245.1846	263.0526	285.6077	306.8063	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	(71)
Water heating gains (Table 5)	48.4101	46.8762	43.6908	39.3604	36.5490	32.5903	29.2255	33.5367	35.0685	39.5506	44.6116	46.8826	(72)
Total internal gains	465.7989	464.3086	447.8540	420.4969	391.0713	364.0422	347.3325	351.6001	366.4011	393.9099	425.5851	450.9265	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	5.1800	19.6403	0.5400	0.8000	0.7700	30.4575 (76)
South	9.8880	46.7521	0.5400	0.8000	0.7700	138.3969 (78)
West	6.6000	19.6403	0.5400	0.8000	0.7700	38.8068 (80)
South	1.1380	47.0123	0.5000	0.7000	1.0000	16.8525 (82)

Solar gains	224.5137	392.2292	555.8579	709.7377	806.0528	802.9425	773.1499	702.3067	610.0608	439.3321	270.8659	190.7853	(83)
Total gains	690.3125	856.5379	1003.7120	1130.2346	1197.1241	1166.9847	1120.4825	1053.9067	976.4619	833.2420	696.4510	641.7117	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	27.9887	28.0705	28.1513	28.5366	28.6099	28.9560	28.9560	29.0210	28.8217	28.6099	28.4620	28.3091	
alpha	2.8659	2.8714	2.8768	2.9024	2.9073	2.9304	2.9304	2.9347	2.9214	2.9073	2.8975	2.8873	
util living area	0.9816	0.9659	0.9373	0.8812	0.7890	0.6530	0.5146	0.5572	0.7539	0.9129	0.9703	0.9850	(86)
MIT	18.7193	19.0266	19.4750	20.0187	20.4762	20.7948	20.9258	20.9045	20.6647	20.0399	19.2750	18.6694	(87)
Th 2	20.0896	20.0920	20.0944	20.1056	20.1076	20.1174	20.1174	20.1192	20.1136	20.1076	20.1034	20.0990	(88)
util rest of house	0.9789	0.9608	0.9277	0.8624	0.7534	0.5913	0.4275	0.4712	0.7013	0.8951	0.9651	0.9827	(89)
MIT 2	17.9773	18.2832	18.7266	19.2630	19.6949	19.9825	20.0811	20.0698	19.8763	19.2939	18.5402	17.9343	(90)
Living area fraction									fLA = Living area / (4) =			0.1618	(91)
MIT	18.0974	18.4035	18.8477	19.3853	19.8214	20.1139	20.2178	20.2049	20.0039	19.4146	18.6591	18.0532	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0974	18.4035	18.8477	19.3853	19.8214	20.1139	20.2178	20.2049	20.0039	19.4146	18.6591	18.0532	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9706	0.9485	0.9114	0.8445	0.7406	0.5910	0.4380	0.4802	0.6940	0.8781	0.9539	0.9756	(94)
Ext temp.	670.0084	812.4619	914.7572	954.4424	886.5771	689.7066	490.7236	506.0478	677.6880	731.6943	664.3472	626.0250	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	2059.6218	2009.8744	1832.5768	1535.1576	1186.0067	795.6003	522.0102	547.7747	855.8383	1287.2426	1696.8112	2044.5587	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	1033.8724	804.6612	682.8578	418.1149	222.7757	0.0000	0.0000	0.0000	0.0000	413.3279	743.3740	1055.3891	(98)
												5374.3729	(98)
										(98) / (4) =		35.7315	(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	1356.3242	1067.7446	1094.1458	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7769	0.8408	0.8177	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1053.6736	897.7341	894.6671	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1478.8454	1422.0202	1347.9224	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													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	306.1237	390.0689	337.2219	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												1033.4145 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	76.5309	97.5172	84.3055	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												258.3536 (107)
Space cooling per m2												1.7177 (108)
Energy for space heating												35.7315 (99)
Energy for space cooling												1.7177 (108)
Total												37.4491 (109)
Dwelling Fabric Energy Efficiency (DFEE)												37.4 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	150.4100 (1b)	x 2.6400 (2b)	= 397.0824 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 397.0824 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) = 0.1007 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3507 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3244 (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	0.4136	0.4055	0.3974	0.3569	0.3488	0.3082	0.3082	0.3001	0.3244	0.3488	0.3650	0.3812 (22b)
Effective ac	0.5856	0.5822	0.5790	0.5637	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5727 (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 Opening Type (Uw = 1.40)			21.6700	1.3258	28.7292		(27)
TER Room Window (Uw = 1.70)			1.1400	1.5918	1.8146		(27a)
External Wall -Type 4	95.9300	21.6680	74.2620	0.1800	13.3672		(29a)
Stud Wall	3.0000		3.0000	0.1800	0.5400		(29a)
Flat Roof	35.3990		35.3990	0.1300	4.6019		(30)
Roof Joist	42.3200		42.3200	0.1300	5.5016		(30)
Roof Rafter	15.6800	1.1380	14.5420	0.1300	1.8905		(30)
Total net area of external elements Aum(A, m ²)			192.3330				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.4449		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.7403 (36)
Total fabric heat loss						(33) + (36) =	73.1851 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	76.7291	76.2938	75.8671	73.8629	73.4879	71.7424	71.7424	71.4191	72.4147	73.4879	74.2465	75.0396 (38)
Heat transfer coeff	149.9142	149.4789	149.0522	147.0480	146.6731	144.9275	144.9275	144.6042	145.5999	146.6731	147.4316	148.2247 (39)
Average = Sum(39)m / 12 =												147.0462 (39)
HLP	0.9967	0.9938	0.9910	0.9776	0.9752	0.9635	0.9635	0.9614	0.9680	0.9752	0.9802	0.9855 (40)
HLP (average)												0.9776 (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												2.9348 (42)
Average daily hot water use (litres/day)												103.9021 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.2923	110.1363	105.9802	101.8241	97.6680	93.5119	93.5119	97.6680	101.8241	105.9802	110.1363	114.2923 (44)
Energy content (annual)	169.4922	148.2390	152.9694	133.3624	127.9644	110.4235	102.3236	117.4179	118.8202	138.4735	151.1547	164.1442 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1634.7851 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 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	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	36.0171	31.5008	32.5060	28.3395	27.1924	23.4650	21.7438	24.9513	25.2493	29.4256	32.1204	34.8806 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	146.7413	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.1169	26.7496	21.7542	16.4693	12.3110	10.3935	11.2305	14.5979	19.5932	24.8781	29.0364	30.9539	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	320.9682	324.2989	315.9058	298.0378	275.4827	254.2841	240.1221	236.7915	245.1846	263.0526	285.6077	306.8063	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	37.6741	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	(71)
Water heating gains (Table 5)	48.4101	46.8762	43.6908	39.3604	36.5490	32.5903	29.2255	33.5367	35.0685	39.5506	44.6116	46.8826	(72)
Total internal gains	466.5176	464.9470	448.3732	420.8900	391.3651	364.2903	347.6006	351.9485	366.8687	394.5036	426.2781	451.6652	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	5.1800	19.6403	0.6300	0.7000	0.7700	31.0920	(76)
South	9.8880	46.7521	0.6300	0.7000	0.7700	141.2801	(78)
West	6.6000	19.6403	0.6300	0.7000	0.7700	39.6153	(80)
South	1.1380	47.0123	0.6300	0.7000	1.0000	21.2342	(82)

Solar gains	233.2216	407.5936	577.9600	738.3906	838.9104	835.7936	804.7334	730.7873	634.4735	456.6363	281.4009	198.1652	(83)
Total gains	699.7392	872.5407	1026.3333	1159.2805	1230.2755	1200.0838	1152.3340	1082.7358	1001.3422	851.1399	707.6790	649.8304	(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	69.6741	69.8770	70.0770	71.0322	71.2138	72.0715	72.0715	72.2326	71.7387	71.2138	70.8473	70.4683	
alpha	5.6449	5.6585	5.6718	5.7355	5.7476	5.8048	5.8048	5.8155	5.7826	5.7476	5.7232	5.6979	
util living area	0.9995	0.9980	0.9923	0.9684	0.8920	0.7253	0.5453	0.5999	0.8540	0.9842	0.9985	0.9996	(86)
MIT	19.8411	20.0129	20.2651	20.5767	20.8280	20.9631	20.9940	20.9899	20.9034	20.5565	20.1349	19.8152	(87)
Th 2	20.0861	20.0885	20.0909	20.1020	20.1041	20.1138	20.1138	20.1156	20.1101	20.1041	20.0999	20.0955	(88)
util rest of house	0.9993	0.9972	0.9895	0.9564	0.8526	0.6435	0.4398	0.4920	0.7895	0.9763	0.9979	0.9995	(89)
MIT 2	19.0151	19.1886	19.4413	19.7549	19.9856	20.0964	20.1122	20.1126	20.0555	19.7410	19.3200	18.9970	(90)
Living area fraction									fLA = Living area / (4) =			0.1618	(91)
MIT	19.1488	19.3220	19.5746	19.8879	20.1219	20.2367	20.2549	20.2546	20.1927	19.8729	19.4518	19.1294	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1488	19.3220	19.5746	19.8879	20.1219	20.2367	20.2549	20.2546	20.1927	19.8729	19.4518	19.1294	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	699.0408	869.4233	1013.3595	1104.6617	1050.0638	786.7341	526.5366	551.6372	797.4434	828.6563	705.7397	649.4041	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2226.0414	2155.7839	1948.7944	1615.7441	1235.2713	816.9106	529.6950	557.3893	887.1009	1360.0907	1821.0523	2212.9017	(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	1136.0884	864.4343	695.9636	367.9794	137.7944	0.0000	0.0000	0.0000	0.0000	395.3872	803.0250	1163.2422	(98)
Space heating												5563.9146	(98)
Space heating per m2												36.9917	(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	1362.3183	1072.4634	1098.9921	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8943	0.9491	0.9312	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1218.2901	1017.8501	1023.3596	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1514.9037	1456.7656	1379.5406	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													

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Calculation Type: New Build (As Designed)

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	0.0000	0.0000	0.0000	0.0000	0.0000	213.5618	326.5531	264.9986	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												805.1135 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	53.3904	81.6383	66.2496	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												201.2784 (107)
Space cooling per m2												1.3382 (108)
Energy for space heating												36.9917 (99)
Energy for space cooling												1.3382 (108)
Total												38.3299 (109)
Target Fabric Energy Efficiency (TFEE)												44.1 (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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	150.4100 (1b)	x 2.6400 (2b)	= 397.0824 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 397.0824 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2313 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.3000	4.4000	4.0000	4.0000	3.7000	3.7000	3.4000	3.7000	3.9000	3.8000	4.1000 (22)
Wind factor	1.1250	1.0750	1.1000	1.0000	1.0000	0.9250	0.9250	0.8500	0.9250	0.9750	0.9500	1.0250 (22a)
Adj infilt rate	0.2602	0.2486	0.2544	0.2313	0.2313	0.2139	0.2139	0.1966	0.2139	0.2255	0.2197	0.2370 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												65.1000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.4347	0.4231	0.4289	0.4058	0.4058	0.3884	0.3884	0.3711	0.3884	0.4000	0.3942	0.4115 (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
E Window (Uw = 1.40)			21.6700	1.3258	28.7292		(27)
S Roof Light (Uw = 1.30)			1.1400	1.2357	1.4087		(27a)
External Wall -Type 4	95.9300	21.6680	74.2620	0.1900	14.1098		(29a)
Stud Wall	3.0000		3.0000	0.1008	0.3024		(29a)
Flat Roof	35.3990		35.3990	0.1000	3.5399		(30)
Roof Joist	42.3200		42.3200	0.1500	6.3480		(30)
Roof Rafter	15.6800	1.1380	14.5420	0.1500	2.1813		(30)
Total net area of external elements Aum(A, m ²)			192.3330				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.6193		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.9282 (36)
Total fabric heat loss							(33) + (36) = 72.5475 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	56.9561	55.4410	56.1986	53.1683	53.1683	50.8957	50.8957	48.6230	50.8957	52.4108	51.6532	53.9259 (38)
Heat transfer coeff	129.5036	127.9885	128.7460	125.7158	125.7158	123.4431	123.4431	121.1704	123.4431	124.9582	124.2007	126.4734 (39)
Average = Sum(39)m / 12 =												125.4001 (39)
HLP	0.8610	0.8509	0.8560	0.8358	0.8358	0.8207	0.8207	0.8056	0.8207	0.8308	0.8257	0.8409 (40)
HLP (average)												0.8337 (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												2.9348 (42)
Average daily hot water use (litres/day)												103.9021 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	114.2923	110.1363	105.9802	101.8241	97.6680	93.5119	93.5119	97.6680	101.8241	105.9802	110.1363	114.2923 (44)
Energy conte	169.4922	148.2390	152.9694	133.3624	127.9644	110.4235	102.3236	117.4179	118.8202	138.4735	151.1547	164.1442 (45)
Energy content (annual)												Total = Sum(45)m = 1634.7851 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

	25.4238	22.2358	22.9454	20.0044	19.1947	16.5635	15.3485	17.6127	17.8230	20.7710	22.6732	24.6216 (46)
Water storage loss:												
Store volume												10.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.5000 (48)
Temperature factor from Table 2b												1.0000 (49)
Enter (49) or (54) in (55)												0.5000 (55)
Total storage loss												
15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	15.0000	15.5000	15.0000	15.5000	(56)
If cylinder contains dedicated solar storage												
15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	15.0000	15.5000	15.0000	15.5000	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
208.2546	183.2502	191.7318	170.8744	166.7268	147.9355	141.0860	156.1803	156.3322	177.2359	188.6667	202.9066	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
208.2546	183.2502	191.7318	170.8744	166.7268	147.9355	141.0860	156.1803	156.3322	177.2359	188.6667	202.9066	(64)
RHI water heating demand												
Heat gains from water heating, kWh/month												
87.3661	77.2984	81.8722	74.3526	73.5581	66.7254	65.0325	70.0514	69.5173	77.0524	80.2685	85.5879	(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	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.4953	65.2779	53.0876	40.1907	30.0430	25.3636	27.4062	35.6237	47.8140	60.7109	70.8586	75.5380 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	479.0571	484.0282	471.5012	444.8326	411.1682	379.5285	358.3913	353.4202	365.9472	392.6158	426.2801	457.9198 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931 (71)
Water heating gains (Table 5)	117.4275	115.0274	110.0433	103.2675	98.8684	92.6742	87.4093	94.1551	96.5518	103.5650	111.4841	115.0374 (72)
Total internal gains	784.2203	778.5738	748.8724	702.5311	654.3200	611.8066	587.4471	597.4392	624.5534	671.1320	722.8631	762.7356 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
East	5.1800	22.3313	0.5400	0.8000	0.7700	34.6307 (76)
South	9.8880	50.9848	0.5400	0.8000	0.7700	150.9268 (78)
West	6.6000	22.3313	0.5400	0.8000	0.7700	44.1240 (80)
South	1.1380	52.2757	0.5000	0.7000	1.0000	18.7393 (82)

Solar gains	248.4208	390.5137	552.8354	726.8353	801.8492	856.3103	814.9866	750.4263	651.6604	467.1230	299.1539	209.0819 (83)
Total gains	1032.6411	1169.0875	1301.7077	1429.3664	1456.1692	1468.1169	1402.4338	1347.8655	1276.2137	1138.2550	1022.0170	971.8175 (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	32.2621	32.6440	32.4519	33.2341	33.2341	33.8460	33.8460	34.4808	33.8460	33.4356	33.6396	33.0351
alpha	3.1508	3.1763	3.1635	3.2156	3.2156	3.2564	3.2564	3.2987	3.2564	3.2290	3.2426	3.2023
util living area	0.9426	0.9152	0.8604	0.7604	0.6191	0.4201	0.2784	0.3014	0.5344	0.7832	0.9076	0.9496 (86)
MIT	19.5155	19.7721	20.1485	20.5553	20.8277	20.9663	20.9938	20.9922	20.9214	20.5885	20.0308	19.5020 (87)
Th 2	20.2008	20.2094	20.2051	20.2224	20.2224	20.2354	20.2354	20.2485	20.2354	20.2267	20.2311	20.2181 (88)
util rest of house	0.9352	0.9048	0.8432	0.7324	0.5758	0.3634	0.2132	0.2365	0.4775	0.7514	0.8945	0.9430 (89)
MIT 2	18.2119	18.5836	19.1127	19.6838	20.0377	20.2078	20.2323	20.2442	20.1631	19.7422	18.9725	18.2043 (90)
Living area fraction									fLA = Living area / (4) =			0.1618 (91)
MIT	18.4228	18.7759	19.2803	19.8248	20.1655	20.3306	20.3556	20.3653	20.2858	19.8791	19.1437	18.4143 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4228	18.7759	19.2803	19.8248	20.1655	20.3306	20.3556	20.3653	20.2858	19.8791	19.1437	18.4143 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9140	0.8815	0.8199	0.7168	0.5725	0.3706	0.2236	0.2467	0.4814	0.7355	0.8720	0.9233	(94)
Useful gains	943.8143	1030.5282	1067.2685	1024.6140	833.6430	544.0748	313.5652	332.5105	614.4215	837.1778	891.1913	897.2896	(95)
Ext temp.	4.8000	5.4000	7.3000	9.7000	12.8000	15.8000	17.8000	17.6000	15.0000	11.4000	7.7000	4.8000	(96)
Heat loss rate W													
	1764.2064	1711.9654	1542.4194	1272.8495	925.9617	559.2685	315.4669	335.0690	652.4965	1059.5390	1421.3188	1721.8469	(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													
	610.3718	457.9258	353.5122	178.7296	68.6851	0.0000	0.0000	0.0000	0.0000	165.4368	381.6918	613.4706	(98)
Space heating													
RHI space heating demand													2829.8237 (98)
													2830 (98)

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Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	150.4100 (1b)	x 2.6400 (2b)	= 397.0824 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 397.0824 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =		0.0000	(6a)		
Number of open flues	0	+	0	+	0	=	0 * 20 =		0.0000	(6b)		
Number of intermittent fans							0 * 10 =		0.0000	(7a)		
Number of passive vents							0 * 10 =		0.0000	(7b)		
Number of flueless gas fires							0 * 40 =		0.0000	(7c)		
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =		0.0000	(8)		
Pressure test									Yes			
Measured/design AP50									5.0000			
Infiltration rate									0.2500	(18)		
Number of sides sheltered									1	(19)		
Shelter factor							(20) = 1 - [0.075 x (19)] =		0.9250	(20)		
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =		0.2313	(21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
	0.2948	0.2891	0.2833	0.2544	0.2486	0.2197	0.2197	0.2139	0.2313	0.2486	0.2602	0.2717
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												65.1000
Effective ac	0.4693	0.4636	0.4578	0.4289	0.4231	0.3942	0.3942	0.3884	0.4058	0.4231	0.4347	0.4462

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					
E Window (Uw = 1.40)			21.6700	1.3258	28.7292		(27)					
S Roof Light (Uw = 1.30)			1.1400	1.2357	1.4087		(27a)					
External Wall -Type 4	95.9300	21.6680	74.2620	0.1900	14.1098		(29a)					
Stud Wall	3.0000		3.0000	0.1008	0.3024		(29a)					
Flat Roof	35.3990		35.3990	0.1000	3.5399		(30)					
Roof Joist	42.3200		42.3200	0.1500	6.3480		(30)					
Roof Rafter	15.6800	1.1380	14.5420	0.1500	2.1813		(30)					
Total net area of external elements Aum(A, m2)			192.3330				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.6193		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.9282 (36)					
Total fabric heat loss						(33) + (36) =	72.5475 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 61.5015	Feb 60.7439	Mar 59.9864	Apr 56.1986	May 55.4410	Jun 51.6532	Jul 51.6532	Aug 50.8957	Sep 53.1683	Oct 55.4410	Nov 56.9561	Dec 58.4713 (38)
Heat transfer coeff	134.0489	133.2914	132.5338	128.7460	127.9885	124.2007	124.2007	123.4431	125.7158	127.9885	129.5036	131.0187 (39)
Average = Sum(39)m / 12 =												128.5566 (39)
HLP	Jan 0.8912	Feb 0.8862	Mar 0.8812	Apr 0.8560	May 0.8509	Jun 0.8257	Jul 0.8257	Aug 0.8207	Sep 0.8358	Oct 0.8509	Nov 0.8610	Dec 0.8711 (40)
HLP (average)												0.8547 (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												2.9348 (42)
Average daily hot water use (litres/day)												103.9021 (43)
Daily hot water use	Jan 114.2923	Feb 110.1363	Mar 105.9802	Apr 101.8241	May 97.6680	Jun 93.5119	Jul 93.5119	Aug 97.6680	Sep 101.8241	Oct 105.9802	Nov 110.1363	Dec 114.2923 (44)
Energy conte	169.4922	148.2390	152.9694	133.3624	127.9644	110.4235	102.3236	117.4179	118.8202	138.4735	151.1547	164.1442 (45)
Energy content (annual)												Total = Sum(45)m = 1634.7851 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water storage loss:	25.4238	22.2358	22.9454	20.0044	19.1947	16.5635	15.3485	17.6127	17.8230	20.7710	22.6732	24.6216 (46)
Store volume												10.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.5000 (48)
Temperature factor from Table 2b												1.0000 (49)
Enter (49) or (54) in (55)												0.5000 (55)
Total storage loss												
15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	15.0000	15.5000	15.0000	15.5000	(56)
If cylinder contains dedicated solar storage												
15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	15.0000	15.5000	15.0000	15.5000	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
208.2546	183.2502	191.7318	170.8744	166.7268	147.9355	141.0860	156.1803	156.3322	177.2359	188.6667	202.9066	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
208.2546	183.2502	191.7318	170.8744	166.7268	147.9355	141.0860	156.1803	156.3322	177.2359	188.6667	202.9066	(64)
Heat gains from water heating, kWh/month												
87.3661	77.2984	81.8722	74.3526	73.5581	66.7254	65.0325	70.0514	69.5173	77.0524	80.2685	85.5879	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
73.4953	65.2779	53.0876	40.1907	30.0430	25.3636	27.4062	35.6237	47.8140	60.7109	70.8586	75.5380	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
479.0571	484.0282	471.5012	444.8326	411.1682	379.5285	358.3913	353.4202	365.9472	392.6158	426.2801	457.9198	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	(71)
Water heating gains (Table 5)												
117.4275	115.0274	110.0433	103.2675	98.8684	92.6742	87.4093	94.1551	96.5518	103.5650	111.4841	115.0374	(72)
Total internal gains												
784.2203	778.5738	748.8724	702.5311	654.3200	611.8066	587.4471	597.4392	624.5534	671.1320	722.8631	762.7356	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				5.1800	19.6403	0.5400	0.8000	0.7700	30.4575 (76)			
South				9.8880	46.7521	0.5400	0.8000	0.7700	138.3969 (78)			
West				6.6000	19.6403	0.5400	0.8000	0.7700	38.8068 (80)			
South				1.1380	47.0123	0.5000	0.7000	1.0000	16.8525 (82)			
Solar gains	224.5137	392.2292	555.8579	709.7377	806.0528	802.9425	773.1499	702.3067	610.0608	439.3321	270.8659	190.7853 (83)
Total gains	1008.7340	1170.8031	1304.7303	1412.2688	1460.3728	1414.7491	1360.5971	1299.7459	1234.6142	1110.4641	993.7290	953.5209 (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	31.1681	31.3453	31.5244	32.4519	32.6440	33.6396	33.6396	33.8460	33.2341	32.6440	32.2621	31.8890
alpha	3.0779	3.0897	3.1016	3.1635	3.1763	3.2426	3.2426	3.2564	3.2156	3.1763	3.1508	3.1259
util living area	0.9509	0.9237	0.8786	0.7957	0.6780	0.5203	0.3889	0.4198	0.6158	0.8244	0.9247	0.9572 (86)
MIT	19.3306	19.6084	19.9844	20.4259	20.7347	20.9213	20.9768	20.9702	20.8572	20.4493	19.8368	19.3059 (87)
Th 2	20.1750	20.1793	20.1836	20.2051	20.2094	20.2311	20.2311	20.2354	20.2224	20.2094	20.2008	20.1922 (88)
util rest of house	0.9445	0.9142	0.8636	0.7711	0.6400	0.4675	0.3252	0.3555	0.5639	0.7979	0.9139	0.9516 (89)
MIT 2	17.9289	18.3292	18.8661	19.4953	19.9097	20.1568	20.2145	20.2131	20.0790	19.5420	18.6764	17.9045 (90)
Living area fraction									fLA = Living area / (4) =			0.1618 (91)
MIT	18.1558	18.5362	19.0471	19.6459	20.0432	20.2805	20.3378	20.3356	20.2050	19.6888	18.8642	18.1313 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1558	18.5362	19.0471	19.6459	20.0432	20.2805	20.3378	20.3356	20.2050	19.6888	18.8642	18.1313 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9239	0.8904	0.8389	0.7519	0.6315	0.4711	0.3343	0.3641	0.5627	0.7779	0.8910	0.9326 (94)
Useful gains	931.9607	1042.5227	1094.6021	1061.9363	922.2682	666.4273	454.7826	473.2866	694.7176	863.8381	885.4428	889.2853 (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	1857.3498	1817.5901	1662.9130	1383.4898	1067.8357	705.5193	464.2403	485.8213	767.4887	1163.2594	1523.5061	1825.2556 (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	688.4895	520.8452	422.8233	231.5185	108.3022	0.0000	0.0000	0.0000	0.0000	222.7694	459.4056	696.3619 (98)
Space heating												3350.5157 (98)
Space heating per m2												22.2759 (99)
										(98) / (4) =		

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1167.4863	919.0850	938.1677	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8572	0.9068	0.8919	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1000.7940	833.4485	836.7739	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1538.9293	1480.2040	1408.5407	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh						1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	387.4574	481.1861	425.3946	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction												1294.0381	(104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =				0.5128 (105)
0.0000	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	49.6719	61.6879	54.5354	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												165.8952	(107)
Space cooling per m2												1.1030	(108)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	1.0000	(303a)
Fraction of total space heat from community Heat pump	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	3350.5157	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	3518.0415	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2091.1811	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2195.7401	(310a)
Electricity used for heat distribution	57.1378	(313)
Cooling System Energy Efficiency Ratio	6.7500	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	24.5771	(315)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9240)		
mechanical ventilation fans (SFP = 0.9240)	447.6230	(330a)
Total electricity for the above, kWh/year	447.6230	(331)
Electricity for lighting (calculated in Appendix L)	519.1803	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 1.37 * 951 * 0.80) =	-833.5001	(333)
Total delivered energy for all uses	5871.6619	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	3518.0415	4.2400	149.1650	(340a)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2195.7401	4.2400	93.0994	(342a)
Space cooling	24.5771	13.1900	3.2417	(348)
Mechanical ventilation fans	447.6230	13.1900	59.0415	(349)
Pumps and fans for heating	0.0000	0.0000	0.0000	(349)
Energy for lighting	519.1803	13.1900	68.4799	(350)
Additional standing charges			120.0000	(351)
Energy saving/generation technologies				
PV Unit	0.0000	0.0000	0.0000	(352)
Total energy cost			493.0274	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.4200	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0597	(357)
SAP value		85.2175	
SAP rating (Section 12)		85	(358)
SAP band		B	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			300.0000	(367a)
Space heating from Heat pump	1904.5939	0.5190	988.4842	(367)
Electrical energy for heat distribution	57.1378	0.5190	29.6545	(372)

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Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1018.1387 (373)
Space and water heating			1018.1387 (376)
Space cooling	24.5771	0.5190	12.7555 (377)
Pumps and fans	447.6230	0.5190	232.3164 (378)
Energy for lighting	519.1803	0.5190	269.4546 (379)
Energy saving/generation technologies			
PV Unit	-833.5001	0.5190	-432.5866 (380)
Total kg/year			1100.0786 (383)
CO2 emissions per m2			7.3100 (384)
EI value			92.4563 (384a)
EI rating			92 (385)
EI band			A

----- Calculation of stars for heating and DHW

Space heating energy efficiency	$1.00 \times 4.240 \times 1.05$	
= 4.452, stars = 4		
Space heating environmental impact	$1.00 \times 0.519 \times 1.05 / 3.0000$	
= 0.1817, stars = 5		
Water heating energy efficiency		4.452, stars = 4
Water heating environmental impact		0.1817, stars = 5

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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	150.4100 (1b)	x 2.6400 (2b)	= 397.0824 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 397.0824 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2313 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.3000	4.4000	4.0000	4.0000	3.7000	3.7000	3.4000	3.7000	3.9000	3.8000	4.1000 (22)
Wind factor	1.1250	1.0750	1.1000	1.0000	1.0000	0.9250	0.9250	0.8500	0.9250	0.9750	0.9500	1.0250 (22a)
Adj infilt rate	0.2602	0.2486	0.2544	0.2313	0.2313	0.2139	0.2139	0.1966	0.2139	0.2255	0.2197	0.2370 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												65.1000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.4347	0.4231	0.4289	0.4058	0.4058	0.3884	0.3884	0.3711	0.3884	0.4000	0.3942	0.4115 (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
E Window (Uw = 1.40)			21.6700	1.3258	28.7292		(27)
S Roof Light (Uw = 1.30)			1.1400	1.2357	1.4087		(27a)
External Wall -Type 4	95.9300	21.6680	74.2620	0.1900	14.1098		(29a)
Stud Wall	3.0000		3.0000	0.1008	0.3024		(29a)
Flat Roof	35.3990		35.3990	0.1000	3.5399		(30)
Roof Joist	42.3200		42.3200	0.1500	6.3480		(30)
Roof Rafter	15.6800	1.1380	14.5420	0.1500	2.1813		(30)
Total net area of external elements Aum(A, m ²)			192.3330				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.6193		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.9282 (36)
Total fabric heat loss							(33) + (36) = 72.5475 (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	56.9561	55.4410	56.1986	53.1683	53.1683	50.8957	50.8957	48.6230	50.8957	52.4108	51.6532	53.9259 (38)
Average = Sum(39)m / 12 =	129.5036	127.9885	128.7460	125.7158	125.7158	123.4431	123.4431	121.1704	123.4431	124.9582	124.2007	126.4734 (39)
												125.4001 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8610	0.8509	0.8560	0.8358	0.8358	0.8207	0.8207	0.8056	0.8207	0.8308	0.8257	0.8409 (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												2.9348 (42)
Average daily hot water use (litres/day)												103.9021 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.2923	110.1363	105.9802	101.8241	97.6680	93.5119	93.5119	97.6680	101.8241	105.9802	110.1363	114.2923 (44)
Energy content (annual)	169.4922	148.2390	152.9694	133.3624	127.9644	110.4235	102.3236	117.4179	118.8202	138.4735	151.1547	164.1442 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1634.7851 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Water storage loss:	25.4238	22.2358	22.9454	20.0044	19.1947	16.5635	15.3485	17.6127	17.8230	20.7710	22.6732	24.6216 (46)
Store volume												10.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.5000 (48)
Temperature factor from Table 2b												1.0000 (49)
Enter (49) or (54) in (55)												0.5000 (55)
Total storage loss	15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	15.0000	15.5000	15.0000	15.5000 (56)
If cylinder contains dedicated solar storage	15.5000	14.0000	15.5000	15.0000	15.5000	15.0000	15.5000	15.5000	15.0000	15.5000	15.0000	15.5000 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	208.2546	183.2502	191.7318	170.8744	166.7268	147.9355	141.0860	156.1803	156.3322	177.2359	188.6667	202.9066 (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	208.2546	183.2502	191.7318	170.8744	166.7268	147.9355	141.0860	156.1803	156.3322	177.2359	188.6667	202.9066 (64)
Heat gains from water heating, kWh/month	87.3661	77.2984	81.8722	74.3526	73.5581	66.7254	65.0325	70.0514	69.5173	77.0524	80.2685	85.5879 (65)
Total per year (kWh/year) = Sum(64)m = 2091.1811 (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	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896	176.0896 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.4953	65.2779	53.0876	40.1907	30.0430	25.3636	27.4062	35.6237	47.8140	60.7109	70.8586	75.5380 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	479.0571	484.0282	471.5012	444.8326	411.1682	379.5285	358.3913	353.4202	365.9472	392.6158	426.2801	457.9198 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438	55.5438 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931	-117.3931 (71)
Water heating gains (Table 5)	117.4275	115.0274	110.0433	103.2675	98.8684	92.6742	87.4093	94.1551	96.5518	103.5650	111.4841	115.0374 (72)
Total internal gains	784.2203	778.5738	748.8724	702.5311	654.3200	611.8066	587.4471	597.4392	624.5534	671.1320	722.8631	762.7356 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W		
East				5.1800	22.3313	0.5400	0.8000		0.7700	34.6307 (76)		
South				9.8880	50.9848	0.5400	0.8000		0.7700	150.9268 (78)		
West				6.6000	22.3313	0.5400	0.8000		0.7700	44.1240 (80)		
South				1.1380	52.2757	0.5000	0.7000		1.0000	18.7393 (82)		
Solar gains	248.4208	390.5137	552.8354	726.8353	801.8492	856.3103	814.9866	750.4263	651.6604	467.1230	299.1539	209.0819 (83)
Total gains	1032.6411	1169.0875	1301.7077	1429.3664	1456.1692	1468.1169	1402.4338	1347.8655	1276.2137	1138.2550	1022.0170	971.8175 (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	32.2621	32.6440	32.4519	33.2341	33.2341	33.8460	33.8460	34.4808	33.8460	33.4356	33.6396	33.0351
alpha	3.1508	3.1763	3.1635	3.2156	3.2156	3.2564	3.2564	3.2987	3.2564	3.2290	3.2426	3.2023
util living area	0.9426	0.9152	0.8604	0.7604	0.6191	0.4201	0.2784	0.3014	0.5344	0.7832	0.9076	0.9496 (86)
MIT	19.5155	19.7721	20.1485	20.5553	20.8277	20.9663	20.9938	20.9922	20.9214	20.5885	20.0308	19.5020 (87)
Th 2	20.2008	20.2094	20.2051	20.2224	20.2224	20.2354	20.2354	20.2485	20.2354	20.2267	20.2311	20.2181 (88)
util rest of house	0.9352	0.9048	0.8432	0.7324	0.5758	0.3634	0.2132	0.2365	0.4775	0.7514	0.8945	0.9430 (89)
MIT 2	18.2119	18.5836	19.1127	19.6838	20.0377	20.2078	20.2323	20.2442	20.1631	19.7422	18.9725	18.2043 (90)
Living area fraction	18.4228	18.7759	19.2803	19.8248	20.1655	20.3306	20.3556	20.3653	20.2858	19.8791	19.1437	18.4143 (92)
Temperature adjustment	18.4228	18.7759	19.2803	19.8248	20.1655	20.3306	20.3556	20.3653	20.2858	19.8791	19.1437	18.4143 (93)
adjusted MIT	18.4228	18.7759	19.2803	19.8248	20.1655	20.3306	20.3556	20.3653	20.2858	19.8791	19.1437	18.4143 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	943.8143	1030.5282	1067.2685	1024.6140	833.6430	544.0748	313.5652	332.5105	614.4215	837.1778	891.1913	897.2896 (95)
Ext temp.	4.8000	5.4000	7.3000	9.7000	12.8000	15.8000	17.8000	17.6000	15.0000	11.4000	7.7000	4.8000 (96)
Heat loss rate W	1764.2064	1711.9654	1542.4194	1272.8495	925.9617	559.2685	315.4669	335.0690	652.4965	1059.5390	1421.3188	1721.8469 (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	610.3718	457.9258	353.5122	178.7296	68.6851	0.0000	0.0000	0.0000	0.0000	165.4368	381.6918	613.4706 (98)
Space heating												2829.8237 (98)
Space heating per m2												(98) / (4) = 18.8141 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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.	4.8000	5.4000	7.3000	9.7000	12.8000	15.8000	17.8000	17.6000	15.0000	11.4000	7.7000	4.8000	
Heat loss rate W													
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1012.2336	765.3473	775.4908	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9036	0.9446	0.9382	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	914.6691	722.9378	727.5388	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1600.5159	1528.4767	1464.0710	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh						1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	493.8097	599.3209	547.9800	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction												1641.1106	(104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =				0.5128 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	63.3062	76.8327	70.2508	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												210.3897	(107)
Space cooling per m2												1.3988	(108)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	1.0000	(303a)
Fraction of total space heat from community Heat pump	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	2829.8237	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	2971.3149	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2091.1811	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2195.7401	(310a)
Electricity used for heat distribution	51.6705	(313)
Cooling System Energy Efficiency Ratio	6.7500	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	31.1688	(315)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9240)		
mechanical ventilation fans (SFP = 0.9240)	447.6230	(330a)
Total electricity for the above, kWh/year	447.6230	(331)
Electricity for lighting (calculated in Appendix L)	519.1803	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 1.37 * 1019 * 0.80) =	-893.1576	(333)
Total delivered energy for all uses	5271.8696	(338)

10b. Fuel costs - using BEDF prices (520)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	2971.3149	11.8800	352.9922	(340a)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2195.7401	11.8800	260.8539	(342a)
Space cooling	31.1688	36.8500	11.4857	(348)
Mechanical ventilation fans	447.6230	36.8500	164.9491	(349)
Pumps and fans for heating	0.0000	0.0000	0.0000	(349)
Energy for lighting	519.1803	36.8500	191.3179	(350)
Additional standing charges			104.0000	(351)
Energy saving/generation technologies				
PV Unit	0.0000	0.0000	0.0000	(352)
Total energy cost			1085.5989	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			300.0000	(367a)
Space heating from Heat pump	1722.3517	0.5190	893.9005	(367)
Electrical energy for heat distribution	51.6705	0.5190	26.8170	(372)
Total CO2 associated with community systems (negative value allowed since DFEE < TFEE)			920.7175	(373)
Space and water heating			920.7175	(376)
Space cooling	31.1688	0.5190	16.1766	(377)
Pumps and fans	447.6230	0.5190	232.3164	(378)
Energy for lighting	519.1803	0.5190	269.4546	(379)
Energy saving/generation technologies				
PV Unit	-893.1576	0.5190	-463.5488	(380)
Total kg/year			975.1163	(383)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			300.0000 (367a)
Space heating from Heat pump	1722.3517	3.0700	5287.6196 (367)
Electrical energy for heat distribution	51.6705	3.0700	158.6286 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			5446.2482 (373)
Space and water heating			5446.2482 (376)
Space cooling	31.1688	3.0700	95.6884 (377)
Pumps and fans	447.6230	3.0700	1374.2028 (378)
Energy for lighting	519.1803	3.0700	1593.8836 (379)
Energy saving/generation technologies			
PV Unit	-893.1576	3.0700	-2741.9938 (380)
Primary energy kWh/year			5768.0291 (383)
Primary energy kWh/m2/year			38.3487 (384)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: A 92

(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	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
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: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings £0		0.00 kg/m²

Potential energy efficiency rating: B 85
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 520 TEST (05 Jun 2023)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£368	£368	£0
Community scheme	£718	£718	£0
Space heating	£622	£622	£0
Space cooling	£11	£11	£0
Water heating	£261	£261	£0
Lighting	£191	£191	£0
Total cost of fuels	£1086	£1086	£0
Total cost of uses	£1085	£1085	£0
Delivered energy	35 kWh/m²	35 kWh/m²	0 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m ²	6 kg/m ²	6 kg/m ²	0 kg/m ²
Primary energy	38 kWh/m ²	38 kWh/m ²	0 kWh/m ²

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 SemiDetached Flat
Number of storeys 1
Cross ventilation possible Yes
SAP Region Thames Valley
Front of dwelling faces East
Overshading Average or unknown
Thermal mass parameter 100.0
Night ventilation No
Ventilation rate during hot weather (ach) 6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient 786.22 (P1)
Transmission heat loss coefficient 72.55 (37)
Summer heat loss coefficient 858.77 (P2)

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

Solar shading Orientation	Z blinds	Solar access	Z overhangs	Z summer
East	0.850	0.90	1.000	0.765 (P8)
South	0.850	0.90	1.000	0.765 (P8)
South	1.000	1.00	1.000	1.000 (P8)
West	0.850	0.90	1.000	0.765 (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
East	5.1800	117.5071	0.5400	0.8000	0.7650	181.0429
South	9.8880	112.2060	0.5400	0.8000	0.7650	329.9987
West	6.6000	117.5071	0.5400	0.8000	0.7650	230.6724
South	1.1380	190.8804	0.5000	0.7000	1.0000	68.4249
total:						810.1388

	Jun	Jul	Aug	
Solar gains	851	810	750	(P3)
Internal gains	612	587	597	
Total summer gains	1463	1398	1348	(P5)
Summer gain/loss ratio	1.70	1.63	1.57	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 100.0)	1.30	1.30	1.30	
Threshold temperature	19.00	20.83	20.67	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			