

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat 10			Issued on Date	21/06/2023
Assessment Reference	001	Prop Type Ref	10		
Property	Birchwood House, Flat 10, Northwood, HA6 2UZ				
SAP Rating	85 B	DER	8.61	TER	18.74
Environmental	92 A	% DER<TER	54.05		
CO₂ Emissions (t/year)	1.14	DFEE	36.44	TFEE	42.19
General Requirements Compliance	Pass	% DFEE<TFEE	13.62		
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 165 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) 18.74 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 8.61 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 42.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 36.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.19 (max. 0.70)	OK
Floor	(no floor)		
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.38 (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 cylinder stat

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: 0.94
Maximum 1.5 OK
MVHR efficiency: 91%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average
Windows facing North: 5.35 m², No overhang
Windows facing East: 2.72 m², No overhang
Windows facing South: 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 0.11 W/m²K
Photovoltaic array 1.50 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	164.8400 (1b)	x 2.6200 (2b)	= 431.8808 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	164.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 431.8808 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				0 * 10 =	0.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
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) =												63.7000 (23c)
Effective ac	0.4763	0.4706	0.4648	0.4359	0.4301	0.4012	0.4012	0.3954	0.4128	0.4301	0.4417	0.4532 (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 Dormer Window (Uw = 1.40)			14.6700	1.3258	19.4489		(27)
E Rooflight (Uw = 1.30)			3.0300	1.2357	3.7567		(27a)
External Wall -Type 4	80.7990	13.0500	67.7490	0.1900	12.8723		(29a)
Stud Wall	19.2200		19.2200	0.1080	2.0758		(29a)
Dormer Wall	4.0600	1.6200	2.4400	0.1700	0.4148		(29a)
Roof Joist	51.5000		51.5000	0.1500	7.7250		(30)
Dormer Pitched Roof	2.9100		2.9100	0.1500	0.4365		(30)
Roof Rafter	31.4300	3.0350	28.3950	0.1500	4.2593		(30)
Total net area of external elements Aum(A, m ²)			189.9240				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	50.9891		(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)							13.9544 (36)
Total fabric heat loss						(33) + (36) =	64.9435 (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
(38)m	67.8888	67.0649	66.2409	62.1212	61.2972	57.1775	57.1775	56.3536	58.8254	61.2972	62.9451	64.5930 (38)
Heat transfer coeff	132.8324	132.0084	131.1845	127.0647	126.2408	122.1210	122.1210	121.2971	123.7689	126.2408	127.8887	129.5366 (39)
Average = Sum(39)m / 12 =												126.8587 (39)
HLP	0.8058	0.8008	0.7958	0.7708	0.7658	0.7408	0.7408	0.7358	0.7508	0.7658	0.7758	0.7858 (40)
HLP (average)												0.7696 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9556 (42)
Average daily hot water use (litres/day)												104.3955 (43)
Daily hot water use	114.8351	110.6593	106.4835	102.3076	98.1318	93.9560	93.9560	98.1318	102.3076	106.4835	110.6593	114.8351 (44)
Energy conte	170.2971	148.9430	153.6958	133.9957	128.5721	110.9479	102.8096	117.9755	119.3845	139.1311	151.8725	164.9237 (45)
Energy content (annual)										Total = Sum(45)m =		1642.5485 (45)

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Distribution loss (46)m = 0.15 x (45)m	25.5446	22.3414	23.0544	20.0994	19.2858	16.6422	15.4214	17.6963	17.9077	20.8697	22.7809	24.7386 (46)
Water storage loss:												
Store volume												
a) If manufacturer declared loss factor is known (kWh/day):												
Temperature factor from Table 2b												
Enter (49) or (54) in (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	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	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												
209.0595	183.9542	192.4582	171.5077	167.3345	148.4599	141.5720	156.7379	156.8965	177.8935	189.3845	203.6861	203.6861 (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												
209.0595	183.9542	192.4582	171.5077	167.3345	148.4599	141.5720	156.7379	156.8965	177.8935	189.3845	203.6861	203.6861 (64)
Heat gains from water heating, kWh/month												
87.6337	77.5325	82.1138	74.5632	73.7601	66.8998	65.1941	70.2368	69.7049	77.2710	80.5072	85.8470	85.8470 (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	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
33.0387	29.3446	23.8647	18.0671	13.5054	11.4018	12.3200	16.0141	21.4940	27.2916	31.8533	33.9569	33.9569 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
336.2492	339.7384	330.9457	312.2271	288.5982	266.3903	251.5541	248.0649	256.8576	275.5763	299.2052	321.4130	321.4130 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780 (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)												
-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241 (71)
Water heating gains (Table 5)												
117.7873	115.3757	110.3680	103.5600	99.1400	92.9164	87.6265	94.4043	96.8124	103.8589	111.8156	115.3858	115.3858 (72)
Total internal gains	554.4092	551.7929	532.5124	501.1882	468.5775	438.0425	418.8347	425.8173	442.4981	474.0608	510.2081	538.0898 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m ²	Table 6a	Specific data	Specific data	factor	W						
		W/m ²	or Table 6b	or Table 6c	Table 6d							
North	5.3500	10.6334	0.5400	0.8000	0.7700	17.0311 (74)						
East	2.7200	19.6403	0.5400	0.8000	0.7700	15.9931 (76)						
South	6.6000	46.7521	0.5400	0.8000	0.7700	92.3765 (78)						
East	3.0350	25.9287	0.5000	0.7000	1.0000	24.7885 (82)						
Solar gains	150.1893	264.7172	384.0397	509.5634	599.4387	607.1628	580.3925	511.8675	427.4722	298.6291	181.5539	127.4322 (83)
Total gains	704.5985	816.5101	916.5521	1010.7516	1068.0162	1045.2053	999.2272	937.6848	869.9703	772.6899	691.7620	665.5220 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	3.4712	3.4683	3.4942	3.60359	3.62711	37.4947	37.4947	37.7494	36.9955	36.2711	35.8037	35.3482
util living area	3.2981	3.3124	3.3269	3.4024	3.4181	3.4996	3.4996	3.5166	3.4664	3.4181	3.3869	3.3565
0.9844	0.9737	0.9523	0.9024	0.8088	0.6543	0.5075	0.5521	0.7689	0.9256	0.9746	0.9869	0.9869 (86)
MIT	19.1237	19.3597	19.7283	20.2197	20.6121	20.8766	20.9619	20.9490	20.7672	20.2528	19.6259	19.1154 (87)
Th 2	20.2483	20.2526	20.2569	20.2787	20.2830	20.3049	20.3049	20.3093	20.2961	20.2830	20.2743	20.2656 (88)
util rest of house	0.9822	0.9700	0.9454	0.8878	0.7792	0.6025	0.4369	0.4819	0.7249	0.9117	0.9705	0.9851 (89)
MIT 2	17.6774	18.0230	18.5594	19.2763	19.8228	20.1810	20.2754	20.2679	20.0451	19.3346	18.4258	17.6760 (90)
Living area fraction												
MIT	18.1284	18.4398	18.9239	19.5704	20.0689	20.3979	20.4895	20.4803	20.2702	19.6209	18.8000	18.1249 (92)
Temperature adjustment												
adjusted MIT	18.1284	18.4398	18.9239	19.5704	20.0689	20.3979	20.4895	20.4803	20.2702	19.6209	18.8000	18.1249 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9734	0.9580	0.9297	0.8709	0.7694	0.6098	0.4562	0.4999	0.7231	0.8958	0.9592	0.9775 (94)
Ext temp.	685.8702	782.2404	852.1122	880.2368	821.7801	637.3432	455.8548	468.7640	629.0759	692.2031	663.5372	650.5444 (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)
1836.8546	1787.3657	1629.8205	1355.8363	1056.5009	708.0478	474.9884	494.9252	763.6851	1138.8019	1496.3033	1803.7782 (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	856.3323	675.4442	578.6150	342.4317	174.6323	0.0000	0.0000	0.0000	0.0000	332.2695	599.5916	858.0060 (98)
Space heating												
Space heating per m ²												
(98) / (4) =												

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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	1147.9378	903.6957	921.8579	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8275	0.8862	0.8672	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	949.8690	800.8565	799.3919	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1315.4051	1260.4521	1195.3830	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	263.1859	341.9391	294.6174	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												899.7424 (104)
Intermittency factor (Table 10b)												fC = cooled area / (4) =
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	0.6578 (105)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	43.2802	56.2310	48.4490	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling												147.9603 (107)
Space cooling per m2												0.8976 (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	4417.3225 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	4638.1887 (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	2098.9445 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2203.8917 (310a)
Electricity used for heat distribution	68.4208 (313)
Cooling System Energy Efficiency Ratio	6.7500 (314)
Space cooling (if there is a fixed cooling system, if not enter 0)	21.9200 (315)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3160)	
mechanical ventilation fans (SFP = 1.3160)	693.3933 (330a)
Total electricity for the above, kWh/year	693.3933 (331)
Electricity for lighting (calculated in Appendix L)	583.4731 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 1.50 * 951 * 0.80) =	-912.5914 (333)
Total delivered energy for all uses	7228.2755 (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	2280.6935	0.5190	1183.6799 (367)
Electrical energy for heat distribution	68.4208	0.5190	35.5104 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1219.1903 (373)
Space and water heating			1219.1903 (376)
Space cooling	21.9200	0.5190	11.3765 (377)
Pumps and fans	693.3933	0.5190	359.8711 (378)
Energy for lighting	583.4731	0.5190	302.8226 (379)
Energy saving/generation technologies			
PV Unit	-912.5914	0.5190	-473.6349 (380)
Total CO2, kg/year			1419.6255 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			8.6100 (384)

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

DER			8.6100 ZC1
Total Floor Area		TFA	164.8400
Assumed number of occupants		N	2.9556
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			12.0877 ZC2
CO2 emissions from cooking, equation (L16)			1.1522 ZC3
Total CO2 emissions			21.8500 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			21.8500 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	164.8400 (1b)	x 2.6200 (2b)	= 431.8808 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	164.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 431.8808 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.0926 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3426	(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) =		0.3169 (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	0.4041	0.3962	0.3882	0.3486	0.3407	0.3011	0.3011	0.2932	0.3169	0.3407	0.3565	0.3724 (22b)
Effective ac	0.5816	0.5785	0.5754	0.5608	0.5580	0.5453	0.5453	0.5430	0.5502	0.5580	0.5636	0.5693 (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)			14.6700	1.3258	19.4489		(27)
TER Room Window (Uw = 1.70)			3.0300	1.5918	4.8390		(27a)
External Wall -Type 4	80.7990	13.0500	67.7490	0.1800	12.1948		(29a)
Stud Wall	19.2200		19.2200	0.1800	3.4596		(29a)
Dormer Wall	4.0600	1.6200	2.4400	0.1800	0.4392		(29a)
Roof Joist	51.5000		51.5000	0.1300	6.6950		(30)
Dormer Pitched Roof	2.9100		2.9100	0.1300	0.3783		(30)
Roof Rafter	31.4300	3.0350	28.3950	0.1300	3.6914		(30)
Total net area of external elements Aum(A, m ²)			189.9240				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.1461		(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)							11.0122 (36)
Total fabric heat loss						(33) + (36) =	62.1583 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	82.8955	82.4437	82.0008	79.9207	79.5315	77.7198	77.7198	77.3843	78.4177	79.5315	80.3188	81.1419 (38)
Heat transfer coeff	145.0538	144.6020	144.1591	142.0790	141.6898	139.8781	139.8781	139.5426	140.5760	141.6898	142.4771	143.3002 (39)
Average = Sum(39)m / 12 =												142.0771 (39)
HLP	0.8800	0.8772	0.8745	0.8619	0.8596	0.8486	0.8486	0.8465	0.8528	0.8596	0.8643	0.8693 (40)
HLP (average)												0.8619 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9556 (42)
Average daily hot water use (litres/day)												104.3955 (43)
Daily hot water use	114.8351	110.6593	106.4835	102.3076	98.1318	93.9560	93.9560	98.1318	102.3076	106.4835	110.6593	114.8351 (44)
Energy conte	170.2971	148.9430	153.6958	133.9957	128.5721	110.9479	102.8096	117.9755	119.3845	139.1311	151.8725	164.9237 (45)
Energy content (annual)												Total = Sum(45)m = 1642.5485 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	25.5446	22.3414	23.0544	20.0994	19.2858	16.6422	15.4214	17.6963	17.9077	20.8697	22.7809	24.7386 (46)
Store volume												10.0000 (47)

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):													0.3712 (48)
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	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	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	23.2624 (59)
Total heat required for water heating calculated for each month	199.7736	175.5669	183.1723	162.5214	158.0486	139.4736	132.2861	147.4520	147.9101	168.6076	180.3981	194.4002	194.4002 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	199.7736	175.5669	183.1723	162.5214	158.0486	139.4736	132.2861	147.4520	147.9101	168.6076	180.3981	194.4002	194.4002 (64)
Heat gains from water heating, kWh/month	80.2050	70.8227	74.6851	67.3741	66.3314	59.7107	57.7654	62.8081	62.5159	69.8423	73.3181	78.4183	78.4183 (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	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.8370	30.0537	24.4413	18.5036	13.8317	11.6773	12.6177	16.4010	22.0134	27.9510	32.6230	34.7774	34.7774 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	336.2492	339.7384	330.9457	312.2271	288.5982	266.3903	251.5541	248.0649	256.8576	275.5763	299.2052	321.4130	321.4130 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241 (71)
Water heating gains (Table 5)	107.8024	105.3909	100.3831	93.5751	89.1551	82.9315	77.6416	84.4194	86.8276	93.8741	101.8307	105.4010	105.4010 (72)
Total internal gains	548.2226	545.5171	526.1042	494.6399	461.9190	431.3332	412.1475	419.2194	436.0326	467.7354	503.9929	531.9254	531.9254 (73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North		5.3500	10.6334	0.6300	0.7000	0.7700	17.3859	17.3859 (74)					
East		2.7200	19.6403	0.6300	0.7000	0.7700	16.3263	16.3263 (76)					
South		6.6000	46.7521	0.6300	0.7000	0.7700	94.3011	94.3011 (78)					
East		3.0350	25.9287	0.6300	0.7000	1.0000	31.2335	31.2335 (82)					
Solar gains	159.2468	282.0937	412.2490	550.7386	650.3625	659.5978	630.1806	554.2500	460.2320	319.1008	192.7754	134.9327	134.9327 (83)
Total gains	707.4694	827.6107	938.3532	1045.3785	1112.2816	1090.9310	1042.3281	973.4693	896.2647	786.8362	696.7683	666.8581	666.8581 (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	78.9171	79.1637	79.4069	80.5694	80.7907	81.8371	81.8371	82.0339	81.4309	80.7907	80.3443	79.8828	79.8828
alpha	6.2611	6.2776	6.2938	6.3713	6.3860	6.4558	6.4558	6.4689	6.4287	6.3860	6.3563	6.3255	6.3255
util living area	0.9997	0.9990	0.9964	0.9831	0.9260	0.7673	0.5822	0.6435	0.8970	0.9914	0.9992	0.9998	0.9998 (86)
MIT	19.9723	20.0999	20.3070	20.5842	20.8269	20.9650	20.9948	20.9907	20.9000	20.5828	20.2281	19.9548	19.9548 (87)
Th 2	20.1846	20.1869	20.1892	20.2000	20.2020	20.2114	20.2114	20.2132	20.2078	20.2020	20.1979	20.1936	20.1936 (88)
util rest of house	0.9996	0.9987	0.9951	0.9763	0.8965	0.6931	0.4823	0.5416	0.8461	0.9870	0.9988	0.9997	0.9997 (89)
MIT 2	18.7830	18.9716	19.2758	19.6849	20.0192	20.1860	20.2093	20.2089	20.1193	19.6875	19.1678	18.7644	18.7644 (90)
Living area fraction	19.1538	19.3235	19.5974	19.9653	20.2711	20.4289	20.4542	20.4526	20.3628	19.9667	19.4984	19.1356	19.1356 (92)
Temperature adjustment												0.0000	0.0000
adjusted MIT	19.1538	19.3235	19.5974	19.9653	20.2711	20.4289	20.4542	20.4526	20.3628	19.9667	19.4984	19.1356	19.1356 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9994	0.9982	0.9938	0.9738	0.8995	0.7149	0.5137	0.5735	0.8575	0.9852	0.9984	0.9996	0.9996 (94)
Ext temp.	707.0241	826.1011	932.5262	1018.0086	1000.4657	779.8569	535.4057	558.3305	768.5773	775.2229	695.6265	666.5707	666.5707 (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	4.2000 (96)
Month fracti	2154.6069	2085.6595	1888.1022	1572.1524	1214.4348	815.3390	539.1229	565.5158	880.3953	1327.1680	1766.4946	2140.2714	2140.2714 (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	1.0000 (97a)
Space heating per m ²	1077.0016	846.4233	710.9485	398.9836	159.1930	0.0000	0.0000	0.0000	0.0000	410.6472	771.0251	1096.4333	1096.4333 (98)
												5470.6555	5470.6555 (98)
													(98) / (4) = 33.1877 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													5850.9685 (211)
Space heating requirement	1077.0016	846.4233	710.9485	398.9836	159.1930	0.0000	0.0000	0.0000	0.0000	410.6472	771.0251	1096.4333	(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)	1151.8734	905.2655	760.3728	426.7204	170.2599	0.0000	0.0000	0.0000	0.0000	439.1948	824.6257	1172.6559	(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	199.7736	175.5669	183.1723	162.5214	158.0486	139.4736	132.2861	147.4520	147.9101	168.6076	180.3981	194.4002	(64)
Efficiency of water heater (217)m	88.6403	88.4623	88.0805	87.1190	84.8331	79.8000	79.8000	79.8000	79.8000	87.1005	88.2562	88.7087	(216)
Fuel for water heating, kWh/month	225.3756	198.4652	207.9601	186.5511	186.3054	174.7789	165.7720	184.7769	185.3510	193.5781	204.4028	219.1445	(219)
Water heating fuel used													2332.4617 (219)
Annual totals kWh/year													
Space heating fuel - main system													5850.9685 (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)													597.5712 (232)
Total delivered energy for all uses													8856.0013 (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	5850.9685	0.2160	1263.8092 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2332.4617	0.2160	503.8117 (264)
Space and water heating			1767.6209 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	597.5712	0.5190	310.1395 (268)
Total CO2, kg/m2/year			2116.6854 (272)
Emissions per m2 for space and water heating			10.7233 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			1.8815 (272b)
Emissions per m2 for pumps and fans			0.2361 (272c)
Target Carbon Dioxide Emission Rate (TER) = (10.7233 * 1.55) + 1.8815 + 0.2361, rounded to 2 d.p.			18.7400 (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	164.8400 (1b)	x 2.6200 (2b)	= 431.8808 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	164.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 431.8808 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0926 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3426 (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) =	0.3169 (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	0.4041	0.3962	0.3882	0.3486	0.3407	0.3011	0.3011	0.2932	0.3169	0.3407	0.3565	0.3724 (22b)
Effective ac	0.5816	0.5785	0.5754	0.5608	0.5580	0.5453	0.5453	0.5430	0.5502	0.5580	0.5636	0.5693 (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 Dormer Window (Uw = 1.40)			14.6700	1.3258	19.4489		(27)
E Rooflight (Uw = 1.30)			3.0300	1.2357	3.7567		(27a)
External Wall -Type 4	80.7990	13.0500	67.7490	0.1900	12.8723		(29a)
Stud Wall	19.2200		19.2200	0.1080	2.0758		(29a)
Dormer Wall	4.0600	1.6200	2.4400	0.1700	0.4148		(29a)
Roof Joist	51.5000		51.5000	0.1500	7.7250		(30)
Dormer Pitched Roof	2.9100		2.9100	0.1500	0.4365		(30)
Roof Rafter	31.4300	3.0350	28.3950	0.1500	4.2593		(30)
Total net area of external elements Aum(A, m ²)			189.9240				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.9891		(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)							13.9544 (36)
Total fabric heat loss						(33) + (36) =	64.9435 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	82.8955	82.4437	82.0008	79.9207	79.5315	77.7198	77.7198	77.3843	78.4177	79.5315	80.3188	81.1419 (38)
Heat transfer coeff	147.8390	147.3872	146.9444	144.8642	144.4751	142.6634	142.6634	142.3279	143.3612	144.4751	145.2624	146.0855 (39)
Average = Sum(39)m / 12 =												144.8624 (39)
HLP	0.8969	0.8941	0.8914	0.8788	0.8765	0.8655	0.8655	0.8634	0.8697	0.8765	0.8812	0.8862 (40)
HLP (average)												0.8788 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9556 (42)
Average daily hot water use (litres/day)												104.3955 (43)
Daily hot water use	114.8351	110.6593	106.4835	102.3076	98.1318	93.9560	93.9560	98.1318	102.3076	106.4835	110.6593	114.8351 (44)
Energy conte	170.2971	148.9430	153.6958	133.9957	128.5721	110.9479	102.8096	117.9755	119.3845	139.1311	151.8725	164.9237 (45)
Energy content (annual)												Total = Sum(45)m = 1642.5485 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												

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	0.0000	0.0000	(56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Heat gains from water heating, kWh/month	36.1881	31.6504	32.6604	28.4741	27.3216	23.5764	21.8470	25.0698	25.3692	29.5654	32.2729	35.0463			(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	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.0387	29.3446	23.8647	18.0671	13.5054	11.4018	12.3200	16.0141	21.4940	27.2916	31.8533	33.9569	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	336.2492	339.7384	330.9457	312.2271	288.5982	266.3903	251.5541	248.0649	256.8576	275.5763	299.2052	321.4130	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	(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)	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	(71)
Water heating gains (Table 5)	48.6400	47.0988	43.8983	39.5473	36.7225	32.7451	29.3643	33.6960	35.2350	39.7384	44.8235	47.1052	(72)
Total internal gains	485.2619	483.5159	466.0428	437.1756	406.1601	377.8712	360.5725	365.1090	380.9207	409.9403	443.2160	469.8092	(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
North	5.3500	10.6334	0.5400	0.8000	0.7700	17.0311 (74)
East	2.7200	19.6403	0.5400	0.8000	0.7700	15.9931 (76)
South	6.6000	46.7521	0.5400	0.8000	0.7700	92.3765 (78)
East	3.0350	25.9287	0.5000	0.7000	1.0000	24.7885 (82)

Solar gains	150.1893	264.7172	384.0397	509.5634	599.4387	607.1628	580.3925	511.8675	427.4722	298.6291	181.5539	127.4322	(83)
Total gains	635.4512	748.2331	850.0825	946.7390	1005.5988	985.0340	940.9650	876.9765	808.3929	708.5694	624.7699	597.2414	(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, n1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.9721	31.0671	31.1607	31.6081	31.6933	32.0958	32.0958	32.1714	31.9395	31.6933	31.5215	31.3439	
alpha	3.0648	3.0711	3.0774	3.1072	3.1129	3.1397	3.1397	3.1448	3.1293	3.1129	3.1014	3.0896	
util living area	0.9884	0.9800	0.9636	0.9263	0.8534	0.7289	0.5905	0.6391	0.8281	0.9467	0.9817	0.9904 (86)	
MIT	18.8130	19.0501	19.4386	19.9522	20.4188	20.7655	20.9133	20.8866	20.6162	20.0041	19.3199	18.7780 (87)	
Th 2	20.1702	20.1725	20.1748	20.1855	20.1876	20.1970	20.1970	20.1987	20.1933	20.1876	20.1835	20.1792 (88)	
util rest of house	0.9866	0.9771	0.9579	0.9138	0.8260	0.6739	0.5051	0.5568	0.7863	0.9353	0.9785	0.9889 (89)	
MIT 2	18.1276	18.3649	18.7520	19.2647	19.7139	20.0350	20.1515	20.1357	19.9078	19.3226	18.6427	18.0993 (90)	
Living area fraction	fLA = Living area / (4) =												
MIT	18.3413	18.5786	18.9661	19.4791	19.9337	20.2628	20.3890	20.3698	20.1287	19.5351	18.8539	18.3109 (92)	
Temperature adjustment	0.0000												
adjusted MIT	18.3413	18.5786	18.9661	19.4791	19.9337	20.2628	20.3890	20.3698	20.1287	19.5351	18.8539	18.3109 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9814	0.9695	0.9472	0.9007	0.8163	0.6788	0.5268	0.5757	0.7825	0.9238	0.9715	0.9844 (94)
Useful gains	623.6412	725.4126	805.2166	852.7126	820.8340	668.6264	495.6706	504.8537	632.5905	654.5907	606.9533	587.9500 (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	2075.8583	2016.0469	1831.8198	1532.5335	1189.5656	807.8719	540.5522	565.0195	864.2789	1290.8969	1707.3949	2061.3996 (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	1080.4496	867.3063	763.7927	489.4710	274.3363	0.0000	0.0000	0.0000	0.0000	473.4117	792.3179	1096.2465 (98)
Space heating												5837.3321 (98)
Space heating per m2												(98) / (4) = 35.4121 (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	1341.0356	1055.7089	1081.6918	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7328	0.8052	0.7766	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	982.7137	850.0864	839.9900	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1255.2337	1202.1899	1134.6747	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	196.2145	261.9651	219.2454	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													677.4249 (104)
Cooled fraction													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	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	49.0536	65.4913	54.8113	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													169.3562 (107)
Space cooling per m2													1.0274 (108)
Energy for space heating													35.4121 (99)
Energy for space cooling													1.0274 (108)
Total													36.4395 (109)
Dwelling Fabric Energy Efficiency (DFEE)													36.4 (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	164.8400 (1b)	x 2.6200 (2b)	= 431.8808 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	164.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 431.8808 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.0926 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3426 (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) =	0.3169 (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	0.4041	0.3962	0.3882	0.3486	0.3407	0.3011	0.3011	0.2932	0.3169	0.3407	0.3565	0.3724 (22b)
Effective ac	0.5816	0.5785	0.5754	0.5608	0.5580	0.5453	0.5453	0.5430	0.5502	0.5580	0.5636	0.5693 (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)			14.6700	1.3258	19.4489		(27)
TER Room Window (Uw = 1.70)			3.0300	1.5918	4.8390		(27a)
External Wall -Type 4	80.7990	13.0500	67.7490	0.1800	12.1948		(29a)
Stud Wall	19.2200		19.2200	0.1800	3.4596		(29a)
Dormer Wall	4.0600	1.6200	2.4400	0.1800	0.4392		(29a)
Roof Joist	51.5000		51.5000	0.1300	6.6950		(30)
Dormer Pitched Roof	2.9100		2.9100	0.1300	0.3783		(30)
Roof Rafter	31.4300	3.0350	28.3950	0.1300	3.6914		(30)
Total net area of external elements Aum(A, m ²)			189.9240				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.1461		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.0122 (36)
 Total fabric heat loss (33) + (36) = 62.1583 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	82.8955	82.4437	82.0008	79.9207	79.5315	77.7198	77.7198	77.3843	78.4177	79.5315	80.3188	81.1419 (38)
Heat transfer coeff	145.0538	144.6020	144.1591	142.0790	141.6898	139.8781	139.8781	139.5426	140.5760	141.6898	142.4771	143.3002 (39)
Average = Sum(39)m / 12 =												142.0771 (39)
HLP	0.8800	0.8772	0.8745	0.8619	0.8596	0.8486	0.8486	0.8465	0.8528	0.8596	0.8643	0.8693 (40)
HLP (average)												0.8619 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9556 (42)
Average daily hot water use (litres/day)												104.3955 (43)
Daily hot water use	114.8351	110.6593	106.4835	102.3076	98.1318	93.9560	93.9560	98.1318	102.3076	106.4835	110.6593	114.8351 (44)
Energy conte	170.2971	148.9430	153.6958	133.9957	128.5721	110.9479	102.8096	117.9755	119.3845	139.1311	151.8725	164.9237 (45)
Energy content (annual)												Total = Sum(45)m = 1642.5485 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												

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	0.0000	0.0000	0.0000	(56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Heat gains from water heating, kWh/month	36.1881	31.6504	32.6604	28.4741	27.3216	23.5764	21.8470	25.0698	25.3692	29.5654	32.2729	35.0463			(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	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	147.7801	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.8370	30.0537	24.4413	18.5036	13.8317	11.6773	12.6177	16.4010	22.0134	27.9510	32.6230	34.7774	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	336.2492	339.7384	330.9457	312.2271	288.5982	266.3903	251.5541	248.0649	256.8576	275.5763	299.2052	321.4130	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	37.7780	(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)	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	(71)
Water heating gains (Table 5)	48.6400	47.0988	43.8983	39.5473	36.7225	32.7451	29.3643	33.6960	35.2350	39.7384	44.8235	47.1052	(72)
Total internal gains	486.0602	484.2249	466.6194	437.6121	406.4864	378.1467	360.8702	365.4959	381.4400	410.5997	443.9857	470.6297	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	5.3500	10.6334	0.6300	0.7000	0.7700	17.3859	(74)
East	2.7200	19.6403	0.6300	0.7000	0.7700	16.3263	(76)
South	6.6000	46.7521	0.6300	0.7000	0.7700	94.3011	(78)
East	3.0350	25.9287	0.6300	0.7000	1.0000	31.2335	(82)

Solar gains	159.2468	282.0937	412.2490	550.7386	650.3625	659.5978	630.1806	554.2500	460.2320	319.1008	192.7754	134.9327	(83)
Total gains	645.3070	766.3186	878.8683	988.3507	1056.8490	1037.7445	991.0507	919.7459	841.6721	729.7005	636.7611	605.5624	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	0.9998	0.9994	0.9975	0.9873	0.9398	0.7943	0.6098	0.6758	0.9184	0.9943	0.9995	0.9999	(86)
MIT	19.9351	20.0634	20.2720	20.5530	20.8048	20.9572	20.9933	20.9877	20.8814	20.5500	20.1922	19.9180	(87)
Th 2	20.1846	20.1869	20.1892	20.2000	20.2020	20.2114	20.2114	20.2132	20.2078	20.2020	20.1979	20.1936	(88)
util rest of house	0.9998	0.9992	0.9966	0.9820	0.9142	0.7217	0.5065	0.5713	0.8739	0.9912	0.9993	0.9998	(89)
MIT 2	19.1905	19.3207	19.5308	19.8182	20.0585	20.1897	20.2095	20.2092	20.1336	19.8187	19.4588	19.1811	(90)
Living area fraction	19.4227	19.5523	19.7620	20.0473	20.2912	20.4290	20.4539	20.4520	20.3668	20.0467	19.6875	19.4109	(92)
MIT	19.4227	19.5523	19.7620	20.0473	20.2912	20.4290	20.4539	20.4520	20.3668	20.0467	19.6875	19.4109	(93)
Temperature adjustment													
adjusted MIT	19.4227	19.5523	19.7620	20.0473	20.2912	20.4290	20.4539	20.4520	20.3668	20.0467	19.6875	19.4109	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	645.0925	765.4924	875.2895	969.3432	969.6671	771.2199	534.2005	555.8079	744.2852	722.7281	636.1919	605.4298	(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	2193.5992	2118.7466	1911.8314	1583.8038	1217.2908	815.3557	539.0772	565.4213	880.9613	1338.5053	1793.4280	2179.7198	(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	1152.0890	909.3868	771.1872	442.4116	184.2320	0.0000	0.0000	0.0000	0.0000	458.1383	833.2100	1171.2717	(98)
Space heating													
Space heating per m2													(98) / (4) = 35.9253 (99)

8c. Space cooling requirement

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1314.8543	1035.0980	1060.5239	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8642	0.9335	0.9074	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1136.3484	966.3102	962.3608	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1309.9079	1254.2092	1179.3584	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	124.9629	214.1968	161.4462	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													500.6059 (104)
Cooled fraction									$fC = \text{cooled area} / (4) =$				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	31.2407	53.5492	40.3615	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													125.1515 (107)
Space cooling per m2													0.7592 (108)
Energy for space heating													35.9253 (99)
Energy for space cooling													0.7592 (108)
Total													36.6845 (109)
Target Fabric Energy Efficiency (TFEE)													42.2 (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	164.8400 (1b)	x 2.6200 (2b)	= 431.8808 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	164.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 431.8808 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				0 * 10 =	0.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
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	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												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												63.7000 (23c)
Effective ac	0.4417	0.4301	0.4359	0.4128	0.4128	0.3954	0.3954	0.3781	0.3954	0.4070	0.4012	0.4185 (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 Dormer Window (Uw = 1.40)			14.6700	1.3258	19.4489		(27)
E Rooflight (Uw = 1.30)			3.0300	1.2357	3.7567		(27a)
External Wall -Type 4	80.7990	13.0500	67.7490	0.1900	12.8723		(29a)
Stud Wall	19.2200		19.2200	0.1080	2.0758		(29a)
Dormer Wall	4.0600	1.6200	2.4400	0.1700	0.4148		(29a)
Roof Joist	51.5000		51.5000	0.1500	7.7250		(30)
Dormer Pitched Roof	2.9100		2.9100	0.1500	0.4365		(30)
Roof Rafter	31.4300	3.0350	28.3950	0.1500	4.2593		(30)
Total net area of external elements Aum(A, m ²)			189.9240				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	50.9891		(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)							13.9544 (36)
Total fabric heat loss						(33) + (36) =	64.9435 (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	62.9451	61.2972	62.1212	58.8254	58.8254	56.3536	56.3536	53.8817	56.3536	58.0015	57.1775	59.6494 (38)
Average = Sum(39)m / 12 =	127.8887	126.2408	127.0647	123.7689	123.7689	121.2971	121.2971	118.8252	121.2971	122.9450	122.1210	124.5929 (39)
HLP	0.7758	0.7658	0.7708	0.7508	0.7508	0.7358	0.7358	0.7209	0.7358	0.7458	0.7408	0.7558 (40)
HLP (average)												0.7488 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9556 (42)
Average daily hot water use (litres/day)												104.3955 (43)
Daily hot water use	114.8351	110.6593	106.4835	102.3076	98.1318	93.9560	93.9560	98.1318	102.3076	106.4835	110.6593	114.8351 (44)
Energy conte	170.2971	148.9430	153.6958	133.9957	128.5721	110.9479	102.8096	117.9755	119.3845	139.1311	151.8725	164.9237 (45)
Energy content (annual)										Total = Sum(45)m =		1642.5485 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.5446	22.3414	23.0544	20.0994	19.2858	16.6422	15.4214	17.6963	17.9077	20.8697	22.7809	24.7386 (46)
Water storage loss:												
Store volume												
a) If manufacturer declared loss factor is known (kWh/day):												
Temperature factor from Table 2b												
Enter (49) or (54) in (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	209.0595	183.9542	192.4582	171.5077	167.3345	148.4599	141.5720	156.7379	156.8965	177.8935	189.3845	203.6861 (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	209.0595	183.9542	192.4582	171.5077	167.3345	148.4599	141.5720	156.7379	156.8965	177.8935	189.3845	203.6861 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	87.6337	77.5325	82.1138	74.5632	73.7601	66.8998	65.1941	70.2368	69.7049	77.2710	80.5072	85.8470 (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	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.5967	73.3616	59.6617	45.1677	33.7634	28.5045	30.8001	40.0351	53.7351	68.2290	79.6334	84.8923 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	501.8645	507.0723	493.9488	466.0106	430.7436	397.5975	375.4539	370.2461	383.3696	411.3078	446.5749	479.7209 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892 (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)	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241 (71)
Water heating gains (Table 5)	117.7873	115.3757	110.3680	103.5600	99.1400	92.9164	87.6265	94.4043	96.8124	103.8589	111.8156	115.3858 (72)
Total internal gains	817.0497	810.6109	778.7798	729.5395	678.4482	633.8196	608.6818	619.4868	648.7183	698.1970	752.8251	794.8003 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
North	5.3500	11.9814	0.5400	0.8000	0.7700	19.1902 (74)						
East	2.7200	22.3313	0.5400	0.8000	0.7700	18.1845 (76)						
South	6.6000	50.9848	0.5400	0.8000	0.7700	100.7400 (78)						
East	3.0350	29.6355	0.5000	0.7000	1.0000	28.3323 (82)						
Solar gains	166.4469	264.3708	384.0277	525.6355	600.7692	652.1259	616.2702	551.0512	459.5152	318.7742	200.9139	139.8248 (83)
Total gains	983.4966	1074.9818	1162.8075	1255.1750	1279.2174	1285.9455	1224.9520	1170.5380	1108.2335	1016.9712	953.7389	934.6250 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	0.9562	0.9384	0.8987	0.8161	0.6793	0.4692	0.3130	0.3400	0.5963	0.8309	0.9295	0.9610 (86)
MIT	19.5912	19.7990	20.1319	20.5293	20.8165	20.9654	20.9941	20.9924	20.9153	20.5774	20.0684	19.5939 (87)
Th 2	20.2743	20.2830	20.2787	20.2961	20.2961	20.3093	20.3093	20.3225	20.3093	20.3005	20.3049	20.2918 (88)
util rest of house	0.9506	0.9307	0.8856	0.7928	0.6394	0.4130	0.2471	0.2743	0.5416	0.8045	0.9194	0.9560 (89)
MIT 2	18.3700	18.6746	19.1468	19.7134	20.0937	20.2798	20.3061	20.3180	20.2282	19.7908	19.0796	18.3859 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.7508	19.0252	19.4540	19.9678	20.3191	20.4936	20.5206	20.5283	20.4424	20.0361	19.3879	18.7625 (92)
Temperature adjustment												
adjusted MIT	18.7508	19.0252	19.4540	19.9678	20.3191	20.4936	20.5206	20.5283	20.4424	20.0361	19.3879	18.7625 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	920.1378	982.5418	1009.4361	980.1534	819.6490	550.7808	327.6032	344.7211	612.3785	806.8303	861.5257	880.5070 (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	1784.1507	1720.0542	1544.3453	1270.8311	930.6279	569.3207	330.0036	347.9545	660.1495	1061.7628	1427.3438	1739.6332 (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	642.8256	495.6083	397.9725	209.2880	82.5683	0.0000	0.0000	0.0000	0.0000	189.6698	407.3890	639.1899 (98)
Space heating												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

RHI space heating demand

3065 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	164.8400 (1b)	x 2.6200 (2b)	= 431.8808 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	164.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 431.8808 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				0 * 10 =	0.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
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) =												63.7000 (23c)
Effective ac	0.4763	0.4706	0.4648	0.4359	0.4301	0.4012	0.4012	0.3954	0.4128	0.4301	0.4417	0.4532 (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 Dormer Window (Uw = 1.40)			14.6700	1.3258	19.4489		(27)
E Rooflight (Uw = 1.30)			3.0300	1.2357	3.7567		(27a)
External Wall -Type 4	80.7990	13.0500	67.7490	0.1900	12.8723		(29a)
Stud Wall	19.2200		19.2200	0.1080	2.0758		(29a)
Dormer Wall	4.0600	1.6200	2.4400	0.1700	0.4148		(29a)
Roof Joist	51.5000		51.5000	0.1500	7.7250		(30)
Dormer Pitched Roof	2.9100		2.9100	0.1500	0.4365		(30)
Roof Rafter	31.4300	3.0350	28.3950	0.1500	4.2593		(30)
Total net area of external elements Aum(A, m2)			189.9240				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	50.9891		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9544 (36)
 Total fabric heat loss (33) + (36) = 64.9435 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	67.8888	67.0649	66.2409	62.1212	61.2972	57.1775	57.1775	56.3536	58.8254	61.2972	62.9451	64.5930 (38)
Heat transfer coeff	132.8324	132.0084	131.1845	127.0647	126.2408	122.1210	122.1210	121.2971	123.7689	126.2408	127.8887	129.5366 (39)
Average = Sum(39)m / 12 =												126.8587 (39)
HLP	0.8058	0.8008	0.7958	0.7708	0.7658	0.7408	0.7408	0.7358	0.7508	0.7658	0.7758	0.7858 (40)
HLP (average)												0.7696 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9556 (42)
Average daily hot water use (litres/day)												104.3955 (43)
Daily hot water use	114.8351	110.6593	106.4835	102.3076	98.1318	93.9560	93.9560	98.1318	102.3076	106.4835	110.6593	114.8351 (44)
Energy conte	170.2971	148.9430	153.6958	133.9957	128.5721	110.9479	102.8096	117.9755	119.3845	139.1311	151.8725	164.9237 (45)
Energy content (annual)										Total = Sum(45)m =		1642.5485 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.5446	22.3414	23.0544	20.0994	19.2858	16.6422	15.4214	17.6963	17.9077	20.8697	22.7809	24.7386 (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	209.0595	183.9542	192.4582	171.5077	167.3345	148.4599	141.5720	156.7379	156.8965	177.8935	189.3845	203.6861 (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	209.0595	183.9542	192.4582	171.5077	167.3345	148.4599	141.5720	156.7379	156.8965	177.8935	189.3845	203.6861 (64)
Heat gains from water heating, kWh/month	87.6337	77.5325	82.1138	74.5632	73.7601	66.8998	65.1941	70.2368	69.7049	77.2710	80.5072	85.8470 (65)
Total per year (kWh/year) = Sum(64)m = 2098.9445 (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	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.5967	73.3616	59.6617	45.1677	33.7634	28.5045	30.8001	40.0351	53.7351	68.2290	79.6334	84.8923 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	501.8645	507.0723	493.9488	466.0106	430.7436	397.5975	375.4539	370.2461	383.3696	411.3078	446.5749	479.7209 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892 (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)	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241 (71)
Water heating gains (Table 5)	117.7873	115.3757	110.3680	103.5600	99.1400	92.9164	87.6265	94.4043	96.8124	103.8589	111.8156	115.3858 (72)
Total internal gains	817.0497	810.6109	778.7798	729.5395	678.4482	633.8196	608.6818	619.4868	648.7183	698.1970	752.8251	794.8003 (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						
North	5.3500	10.6334	0.5400	0.8000	0.7700	17.0311 (74)						
East	2.7200	19.6403	0.5400	0.8000	0.7700	15.9931 (76)						
South	6.6000	46.7521	0.5400	0.8000	0.7700	92.3765 (78)						
East	3.0350	25.9287	0.5000	0.7000	1.0000	24.7885 (82)						
Solar gains	150.1893	264.7172	384.0397	509.5634	599.4387	607.1628	580.3925	511.8675	427.4722	298.6291	181.5539	127.4322 (83)
Total gains	967.2390	1075.3282	1162.8195	1239.1030	1277.8869	1240.9824	1189.0743	1131.3543	1076.1905	996.8261	934.3789	922.2325 (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	34.4712	34.6863	34.9042	36.0359	36.2711	37.4947	37.4947	37.7494	36.9955	36.2711	35.8037	35.3482
alpha	3.2981	3.3124	3.3269	3.4024	3.4181	3.4996	3.4996	3.5166	3.4664	3.4181	3.3869	3.3565
util living area	0.9624	0.9454	0.9142	0.8481	0.7398	0.5770	0.4361	0.4715	0.6794	0.8666	0.9429	0.9669 (86)
MIT	19.4158	19.6329	19.9633	20.3929	20.7142	20.9172	20.9763	20.9689	20.8455	20.4385	19.8835	19.4068 (87)
Th 2	20.2483	20.2526	20.2569	20.2787	20.2830	20.3049	20.3049	20.3093	20.2961	20.2830	20.2743	20.2656 (88)
util rest of house	0.9576	0.9385	0.9031	0.8284	0.7061	0.5261	0.3724	0.4075	0.6315	0.8453	0.9346	0.9627 (89)
MIT 2	18.0995	18.4151	18.8917	19.5124	19.9513	20.2239	20.2870	20.2848	20.1353	19.5876	18.7941	18.0979 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.5099	18.7948	19.2258	19.7869	20.1892	20.4401	20.5019	20.4981	20.3567	19.8529	19.1338	18.5060 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.5099	18.7948	19.2258	19.7869	20.1892	20.4401	20.5019	20.4981	20.3567	19.8529	19.1338	18.5060 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9430	0.9216	0.8848	0.8134	0.7014	0.5364	0.3908	0.4254	0.6358	0.8307	0.9184	0.9493 (94)
Useful gains	912.1346	991.0293	1028.8523	1007.8766	896.3354	665.6064	464.6795	481.2491	684.2694	828.0487	858.1049	875.4748 (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	1887.5376	1834.2366	1669.4316	1383.3448	1071.6794	713.1991	476.5099	497.0913	774.3900	1168.0973	1538.9849	1853.1526 (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	725.6998	566.6353	476.5910	270.3371	130.4559	0.0000	0.0000	0.0000	0.0000	252.9961	490.2336	727.3923 (98)
Space heating												3640.3412 (98)
Space heating per m2												(98) / (4) = 22.0841 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	1147.9378	903.6957	921.8579	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8275	0.8862	0.8672	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	949.8690	800.8565	799.3919	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1315.4051	1260.4521	1195.3830	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	263.1859	341.9391	294.6174	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												899.7424 (104)
Intermittency factor (Table 10b)												0.6578 (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	43.2802	56.2310	48.4490	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												147.9603 (107)
												0.8976 (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	3640.3412 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	3822.3582 (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	2098.9445 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2203.8917 (310a)
Electricity used for heat distribution	60.2625 (313)
Cooling System Energy Efficiency Ratio	6.7500 (314)
Space cooling (if there is a fixed cooling system, if not enter 0)	21.9200 (315)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3160)	
mechanical ventilation fans (SFP = 1.3160)	693.3933 (330a)
Total electricity for the above, kWh/year	693.3933 (331)
Electricity for lighting (calculated in Appendix L)	583.4731 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 1.50 * 951 * 0.80) =	-912.5914 (333)
Total delivered energy for all uses	6412.4450 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	3822.3582	4.2400	162.0680 (340a)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2203.8917	4.2400	93.4450 (342a)
Space cooling	21.9200	13.1900	2.8913 (348)
Mechanical ventilation fans	693.3933	13.1900	91.4586 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for lighting	583.4731	13.1900	76.9601 (350)
Additional standing charges			120.0000 (351)
Energy saving/generation technologies			
PV Unit	0.0000	0.0000	0.0000 (352)
Total energy cost			546.8229 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.4200 (356)
Energy cost factor (ECF)	1.0945 (357)
SAP value	84.7320
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	2008.7500	0.5190	1042.5412 (367)

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Electrical energy for heat distribution	60.2625	0.5190	31.2762 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1073.8175 (373)
Space and water heating			1073.8175 (376)
Space cooling	21.9200	0.5190	11.3765 (377)
Pumps and fans	693.3933	0.5190	359.8711 (378)
Energy for lighting	583.4731	0.5190	302.8226 (379)
Energy saving/generation technologies			
PV Unit	-912.5914	0.5190	-473.6349 (380)
Total kg/year			1274.2527 (383)
CO2 emissions per m2			7.7300 (384)
EI value			91.8629 (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	164.8400 (1b)	x 2.6200 (2b)	= 431.8808 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	164.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 431.8808 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				0 * 10 =	0.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
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	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												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												63.7000 (23c)
Effective ac	0.4417	0.4301	0.4359	0.4128	0.4128	0.3954	0.3954	0.3781	0.3954	0.4070	0.4012	0.4185 (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 Dormer Window (Uw = 1.40)			14.6700	1.3258	19.4489		(27)
E Rooflight (Uw = 1.30)			3.0300	1.2357	3.7567		(27a)
External Wall -Type 4	80.7990	13.0500	67.7490	0.1900	12.8723		(29a)
Stud Wall	19.2200		19.2200	0.1080	2.0758		(29a)
Dormer Wall	4.0600	1.6200	2.4400	0.1700	0.4148		(29a)
Roof Joist	51.5000		51.5000	0.1500	7.7250		(30)
Dormer Pitched Roof	2.9100		2.9100	0.1500	0.4365		(30)
Roof Rafter	31.4300	3.0350	28.3950	0.1500	4.2593		(30)
Total net area of external elements Aum(A, m ²)			189.9240				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	50.9891		(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)							13.9544 (36)
Total fabric heat loss						(33) + (36) =	64.9435 (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	127.8887	126.2408	127.0647	123.7689	123.7689	121.2971	121.2971	118.8252	121.2971	122.9450	122.1210	124.5929 (39)
Average = Sum(39)m / 12 =												123.4256 (39)
HLP	0.7758	0.7658	0.7708	0.7508	0.7508	0.7358	0.7358	0.7209	0.7358	0.7458	0.7408	0.7558 (40)
HLP (average)												0.7488 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.9556 (42)
Average daily hot water use (litres/day)												104.3955 (43)
Daily hot water use	114.8351	110.6593	106.4835	102.3076	98.1318	93.9560	93.9560	98.1318	102.3076	106.4835	110.6593	114.8351 (44)
Energy conte	170.2971	148.9430	153.6958	133.9957	128.5721	110.9479	102.8096	117.9755	119.3845	139.1311	151.8725	164.9237 (45)
Energy content (annual)										Total = Sum(45)m =		1642.5485 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	25.5446	22.3414	23.0544	20.0994	19.2858	16.6422	15.4214	17.6963	17.9077	20.8697	22.7809	24.7386 (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	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	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												
209.0595	183.9542	192.4582	171.5077	167.3345	148.4599	141.5720	156.7379	156.8965	177.8935	189.3845	203.6861	203.6861 (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												
209.0595	183.9542	192.4582	171.5077	167.3345	148.4599	141.5720	156.7379	156.8965	177.8935	189.3845	203.6861	203.6861 (64)
Heat gains from water heating, kWh/month												
87.6337	77.5325	82.1138	74.5632	73.7601	66.8998	65.1941	70.2368	69.7049	77.2710	80.5072	85.8470	85.8470 (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	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361	177.3361 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
82.5967	73.3616	59.6617	45.1677	33.7634	28.5045	30.8001	40.0351	53.7351	68.2290	79.6334	84.8923	84.8923 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
501.8645	507.0723	493.9488	466.0106	430.7436	397.5975	375.4539	370.2461	383.3696	411.3078	446.5749	479.7209	479.7209 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892	55.6892 (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)												
-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241	-118.2241 (71)
Water heating gains (Table 5)												
117.7873	115.3757	110.3680	103.5600	99.1400	92.9164	87.6265	94.4043	96.8124	103.8589	111.8156	115.3858	115.3858 (72)
Total internal gains	817.0497	810.6109	778.7798	729.5395	678.4482	633.8196	608.6818	619.4868	648.7183	698.1970	752.8251	794.8003 (73)

6. Solar gains

[Jan]	Area	Solar flux	Specific data	FF	Access	Gains						
	m ²	Table 6a	g	Specific data	factor	W						
		W/m ²	or Table 6b	or Table 6c	Table 6d							
North	5.3500	11.9814	0.5400	0.8000	0.7700	19.1902 (74)						
East	2.7200	22.3313	0.5400	0.8000	0.7700	18.1845 (76)						
South	6.6000	50.9848	0.5400	0.8000	0.7700	100.7400 (78)						
East	3.0350	29.6355	0.5000	0.7000	1.0000	28.3323 (82)						
Solar gains	166.4469	264.3708	384.0277	525.6355	600.7692	652.1259	616.2702	551.0512	459.5152	318.7742	200.9139	139.8248 (83)
Total gains	983.4966	1074.9818	1162.8075	1255.1750	1279.2174	1285.9455	1224.9520	1170.5380	1108.2335	1016.9712	953.7389	934.6250 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	35.8037	36.2711	36.0359	36.9955	36.9955	37.7494	37.7494	38.5346	37.7494	37.2434	37.4947	36.7508
alpha	3.3869	3.4181	3.4024	3.4664	3.4664	3.5166	3.5166	3.5690	3.5166	3.4829	3.4996	3.4501
util living area	0.9562	0.9384	0.8987	0.8161	0.6793	0.4692	0.3130	0.3400	0.5963	0.8309	0.9295	0.9610 (86)
MIT	19.5912	19.7990	20.1319	20.5293	20.8165	20.9654	20.9941	20.9924	20.9153	20.5774	20.0684	19.5939 (87)
Th 2	20.2743	20.2830	20.2787	20.2961	20.2961	20.3093	20.3093	20.3225	20.3093	20.3005	20.3049	20.2918 (88)
util rest of house	0.9506	0.9307	0.8856	0.7928	0.6394	0.4130	0.2471	0.2743	0.5416	0.8045	0.9194	0.9560 (89)
MIT 2	18.3700	18.6746	19.1468	19.7134	20.0937	20.2798	20.3061	20.3180	20.2282	19.7908	19.0796	18.3859 (90)
Living area fraction												
MIT	18.7508	19.0252	19.4540	19.9678	20.3191	20.4936	20.5206	20.5283	20.4424	20.0361	19.3879	18.7625 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7508	19.0252	19.4540	19.9678	20.3191	20.4936	20.5206	20.5283	20.4424	20.0361	19.3879	18.7625 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	920.1378	982.5418	1009.4361	980.1534	819.6490	550.7808	327.6032	344.7211	612.3785	806.8303	861.5257	880.5070 (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												
1784.1507	1720.0542	1544.3453	1270.8311	930.6279	569.3207	330.0036	347.9545	660.1495	1061.7628	1427.3438	1739.6332	1739.6332 (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	642.8256	495.6083	397.9725	209.2880	82.5683	0.0000	0.0000	0.0000	0.0000	189.6698	407.3890	639.1899 (98)
Space heating												3064.5113 (98)
Space heating per m ²												(98) / (4) = 18.5908 (99)

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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	994.6361	752.0420	760.4816	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8829	0.9329	0.9242	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	878.1937	701.5737	702.8533	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1365.6451	1300.4910	1239.1320	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	350.9650	445.5945	398.9914	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												1195.5508 (104)
Intermittency factor (Table 10b)												0.6578 (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	57.7153	73.2768	65.6131	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												196.6052 (107)
Space cooling per m2												1.1927 (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	3064.5113 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	3217.7369 (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	2098.9445 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2203.8917 (310a)
Electricity used for heat distribution	54.2163 (313)
Cooling System Energy Efficiency Ratio	6.7500 (314)
Space cooling (if there is a fixed cooling system, if not enter 0)	29.1267 (315)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.3160)	
mechanical ventilation fans (SFP = 1.3160)	693.3933 (330a)
Total electricity for the above, kWh/year	693.3933 (331)
Electricity for lighting (calculated in Appendix L)	583.4731 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 1.50 * 1019 * 0.80) =	-977.9098 (333)
Total delivered energy for all uses	5749.7119 (338)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Heat pump	3217.7369	11.8800	382.2671 (340a)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Heat pump	2203.8917	11.8800	261.8223 (342a)
Space cooling	29.1267	36.8500	10.7332 (348)
Mechanical ventilation fans	693.3933	36.8500	255.5154 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for lighting	583.4731	36.8500	215.0098 (350)
Additional standing charges			104.0000 (351)
Energy saving/generation technologies			
PV Unit	0.0000	0.0000	0.0000 (352)
Total energy cost			1229.3479 (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	1807.2095	0.5190	937.9417 (367)
Electrical energy for heat distribution	54.2163	0.5190	28.1383 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			966.0800 (373)
Space and water heating			966.0800 (376)
Space cooling	29.1267	0.5190	15.1168 (377)
Pumps and fans	693.3933	0.5190	359.8711 (378)
Energy for lighting	583.4731	0.5190	302.8226 (379)
Energy saving/generation technologies			
PV Unit	-977.9098	0.5190	-507.5352 (380)
Total kg/year			1136.3552 (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	1807.2095	3.0700	5548.1333 (367)
Electrical energy for heat distribution	54.2163	3.0700	166.4440 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			5714.5773 (373)
Space and water heating			5714.5773 (376)
Space cooling	29.1267	3.0700	89.4189 (377)
Pumps and fans	693.3933	3.0700	2128.7173 (378)
Energy for lighting	583.4731	3.0700	1791.2625 (379)
Energy saving/generation technologies			
PV Unit	-977.9098	3.0700	-3002.1830 (380)
Primary energy kWh/year			6721.7931 (383)
Primary energy kWh/m2/year			40.7777 (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

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	£481	£481	£0
Community scheme	£748	£748	£0
Space heating	£742	£742	£0
Space cooling	£11	£11	£0
Water heating	£262	£262	£0
Lighting	£215	£215	£0
Total cost of fuels	£1229	£1229	£0
Total cost of uses	£1230	£1230	£0

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Delivered energy	35 kWh/m ²	35 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m ²	7 kg/m ²	7 kg/m ²	0 kg/m ²
Primary energy	41 kWh/m ²	41 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	West
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	855.12 (P1)
Transmission heat loss coefficient	64.94 (37)
Summer heat loss coefficient	920.07 (P2)

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

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North	0.850	0.90	1.000	0.765 (P8)
East	0.850	0.90	1.000	0.765 (P8)
East	1.000	1.00	1.000	1.000 (P8)
South	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
North	5.3500	81.1852	0.5400	0.8000	0.7650	129.1868
East	2.7200	117.5071	0.5400	0.8000	0.7650	95.0650
South	6.6000	112.2060	0.5400	0.8000	0.7650	220.2661
East	3.0350	176.6135	0.5000	0.7000	1.0000	168.8469

total: 613.3649

	Jun	Jul	Aug	
Solar gains	649	613	552	(P3)
Internal gains	634	609	619	
Total summer gains	1283	1222	1171	(P5)

	1.39	1.33	1.27	(P6)
Summer gain/loss ratio				
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 100.0)	1.30	1.30	1.30	
Threshold temperature	18.69	20.53	20.37	(P7)
Likelihood of high internal temperature	Not significant	Slight	Not significant	

Assessment of likelihood of high internal temperature: Slight