

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	BD23 6RR Plot 42			Issued on Date	20/07/2022
Assessment Reference	001	Prop Type Ref	Type E1		
Property	Plot 42, Phase 4, Shires Lane, Embsay, Skipton, BD23 6RR				
SAP Rating	89 B	DER	11.65	TER	16.48
Environmental	89 B	% DER<TER	29.29		
CO₂ Emissions (t/year)	1.92	DFEE	56.18	TFEE	59.97
General Requirements Compliance	Pass	% DFEE<TFEE	6.32		
Assessor Details	Mr. Jake Eaton, Jake Eaton, Tel: 01400283471, jake@eratech.co.uk			Assessor ID	P711-0001
Client					

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

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DWELLING AS DESIGNED

Detached House, total floor area 163 m²

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

1a TER and DER

Fuel for main heating: Mains gas
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.48 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.65 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 60.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 56.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Floor	0.14 (max. 0.25)	0.19 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.17 (max. 0.35)	OK
Openings	1.62 (max. 2.00)	1.80 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

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

Data from manufacturer

rated a

Combi boiler

Efficiency: 89%

Minimum: 88%

OK

Secondary heating system:

Room heaters - Wood Logs

Closed room heater

Efficiency: 65%

Minimum: 65%

OK

5 Cylinder insulation

Hot water storage: No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

Minimum 75%

OK

8 Mechanical ventilation

Continuous extract system (decentralised)

Specific fan power: 0.1600 0.1600

Maximum 0.7

OK

9 Summertime temperature

Overheating risk (North East England): Not significant

OK

Based on:

Overshading: Average

Windows facing North: 4.48 m², No overhang

Windows facing East: 10.37 m², No overhang

Windows facing South: 6.04 m², No overhang

Windows facing West: 6.70 m², No overhang

Air change rate: 2.50 ach

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

10 Key features

Secondary heating (wood logs)

Secondary heating fuel: wood logs

Photovoltaic array: 2.00 kW

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	77.0400 (1b)	x 2.5000 (2b)	= 192.6000 (1b) - (3b)
First floor	86.2800 (1c)	x 2.7200 (2c)	= 234.6816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 427.2816 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					0 * 10 = 0.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.2500 (18)							
Number of sides sheltered					2 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2125 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5209	0.5156	0.5103	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Opening Type 1			4.0300	1.8000	7.2540		(26)					
Opening Type 2 (Uw = 1.60)			27.5900	1.5038	41.4887		(27)					
Opening Type 3 (Uw = 1.60)			0.8600	1.5038	1.2932		(27a)					
Heat Loss Floor 1			77.0400	0.1300	10.0152	75.0000	5778.0000 (28a)					
Heat Loss Floor 2			22.2000	0.1886	4.1872	20.0000	444.0000 (28b)					
External Wall 1	197.7000	31.6200	166.0800	0.1800	29.8944	110.0000	18268.8000 (29a)					
External Roof 2	86.2800		86.2800	0.1300	11.2164	9.0000	776.5200 (30)					
External Roof 2	13.5500	0.8600	12.6900	0.1700	2.1573	0.0000	0.0000 (30)					
Total net area of external elements Aum(A, m2)			396.7700				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 107.5064		(33)					
Internal Wall 1			70.2300			75.0000	5267.2500 (32c)					
Internal Wall 2			104.2100			9.0000	937.8900 (32c)					
Internal Floor 1			64.0800			18.0000	1153.4400 (32d)					
Internal Ceiling 1			64.0800			18.0000	1153.4400 (32e)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	33779.3400 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							206.8292 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							27.6441 (36)					
Total fabric heat loss						(33) + (36) =	135.1505 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 73.4537	Feb 72.7046	Mar 71.9556	Apr 70.5015	May 70.5015	Jun 70.5015	Jul 70.5015	Aug 70.5015	Sep 70.5015	Oct 70.5015	Nov 70.5015	Dec 70.5015 (38)
Heat transfer coeff	208.6042	207.8552	207.1061	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520 (39)
Average = Sum(39)m / 12 =												206.2028 (39)
HLP	Jan 1.2773	Feb 1.2727	Mar 1.2681	Apr 1.2592	May 1.2592	Jun 1.2592	Jul 1.2592	Aug 1.2592	Sep 1.2592	Oct 1.2592	Nov 1.2592	Dec 1.2592 (40)
HLP (average)												1.2626 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9535 (42)
Average daily hot water use (litres/day)	104.3461 (43)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.7807	110.6068	106.4330	102.2592	98.0853	93.9115	93.9115	98.0853	102.2592	106.4330	110.6068	114.7807 (44)
Energy conte	170.2164	148.8724	153.6230	133.9322	128.5112	110.8954	102.7609	117.9196	119.3279	139.0652	151.8005	164.8455 (45)
Energy content (annual)	Total = Sum(45)m = 1641.7701 (45)											
Distribution loss (46)m = 0.15 x (45)m	25.5325	22.3309	23.0434	20.0898	19.2767	16.6343	15.4141	17.6879	17.8992	20.8598	22.7701	24.7268 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.9832	46.3125	47.8563	49.9832	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	221.1753	194.8998	204.5819	183.2473	178.4944	157.2079	150.6171	167.9028	168.6430	190.0241	201.1156	215.8044 (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	221.1753	194.8998	204.5819	183.2473	178.4944	157.2079	150.6171	167.9028	168.6430	190.0241	201.1156	215.8044 (64)
Heat gains from water heating, kWh/month	69.3367	61.0069	63.8194	56.8612	55.2258	48.4508	46.1320	51.7041	52.0053	58.9789	62.8024	67.5509 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 2233.7135 (64)												

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts												
(66)m	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6075	27.1853	22.1086	16.7376	12.5116	10.5628	11.4135	14.8357	19.9124	25.2834	29.5094	31.4582 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	334.6728	338.1456	329.3942	310.7633	287.2451	265.1414	250.3748	246.9019	255.6534	274.2843	297.8024	319.9061 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408 (71)
Water heating gains (Table 5)	93.1945	90.7841	85.7787	78.9739	74.2282	67.2928	62.0054	69.4947	72.2296	79.2727	87.2256	90.7942 (72)
Total internal gains	528.7776	526.4178	507.5842	476.7776	444.2877	413.2998	394.0965	401.5351	418.0982	449.1431	484.8402	512.4613 (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	4.4800	10.6334	0.7600	0.7000	0.7700	17.5628 (74)						
East	10.3700	19.6403	0.7600	0.7000	0.7700	75.0881 (76)						
South	6.0400	46.7521	0.7600	0.7000	0.7700	104.1076 (78)						
West	6.7000	19.6403	0.7600	0.7000	0.7700	48.5140 (80)						
East	0.8600	26.6635	0.7600	0.7000	1.0000	10.9792 (82)						
Solar gains	256.2517	468.2327	711.4577	978.1360	1167.7976	1186.8475	1133.1199	990.2418	805.0781	537.8917	313.0384	215.1686 (83)
Total gains	785.0293	994.6506	1219.0420	1454.9136	1612.0853	1600.1473	1527.2164	1391.7768	1223.1762	987.0348	797.8786	727.6299 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	44.9806	45.1427	45.3060	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264
alpha	3.9987	4.0095	4.0204	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418
util living area	0.9980	0.9946	0.9840	0.9491	0.8637	0.7168	0.5611	0.6264	0.8563	0.9759	0.9958	0.9985 (86)
MIT	19.6189	19.7849	20.0538	20.3924	20.6791	20.8504	20.9097	20.8968	20.7517	20.3591	19.9254	19.6010 (87)
Th 2	19.8587	19.8623	19.8659	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729 (88)
util rest of house	0.9974	0.9929	0.9790	0.9323	0.8180	0.6249	0.4316	0.4957	0.7895	0.9651	0.9943	0.9981 (89)
MIT 2	18.0052	18.2500	18.6434	19.1312	19.5160	19.7145	19.7649	19.7575	19.6165	19.0924	18.4639	17.9894 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.4656	18.6880	19.0458	19.4911	19.8479	20.0386	20.0916	20.0826	19.9404	19.4538	18.8809	18.4493 (92)
Temperature adjustment												
adjusted MIT	18.3156	18.5380	18.8958	19.3411	19.6979	19.8886	19.9416	19.9326	19.7904	19.3038	18.7309	18.2993 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9962	0.9902	0.9731	0.9222	0.8096	0.6264	0.4400	0.5033	0.7835	0.9574	0.9921	0.9972 (94)
Useful gains	782.0354	984.9097	1186.2049	1341.7244	1305.1766	1002.2724	671.9389	700.4126	958.4055	945.0124	791.5652	725.5878 (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	2923.7232	2834.7250	2567.2452	2147.2265	1644.7749	1087.6210	687.1981	726.4865	1170.2428	1789.9602	2391.9154	2899.5409 (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	1593.4158	1243.0759	1027.4940	579.9615	252.6611	0.0000	0.0000	0.0000	0.0000	628.6411	1152.2521	1617.4212 (98)

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Space heating
Space heating per m2 (98) / (4) = 8094.9226 (98)
49.5648 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.1000 (201)
Fraction of space heat from main system(s) 0.9000 (202)
Efficiency of main space heating system 1 (in %) 91.4000 (206)
Efficiency of secondary/supplementary heating system, % 65.0000 (208)
Space heating requirement 7970.9303 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1593.4158	1243.0759	1027.4940	579.9615	252.6611	0.0000	0.0000	0.0000	0.0000	628.6411	1152.2521	1617.4212	(98)
Space heating efficiency (main heating system 1)	91.4000	91.4000	91.4000	91.4000	91.4000	0.0000	0.0000	0.0000	0.0000	91.4000	91.4000	91.4000	(210)
Space heating fuel (main heating system)	1569.0090	1224.0353	1011.7555	571.0780	248.7910	0.0000	0.0000	0.0000	0.0000	619.0120	1134.6027	1592.6467	(211)
Water heating requirement	245.1409	191.2424	158.0760	89.2248	38.8709	0.0000	0.0000	0.0000	0.0000	96.7140	177.2696	248.8340	(215)
Water heating requirement	221.1753	194.8998	204.5819	183.2473	178.4944	157.2079	150.6171	167.9028	168.6430	190.0241	201.1156	215.8044	(64)
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	248.5116	218.9885	229.8673	205.8958	200.5555	176.6380	169.2327	188.6548	189.4865	213.5102	225.9726	242.4769	(219)
Water heating fuel used												2509.7904	(219)
Annual totals kWh/year													
Space heating fuel - main system												7970.9303	(211)
Space heating fuel - secondary												1245.3727	(215)

Electricity for pumps and fans:

(MEV)Decentralised, Database: total watage = 10.6720, total flow = 58.0000, SFP = 0.1840
mechanical ventilation fans (SFP = 0.1840) 95.9162 (230a)
central heating pump 30.0000 (230c)
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 170.9162 (231)
Electricity for lighting (calculated in Appendix L) 540.5382 (232)

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

PV Unit 0 (0.80 * 2.00 * 908 * 1.00) = -1452.5668 -1452.5668 (233)
Total delivered energy for all uses 10984.9810 (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	7970.9303	0.2160	1721.7209	(261)
Space heating - secondary	1245.3727	0.0190	23.6621	(263)
Water heating (other fuel)	2509.7904	0.2160	542.1147	(264)
Space and water heating			2287.4978	(265)
Pumps and fans	170.9162	0.5190	88.7055	(267)
Energy for lighting	540.5382	0.5190	280.5393	(268)
Energy saving/generation technologies				
PV Unit	-1452.5668	0.5190	-753.8822	(269)
Total CO2, kg/year			1902.8604	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.6500	(273)

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

	TFA	N	EF	
DER				11.6500 ZC1
Total Floor Area	163.3200			
Assumed number of occupants	2.9535			
CO2 emission factor in Table 12 for electricity displaced from grid			0.5190	
CO2 emissions from appliances, equation (L14)				12.1430 ZC2
CO2 emissions from cooking, equation (L16)				1.1627 ZC3
Total CO2 emissions				24.9557 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				24.9557 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	77.0400 (1b)	2.5000 (2b)	192.6000 (1b) - (3b)
First floor	86.2800 (1c)	2.7200 (2c)	234.6816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 427.2816 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.0936 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3436 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2921 (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	0.3724	0.3651	0.3578	0.3213	0.3140	0.2775	0.2775	0.2702	0.2921	0.3140	0.3286	0.3432 (22b)
	0.5693	0.5666	0.5640	0.5516	0.5493	0.5385	0.5385	0.5365	0.5427	0.5493	0.5540	0.5589 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			4.0300	1.0000	4.0300		(26)
TER Opening Type (Uw = 1.40)			27.5900	1.3258	36.5777		(27)
TER Room Window (Uw = 1.70)			0.8600	1.5918	1.3689		(27a)
Heat Loss Floor 1			77.0400	0.1300	10.0152		(28a)
Heat Loss Floor 2			22.2000	0.1300	2.8860		(28b)
External Wall 1	197.7000	31.6200	166.0800	0.1800	29.8944		(29a)
External Roof 2	86.2800		86.2800	0.1300	11.2164		(30)
External Roof 2	13.5500	0.8600	12.6900	0.1300	1.6497		(30)
Total net area of external elements Aum(A, m ²)			396.7700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		97.6383 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K												250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												17.5673 (36)
Total fabric heat loss												(33) + (36) = 115.2056 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	80.2784	79.8987	79.5266	77.7787	77.4517	75.9293	75.9293	75.6474	76.5157	77.4517	78.1132	78.8049 (38)
Heat transfer coeff	195.4839	195.1043	194.7321	192.9843	192.6572	191.1349	191.1349	190.8530	191.7213	192.6572	193.3188	194.0104 (39)
Average = Sum(39)m / 12 =												192.9827 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1969	1.1946	1.1923	1.1816	1.1796	1.1703	1.1703	1.1686	1.1739	1.1796	1.1837	1.1879 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9535 (42)
Average daily hot water use (litres/day)												104.3461 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.7807	110.6068	106.4330	102.2592	98.0853	93.9115	93.9115	98.0853	102.2592	106.4330	110.6068	114.7807 (44)
Energy conte	170.2164	148.8724	153.6230	133.9322	128.5112	110.8954	102.7609	117.9196	119.3279	139.0652	151.8005	164.8455 (45)
Energy content (annual)												Total = Sum(45)m = 1641.7701 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	25.5325	22.3309	23.0434	20.0898	19.2767	16.6343	15.4141	17.6879	17.8992	20.8598	22.7701	24.7268 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.9832	46.3125	47.8563	49.9832	49.3151	50.9589	49.3151	50.9589	50.9589	(61)
Total heat required for water heating calculated for each month	221.1753	194.8998	204.5819	183.2473	178.4944	157.2079	150.6171	167.9028	168.6430	190.0241	201.1156	215.8044	215.8044	(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	221.1753	194.8998	204.5819	183.2473	178.4944	157.2079	150.6171	167.9028	168.6430	190.0241	201.1156	215.8044	215.8044	(64)
Heat gains from water heating, kWh/month	69.3367	61.0069	63.8194	56.8612	55.2258	48.4508	46.1320	51.7041	52.0053	58.9789	62.8024	67.5509	67.5509	(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	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6075	27.1853	22.1086	16.7376	12.5116	10.5628	11.4135	14.8357	19.9124	25.2834	29.5094	31.4582	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	334.6728	338.1456	329.3942	310.7633	287.2451	265.1414	250.3748	246.9019	255.6534	274.2843	297.8024	319.9061	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	(71)
Water heating gains (Table 5)	93.1945	90.7841	85.7787	78.9739	74.2282	67.2928	62.0054	69.4947	72.2296	79.2727	87.2256	90.7942	(72)
Total internal gains	528.7776	526.4178	507.5842	476.7776	444.2877	413.2998	394.0965	401.5351	418.0982	449.1431	484.8402	512.4613	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W							
North	4.4800	10.6334	0.6300	0.7000	0.7700	14.5587 (74)							
East	10.3700	19.6403	0.6300	0.7000	0.7700	62.2441 (76)							
South	6.0400	46.7521	0.6300	0.7000	0.7700	86.2998 (78)							
West	6.7000	19.6403	0.6300	0.7000	0.7700	40.2155 (80)							
East	0.8600	26.6635	0.6300	0.7000	1.0000	9.1012 (82)							
Solar gains	212.4192	388.1403	589.7610	810.8232	968.0428	983.8341	939.2968	820.8583	667.3674	445.8839	259.4923	178.3635	(83)
Total gains	741.1968	914.5581	1097.3453	1287.6009	1412.3305	1397.1339	1333.3932	1222.3934	1085.4655	895.0270	744.3325	690.8247	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.0184	58.1313	58.2424	58.7699	58.8697	59.3386	59.3386	59.4262	59.1571	58.8697	58.6682	58.4591	
alpha	4.8679	4.8754	4.8828	4.9180	4.9246	4.9559	4.9559	4.9617	4.9438	4.9246	4.9112	4.8973	
util living area	0.9994	0.9983	0.9939	0.9753	0.9132	0.7724	0.6054	0.6727	0.9024	0.9895	0.9987	0.9996	(86)
MIT	19.5610	19.7290	20.0111	20.3829	20.7129	20.9175	20.9806	20.9681	20.8034	20.3605	19.8891	19.5329	(87)
Th 2	19.9225	19.9243	19.9261	19.9347	19.9363	19.9438	19.9438	19.9452	19.9409	19.9363	19.9331	19.9297	(88)
util rest of house	0.9992	0.9976	0.9916	0.9649	0.8757	0.6818	0.4727	0.5400	0.8444	0.9836	0.9981	0.9995	(89)
MIT 2	17.9906	18.2376	18.6504	19.1919	19.6431	19.8861	19.9364	19.9313	19.7705	19.1670	18.4782	17.9546	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	18.4387	18.6632	19.0386	19.5317	19.9484	20.1804	20.2344	20.2272	20.0652	19.5075	18.8808	18.4049	(92)
Temperature adjustment													0.0000
adjusted MIT	18.4387	18.6632	19.0386	19.5317	19.9484	20.1804	20.2344	20.2272	20.0652	19.5075	18.8808	18.4049	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9988	0.9965	0.9888	0.9598	0.8762	0.7042	0.5109	0.5779	0.8527	0.9802	0.9972	0.9991	(94)
Ext temp.	740.3012	911.3918	1085.0685	1235.8176	1237.5007	983.7966	681.2373	706.4739	925.5866	877.2965	742.2662	690.2340	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	2763.8874	2685.2522	2441.6773	2051.7484	1589.1068	1066.6026	694.6559	730.4249	1143.6625	1716.1026	2277.4474	2755.9053	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	1505.5481	1192.0342	1009.3170	587.4702	261.5949	0.0000	0.0000	0.0000	0.0000	624.0717	1105.3304	1536.8595	(98)
												7822.2260 (98)	
												(98) / (4) = 47.8951 (99)	

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													8374.9744 (211)
Space heating requirement	1505.5481	1192.0342	1009.3170	587.4702	261.5949	0.0000	0.0000	0.0000	0.0000	624.0717	1105.3304	1536.8595	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	1611.9359	1276.2679	1080.6392	628.9831	280.0802	0.0000	0.0000	0.0000	0.0000	668.1710	1183.4373	1645.4598	(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	221.1753	194.8998	204.5819	183.2473	178.4944	157.2079	150.6171	167.9028	168.6430	190.0241	201.1156	215.8044	(64)
Efficiency of water heater (217)m	88.9667	88.8299	88.5235	87.7751	86.0122	80.3000	80.3000	80.3000	80.3000	87.8217	88.6829	89.0213	(217)
Fuel for water heating, kWh/month	248.6047	219.4078	231.1046	208.7692	207.5222	195.7757	187.5680	209.0944	210.0162	216.3750	226.7806	242.4188	(219)
Water heating fuel used													2603.4371 (219)
Annual totals kWh/year													
Space heating fuel - main system													8374.9744 (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)													540.5382 (232)
Total delivered energy for all uses													11593.9497 (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	8374.9744	0.2160	1808.9945 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2603.4371	0.2160	562.3424 (264)
Space and water heating			2371.3369 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	540.5382	0.5190	280.5393 (268)
Total CO2, kg/m2/year			2690.8012 (272)
Emissions per m2 for space and water heating			14.5196 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.7177 (272b)
Emissions per m2 for pumps and fans			0.2383 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.5196 * 1.00) + 1.7177 + 0.2383, rounded to 2 d.p.			16.4800 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	77.0400 (1b)	x 2.5000 (2b)	= 192.6000 (1b) - (3b)
First floor	86.2800 (1c)	x 2.7200 (2c)	= 234.6816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 427.2816 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.0936 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3436 (18)	
Number of sides sheltered				2 (19)	
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2921 (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	0.3724	0.3651	0.3578	0.3213	0.3140	0.2775	0.2775	0.2702	0.2921	0.3140	0.3286	0.3432 (22b)
	0.5693	0.5666	0.5640	0.5516	0.5493	0.5385	0.5385	0.5365	0.5427	0.5493	0.5540	0.5589 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			4.0300	1.8000	7.2540		(26)
Opening Type 2 (Uw = 1.60)			27.5900	1.5038	41.4887		(27)
Opening Type 3 (Uw = 1.60)			0.8600	1.5038	1.2932		(27a)
Heat Loss Floor 1			77.0400	0.1300	10.0152	75.0000	5778.0000 (28a)
Heat Loss Floor 2			22.2000	0.1886	4.1872	20.0000	444.0000 (28b)
External Wall 1	197.7000	31.6200	166.0800	0.1800	29.8944	110.0000	18268.8000 (29a)
External Roof 2	86.2800		86.2800	0.1300	11.2164	9.0000	776.5200 (30)
External Roof 2	13.5500	0.8600	12.6900	0.1700	2.1573	0.0000	0.0000 (30)
Total net area of external elements Aum(A, m2)			396.7700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	107.5064		(33)
Internal Wall 1			70.2300			75.0000	5267.2500 (32c)
Internal Wall 2			104.2100			9.0000	937.8900 (32c)
Internal Floor 1			64.0800			18.0000	1153.4400 (32d)
Internal Ceiling 1			64.0800			9.0000	576.7200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	33202.6200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							203.2979 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							27.6441 (36)
Total fabric heat loss						(33) + (36) =	135.1505 (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	80.2784	79.8987	79.5266	77.7787	77.4517	75.9293	75.9293	75.6474	76.5157	77.4517	78.1132	78.8049 (38)
Heat transfer coeff	215.4289	215.0492	214.6771	212.9292	212.6022	211.0798	211.0798	210.7979	211.6662	212.6022	213.2638	213.9554 (39)
Average = Sum(39)m / 12 =												212.9277 (39)
HLP	1.3191	1.3167	1.3145	1.3038	1.3018	1.2924	1.2924	1.2907	1.2960	1.3018	1.3058	1.3100 (40)
HLP (average)												1.3037 (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												2.9535 (42)
Average daily hot water use (litres/day)												104.3461 (43)
Daily hot water use	114.7807	110.6068	106.4330	102.2592	98.0853	93.9115	93.9115	98.0853	102.2592	106.4330	110.6068	114.7807 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy conte	170.2164	148.8724	153.6230	133.9322	128.5112	110.8954	102.7609	117.9196	119.3279	139.0652	151.8005	164.8455 (45)
Energy content (annual)	Total = Sum(45)m = 1641.7701 (45)											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	36.1710	31.6354	32.6449	28.4606	27.3086	23.5653	21.8367	25.0579	25.3572	29.5514	32.2576	35.0297 (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	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6075	27.1853	22.1086	16.7376	12.5116	10.5628	11.4135	14.8357	19.9124	25.2834	29.5094	31.4582 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	334.6728	338.1456	329.3942	310.7633	287.2451	265.1414	250.3748	246.9019	255.6534	274.2843	297.8024	319.9061 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676 (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)	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408 (71)
Water heating gains (Table 5)	48.6169	47.0765	43.8775	39.5286	36.7051	32.7295	29.3504	33.6800	35.2183	39.7196	44.8022	47.0829 (72)
Total internal gains	481.2000	479.7102	462.6831	434.3323	403.7646	375.7365	358.4414	362.7203	378.0869	406.5900	439.4168	465.7500 (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	4.4800	10.6334	0.7600	0.7000	0.7700	17.5628 (74)
East	10.3700	19.6403	0.7600	0.7000	0.7700	75.0881 (76)
South	6.0400	46.7521	0.7600	0.7000	0.7700	104.1076 (78)
West	6.7000	19.6403	0.7600	0.7000	0.7700	48.5140 (80)
East	0.8600	26.6635	0.7600	0.7000	1.0000	10.9792 (82)

Solar gains	256.2517	468.2327	711.4577	978.1360	1167.7976	1186.8475	1133.1199	990.2418	805.0781	537.8917	313.0384	215.1686 (83)
Total gains	737.4517	947.9429	1174.1408	1412.4683	1571.5623	1562.5840	1491.5613	1352.9621	1183.1650	944.4817	752.4552	680.9186 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	42.8120	42.8876	42.9620	43.3146	43.3813	43.6941	43.6941	43.7526	43.5731	43.3813	43.2467	43.1069
alpha	3.8541	3.8592	3.8641	3.8876	3.8921	3.9129	3.9129	3.9168	3.9049	3.8921	3.8831	3.8738
util living area	0.9982	0.9951	0.9855	0.9539	0.8756	0.7348	0.5819	0.6483	0.8704	0.9788	0.9964	0.9987 (86)
MIT	19.1367	19.3590	19.7253	20.1971	20.6072	20.8673	20.9602	20.9394	20.7183	20.1592	19.5540	19.0987 (87)
Th 2	19.8259	19.8277	19.8295	19.8379	19.8395	19.8468	19.8468	19.8481	19.8440	19.8395	19.8363	19.8330 (88)
util rest of house	0.9977	0.9936	0.9809	0.9383	0.8320	0.6430	0.4474	0.5143	0.8068	0.9691	0.9950	0.9983 (89)
MIT 2	18.1271	18.3500	18.7151	19.1823	19.5631	19.7794	19.8349	19.8278	19.6730	19.1539	18.5517	18.0944 (90)
Living area fraction	fLA = Living area / (4) = 0.2853 (91)											
MIT	18.4152	18.6379	19.0033	19.4719	19.8610	20.0898	20.1560	20.1450	19.9713	19.4408	18.8376	18.3810 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.4152	18.6379	19.0033	19.4719	19.8610	20.0898	20.1560	20.1450	19.9713	19.4408	18.8376	18.3810 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9968	0.9915	0.9765	0.9322	0.8330	0.6643	0.4856	0.5518	0.8152	0.9646	0.9934	0.9976 (94)
Ext temp.	735.0734	939.9023	1146.5875	1316.7016	1309.0552	1038.0420	724.3135	746.5456	964.5157	911.0596	747.4963	679.2999 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	3040.8138	2954.3251	2684.1805	2251.0593	1735.0478	1158.7960	750.6003	789.4393	1242.7511	1879.5669	2503.2143	3034.0988 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating	1715.4708	1353.6921	1143.9692	672.7375	316.9385	0.0000	0.0000	0.0000	0.0000	720.5694	1264.1170	1751.9704 (98)
Space heating per m2	(98) / (4) = 54.7359 (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
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	1984.1505	1561.9908	1602.0642	0.0000	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.7881	0.8592	0.8197	0.0000	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1563.7014	1342.0212	1313.2491	0.0000	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1943.3342	1857.9814	1700.8163	0.0000	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	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	273.3356	383.8744	288.3500	0.0000	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction													945.5600 (104)
Intermittency factor (Table 10b)													FC = cooled area / (4) = 1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	68.3339	95.9686	72.0875	0.0000	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling													236.3900 (107)
Space cooling per m2													1.4474 (108)
Energy for space heating													54.7359 (99)
Energy for space cooling													1.4474 (108)
Total													56.1833 (109)
Dwelling Fabric Energy Efficiency (DFEE)													56.2 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	77.0400 (1b)	2.5000 (2b)	192.6000 (1b) - (3b)
First floor	86.2800 (1c)	2.7200 (2c)	234.6816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 427.2816 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				40.0000 / (5) =	0.0936 (8)
Pressure test				Yes	5.0000
Measured/design AP50					0.3436 (18)
Infiltration rate					2 (19)
Number of sides sheltered					
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2921 (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	0.3724	0.3651	0.3578	0.3213	0.3140	0.2775	0.2775	0.2702	0.2921	0.3140	0.3286	0.3432 (22b)
	0.5693	0.5666	0.5640	0.5516	0.5493	0.5385	0.5385	0.5365	0.5427	0.5493	0.5540	0.5589 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			4.0300	1.0000	4.0300		(26)
TER Opening Type (Uw = 1.40)			27.5900	1.3258	36.5777		(27)
TER Room Window (Uw = 1.70)			0.8600	1.5918	1.3689		(27a)
Heat Loss Floor 1			77.0400	0.1300	10.0152		(28a)
Heat Loss Floor 2			22.2000	0.1300	2.8860		(28b)
External Wall 1	197.7000	31.6200	166.0800	0.1800	29.8944		(29a)
External Roof 2	86.2800		86.2800	0.1300	11.2164		(30)
External Roof 2	13.5500	0.8600	12.6900	0.1300	1.6497		(30)
Total net area of external elements Aum(A, m2)			396.7700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	97.6383	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	17.5673 (36)
Total fabric heat loss	(33) + (36) = 115.2056 (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	80.2784	79.8987	79.5266	77.7787	77.4517	75.9293	75.9293	75.6474	76.5157	77.4517	78.1132	78.8049 (38)
Average = Sum(39)m / 12 =	195.4839	195.1043	194.7321	192.9843	192.6572	191.1349	191.1349	190.8530	191.7213	192.6572	193.3188	194.0104 (39)
												192.9827 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1969	1.1946	1.1923	1.1816	1.1796	1.1703	1.1703	1.1686	1.1739	1.1796	1.1837	1.1879 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9535 (42)
Average daily hot water use (litres/day)	104.3461 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.7807	110.6068	106.4330	102.2592	98.0853	93.9115	93.9115	98.0853	102.2592	106.4330	110.6068	114.7807 (44)
Energy content (annual)	170.2164	148.8724	153.6230	133.9322	128.5112	110.8954	102.7609	117.9196	119.3279	139.0652	151.8005	164.8455 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1641.7701 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	36.1710	31.6354	32.6449	28.4606	27.3086	23.5653	21.8367	25.0579	25.3572	29.5514	32.2576	35.0297	35.0297	(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	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	147.6759	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6075	27.1853	22.1086	16.7376	12.5116	10.5628	11.4135	14.8357	19.9124	25.2834	29.5094	31.4582	31.4582	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	334.6728	338.1456	329.3942	310.7633	287.2451	265.1414	250.3748	246.9019	255.6534	274.2843	297.8024	319.9061	319.9061	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	37.7676	(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	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	(71)
Water heating gains (Table 5)	48.6169	47.0765	43.8775	39.5286	36.7051	32.7295	29.3504	33.6800	35.2183	39.7196	44.8022	47.0829	47.0829	(72)
Total internal gains	481.2000	479.7102	462.6831	434.3323	403.7646	375.7365	358.4414	362.7203	378.0869	406.5900	439.4168	465.7500	465.7500	(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	4.4800	10.6334	0.6300	0.7000	0.7700	14.5587 (74)
East	10.3700	19.6403	0.6300	0.7000	0.7700	62.2441 (76)
South	6.0400	46.7521	0.6300	0.7000	0.7700	86.2998 (78)
West	6.7000	19.6403	0.6300	0.7000	0.7700	40.2155 (80)
East	0.8600	26.6635	0.6300	0.7000	1.0000	9.1012 (82)

Solar gains	212.4192	388.1403	589.7610	810.8232	968.0428	983.8341	939.2968	820.8583	667.3674	445.8839	259.4923	178.3635	178.3635	(83)
Total gains	693.6192	867.8505	1052.4441	1245.1555	1371.8074	1359.5706	1297.7382	1183.5787	1045.4542	852.4739	698.9092	644.1135	644.1135	(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	58.0184	58.1313	58.2424	58.7699	58.8697	59.3386	59.3386	59.4262	59.1571	58.8697	58.6682	58.4591	58.4591	
alpha	4.8679	4.8754	4.8828	4.9180	4.9246	4.9559	4.9559	4.9617	4.9438	4.9246	4.9112	4.8973	4.8973	
util living area	0.9996	0.9986	0.9949	0.9783	0.9208	0.7853	0.6193	0.6894	0.9130	0.9914	0.9990	0.9997	0.9997	(86)
MIT	19.5340	19.7026	19.9862	20.3614	20.6977	20.9109	20.9786	20.9645	20.7891	20.3374	19.8633	19.5063	19.5063	(87)
Th 2	19.9225	19.9243	19.9261	19.9347	19.9363	19.9438	19.9438	19.9452	19.9409	19.9363	19.9331	19.9297	19.9297	(88)
util rest of house	0.9994	0.9981	0.9929	0.9690	0.8855	0.6959	0.4849	0.5558	0.8590	0.9865	0.9986	0.9996	0.9996	(89)
MIT 2	18.5764	18.7464	19.0305	19.4070	19.7236	19.9007	19.9382	19.9345	19.8140	19.3886	18.9140	18.5546	18.5546	(90)
Living area fraction									fLA = Living area / (4) =			0.2853	0.2853	(91)
MIT	18.8497	19.0192	19.3032	19.6793	20.0015	20.1889	20.2351	20.2284	20.0922	19.6593	19.1849	18.8261	18.8261	(92)
Temperature adjustment												0.0000	0.0000	(93)
adjusted MIT	18.8497	19.0192	19.3032	19.6793	20.0015	20.1889	20.2351	20.2284	20.0922	19.6593	19.1849	18.8261	18.8261	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9992	0.9975	0.9914	0.9662	0.8881	0.7189	0.5239	0.5945	0.8684	0.9848	0.9981	0.9995	0.9995	(94)
Useful gains	693.0740	865.7178	1043.3688	1203.0814	1218.3150	977.3445	679.8281	703.5958	907.8899	839.4927	697.6017	643.7640	643.7640	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000	(96)
Heat loss rate W	2844.2229	2754.7191	2493.1978	2080.2433	1599.3464	1068.2395	694.7862	730.6562	1148.8302	1745.3374	2336.2357	2837.6202	2837.6202	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	1600.4548	1269.4089	1078.6728	631.5565	283.4873	0.0000	0.0000	0.0000	0.0000	673.9484	1179.8165	1632.2290	1632.2290	(98)
Space heating												8349.5742	8349.5742	(98)
Space heating per m2												(98) / (4) =	51.1240	(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	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1796.6678	1414.3981	1450.4825	0.0000	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8105	0.8859	0.8471	0.0000	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1456.1204	1253.0793	1228.7687	0.0000	0.0000	0.0000	0.0000	0.0000	(102)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1708.3559	1633.6187	1504.6546	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	181.6096	283.1213	205.2591	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												669.9900 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	45.4024	70.7803	51.3148	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												167.4975 (107)
Space cooling per m2												1.0256 (108)
Energy for space heating												51.1240 (99)
Energy for space cooling												1.0256 (108)
Total												52.1496 (109)
Target Fabric Energy Efficiency (TFEE)												60.0 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	77.0400 (1b)	x 2.5000 (2b)	= 192.6000 (1b) - (3b)
First floor	86.2800 (1c)	x 2.7200 (2c)	= 234.6816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 427.2816 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					0 * 10 = 0.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.2500 (18)							
Number of sides sheltered					2 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2125 (21)							
Wind speed	Jan 5.0000	Feb 5.0000	Mar 4.9000	Apr 4.3000	May 4.2000	Jun 3.9000	Jul 3.7000	Aug 3.5000	Sep 3.9000	Oct 4.2000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2500	1.2500	1.2250	1.0750	1.0500	0.9750	0.9250	0.8750	0.9750	1.0500	1.1250	1.1750 (22a)
Adj infilt rate	0.2656	0.2656	0.2603	0.2284	0.2231	0.2072	0.1966	0.1859	0.2072	0.2231	0.2391	0.2497 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5156	0.5156	0.5103	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			4.0300	1.8000	7.2540		(26)
Opening Type 2 (Uw = 1.60)			27.5900	1.5038	41.4887		(27)
Opening Type 3 (Uw = 1.60)			0.8600	1.5038	1.2932		(27a)
Heat Loss Floor 1			77.0400	0.1300	10.0152	75.0000	5778.0000 (28a)
Heat Loss Floor 2			22.2000	0.1886	4.1872	20.0000	444.0000 (28b)
External Wall 1	197.7000	31.6200	166.0800	0.1800	29.8944	110.0000	18268.8000 (29a)
External Roof 2	86.2800		86.2800	0.1300	11.2164	9.0000	776.5200 (30)
External Roof 2	13.5500	0.8600	12.6900	0.1700	2.1573	0.0000	0.0000 (30)
Total net area of external elements Aum(A, m2)			396.7700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 107.5064		(33)
Internal Wall 1			70.2300			75.0000	5267.2500 (32c)
Internal Wall 2			104.2100			9.0000	937.8900 (32c)
Internal Floor 1			64.0800			18.0000	1153.4400 (32d)
Internal Ceiling 1			64.0800			18.0000	1153.4400 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	33779.3400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							206.8292 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							27.6441 (36)
Total fabric heat loss						(33) + (36) =	135.1505 (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	72.7046	72.7046	71.9556	70.5015	70.5015	70.5015	70.5015	70.5015	70.5015	70.5015	70.5015	70.5015 (38)
Average = Sum(39)m / 12 =	207.8552	207.8552	207.1061	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520	206.1404 (39)
HLP	1.2727	1.2727	1.2681	1.2592	1.2592	1.2592	1.2592	1.2592	1.2592	1.2592	1.2592	1.2592 (40)
HLP (average)												1.2622 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9535 (42)
Average daily hot water use (litres/day)	104.3461 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.7807	110.6068	106.4330	102.2592	98.0853	93.9115	93.9115	98.0853	102.2592	106.4330	110.6068	114.7807 (44)
Energy conte	170.2164	148.8724	153.6230	133.9322	128.5112	110.8954	102.7609	117.9196	119.3279	139.0652	151.8005	164.8455 (45)
Energy content (annual)	Total = Sum(45)m = 1641.7701 (45)											
Distribution loss (46)m = 0.15 x (45)m	25.5325	22.3309	23.0434	20.0898	19.2767	16.6343	15.4141	17.6879	17.8992	20.8598	22.7701	24.7268 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	49.3151	49.9832	46.3125	47.8563	49.9832	49.3151	50.9589	49.3151	50.9589 (61)
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 (62)
Output from w/h	221.1753	194.8998	204.5819	183.2473	178.4944	157.2079	150.6171	167.9028	168.6430	190.0241	201.1156	215.8044 (64)
RHI water heating demand	Total per year (kWh/year) = Sum(64)m = 2233.7135 (64)											
Heat gains from water heating, kWh/month	69.3367	61.0069	63.8194	56.8612	55.2258	48.4508	46.1320	51.7041	52.0053	58.9789	62.8024	67.5509 (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	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5188	67.9633	55.2715	41.8441	31.2789	26.4070	28.5337	37.0892	49.7810	63.2084	73.7735	78.6455 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	499.5116	504.6950	491.6331	463.8258	428.7241	395.7334	373.6937	368.5103	381.5722	409.3795	444.4812	477.4718 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408 (71)
Water heating gains (Table 5)	93.1945	90.7841	85.7787	78.9739	74.2282	67.2928	62.0054	69.4947	72.2296	79.2727	87.2256	90.7942 (72)
Total internal gains	786.9699	781.1874	750.4283	702.3888	651.9762	607.1783	581.9778	592.8392	621.3278	669.6056	723.2254	764.6565 (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	4.4800	9.8938	0.7600	0.7000	0.7700	16.3413 (74)						
East	10.3700	18.2144	0.7600	0.7000	0.7700	69.6367 (76)						
South	6.0400	43.9264	0.7600	0.7000	0.7700	97.8154 (78)						
West	6.7000	18.2144	0.7600	0.7000	0.7700	44.9919 (80)						
East	0.8600	24.6525	0.7600	0.7000	1.0000	10.1511 (82)						
Solar gains	238.9363	437.6274	694.5849	963.9189	1141.7872	1148.8961	1094.9168	944.3118	775.4017	501.5552	277.8348	196.6746 (83)
Total gains	1025.9062	1218.8148	1445.0132	1666.3077	1793.7634	1756.0744	1676.8946	1537.1509	1396.7295	1171.1608	1001.0602	961.3311 (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)	0.9954	0.9908	0.9774	0.9413	0.8622	0.7466	0.6481	0.7054	0.8692	0.9696	0.9923	0.9965 (86)
tau	45.1427	45.1427	45.3060	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264
alpha	4.0095	4.0095	4.0204	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418
util living area	0.9954	0.9908	0.9774	0.9413	0.8622	0.7466	0.6481	0.7054	0.8692	0.9696	0.9923	0.9965 (86)
MIT	19.6689	19.8001	20.0566	20.3735	20.6540	20.8201	20.8814	20.8601	20.7025	20.3329	19.9421	19.6437 (87)
Th 2	19.8623	19.8623	19.8659	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729 (88)
util rest of house	0.9941	0.9883	0.9710	0.9242	0.8213	0.6711	0.5456	0.6064	0.8176	0.9580	0.9898	0.9955 (89)
MIT 2	18.0804	18.2713	18.6452	19.1008	19.4794	19.6804	19.7420	19.7248	19.5513	19.0518	18.4874	18.0515 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.5336	18.7075	19.0479	19.4639	19.8146	20.0056	20.0671	20.0488	19.8798	19.4173	18.9025	18.5058 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.3836	18.5575	18.8979	19.3139	19.6646	19.8556	19.9171	19.8988	19.7298	19.2673	18.7525	18.3558 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	1017.4692	1199.6172	1392.7813	1522.5461	1457.3993	1176.2147	922.2926	936.0195	1130.8494	1112.0938	987.2492	955.1585 (95)
Ext temp.	3.6000	4.0000	5.5000	7.8000	10.7000	13.5000	15.2000	15.0000	12.8000	9.5000	6.3000	3.5000 (96)
Heat loss rate W	3072.8526	3025.8550	2774.7955	2367.8572	1843.5800	1307.0434	970.0783	1007.4394	1425.1279	2008.6671	2560.8799	3055.1218 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Space heating	1529.2052	1227.2318	1028.2186	608.6240	287.3185	0.0000	0.0000	0.0000	0.0000	667.0506	1133.0141	1562.3727 (98)
RHI space heating demand												8043.0354 (98)
												8043 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	77.0400 (1b)	x 2.5000 (2b)	= 192.6000 (1b) - (3b)
First floor	86.2800 (1c)	x 2.7200 (2c)	= 234.6816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 427.2816 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				0 * 10 =	0.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) =	0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.2500 (18)							
Number of sides sheltered					2 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2125 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5209	0.5156	0.5103	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Opening Type 1			4.0300	1.8000	7.2540		(26)					
Opening Type 2 (Uw = 1.60)			27.5900	1.5038	41.4887		(27)					
Opening Type 3 (Uw = 1.60)			0.8600	1.5038	1.2932		(27a)					
Heat Loss Floor 1			77.0400	0.1300	10.0152	75.0000	5778.0000 (28a)					
Heat Loss Floor 2			22.2000	0.1886	4.1872	20.0000	444.0000 (28b)					
External Wall 1	197.7000	31.6200	166.0800	0.1800	29.8944	110.0000	18268.8000 (29a)					
External Roof 2	86.2800		86.2800	0.1300	11.2164	9.0000	776.5200 (30)					
External Roof 2	13.5500	0.8600	12.6900	0.1700	2.1573	0.0000	0.0000 (30)					
Total net area of external elements Aum(A, m2)			396.7700				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	107.5064	(33)					
Internal Wall 1			70.2300			75.0000	5267.2500 (32c)					
Internal Wall 2			104.2100			9.0000	937.8900 (32c)					
Internal Floor 1			64.0800			18.0000	1153.4400 (32d)					
Internal Ceiling 1			64.0800			18.0000	1153.4400 (32e)					
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 33779.3400 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							206.8292 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							27.6441 (36)					
Total fabric heat loss							(33) + (36) = 135.1505 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 73.4537	Feb 72.7046	Mar 71.9556	Apr 70.5015	May 70.5015	Jun 70.5015	Jul 70.5015	Aug 70.5015	Sep 70.5015	Oct 70.5015	Nov 70.5015	Dec 70.5015 (38)
Heat transfer coeff	208.6042	207.8552	207.1061	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520 (39)
Average = Sum(39)m / 12 =												206.2028 (39)
HLP	Jan 1.2773	Feb 1.2727	Mar 1.2681	Apr 1.2592	May 1.2592	Jun 1.2592	Jul 1.2592	Aug 1.2592	Sep 1.2592	Oct 1.2592	Nov 1.2592	Dec 1.2592 (40)
HLP (average)												1.2626 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9535 (42)
Average daily hot water use (litres/day)	104.3461 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.7807	110.6068	106.4330	102.2592	98.0853	93.9115	93.9115	98.0853	102.2592	106.4330	110.6068	114.7807 (44)
Energy conte	170.2164	148.8724	153.6230	133.9322	128.5112	110.8954	102.7609	117.9196	119.3279	139.0652	151.8005	164.8455 (45)
Energy content (annual)	Total = Sum(45)m = 1641.7701 (45)											
Distribution loss (46)m = 0.15 x (45)m	25.5325	22.3309	23.0434	20.0898	19.2767	16.6343	15.4141	17.6879	17.8992	20.8598	22.7701	24.7268 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.9832	46.3125	47.8563	49.9832	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	221.1753	194.8998	204.5819	183.2473	178.4944	157.2079	150.6171	167.9028	168.6430	190.0241	201.1156	215.8044 (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	221.1753	194.8998	204.5819	183.2473	178.4944	157.2079	150.6171	167.9028	168.6430	190.0241	201.1156	215.8044 (64)
Heat gains from water heating, kWh/month	69.3367	61.0069	63.8194	56.8612	55.2258	48.4508	46.1320	51.7041	52.0053	58.9789	62.8024	67.5509 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 2233.7135 (64)												

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts												
(66)m	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5188	67.9633	55.2715	41.8441	31.2789	26.4070	28.5337	37.0892	49.7810	63.2084	73.7735	78.6455 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	499.5116	504.6950	491.6331	463.8258	428.7241	395.7334	373.6937	368.5103	381.5722	409.3795	444.4812	477.4718 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408 (71)
Water heating gains (Table 5)	93.1945	90.7841	85.7787	78.9739	74.2282	67.2928	62.0054	69.4947	72.2296	79.2727	87.2256	90.7942 (72)
Total internal gains	786.9699	781.1874	750.4283	702.3888	651.9762	607.1783	581.9778	592.8392	621.3278	669.6056	723.2254	764.6565 (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	4.4800	10.6334	0.7600	0.7000	0.7700	17.5628 (74)						
East	10.3700	19.6403	0.7600	0.7000	0.7700	75.0881 (76)						
South	6.0400	46.7521	0.7600	0.7000	0.7700	104.1076 (78)						
West	6.7000	19.6403	0.7600	0.7000	0.7700	48.5140 (80)						
East	0.8600	26.6635	0.7600	0.7000	1.0000	10.9792 (82)						
Solar gains	256.2517	468.2327	711.4577	978.1360	1167.7976	1186.8475	1133.1199	990.2418	805.0781	537.8917	313.0384	215.1686 (83)
Total gains	1043.2216	1249.4201	1461.8860	1680.5248	1819.7738	1794.0257	1715.0977	1583.0810	1426.4059	1207.4973	1036.2637	979.8251 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	44.9806	45.1427	45.3060	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264
alpha	3.9987	4.0095	4.0204	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418
util living area	0.9943	0.9879	0.9708	0.9229	0.8211	0.6629	0.5080	0.5651	0.7996	0.9542	0.9894	0.9956 (86)
MIT	19.7424	19.9042	20.1609	20.4754	20.7288	20.8711	20.9167	20.9080	20.7971	20.4514	20.0380	19.7225 (87)
Th 2	19.8587	19.8623	19.8659	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729 (88)
util rest of house	0.9927	0.9844	0.9622	0.8998	0.7686	0.5705	0.3870	0.4410	0.7222	0.9357	0.9858	0.9943 (89)
MIT 2	18.1852	18.4228	18.7956	19.2425	19.5732	19.7314	19.7682	19.7635	19.6626	19.2192	18.6270	18.1668 (90)
Living area fraction	fLA = Living area / (4) =											0.2853 (91)
MIT	18.6295	18.8455	19.1851	19.5943	19.9029	20.0566	20.0959	20.0900	19.9863	19.5708	19.0296	18.6107 (92)
Temperature adjustment												
adjusted MIT	18.4795	18.6955	19.0351	19.4443	19.7529	19.9066	19.9459	19.9400	19.8363	19.4208	18.8796	18.4607 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9899	0.9795	0.9540	0.8890	0.7622	0.5735	0.3951	0.4489	0.7193	0.9259	0.9812	0.9920 (94)
Useful gains	1032.7015	1223.8089	1394.6543	1493.9602	1387.0246	1028.8885	677.7057	710.6428	1025.9747	1118.0817	1016.8318	972.0285 (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	2957.9058	2867.4643	2596.1051	2168.4528	1656.0961	1091.3075	688.0844	728.0140	1179.6805	1814.0149	2422.5013	2932.7381 (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	1432.3520	1104.5364	893.8794	485.6347	200.1892	0.0000	0.0000	0.0000	0.0000	517.7743	1012.0820	1458.7680 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Space heating 7105.2160 (98)
 Space heating per m2 (98) / (4) = 43.5049 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.1000 (201)
 Fraction of space heat from main system(s) 0.9000 (202)
 Efficiency of main space heating system 1 (in %) 91.4000 (206)
 Efficiency of secondary/supplementary heating system, % 65.0000 (208)
 Space heating requirement 6996.3834 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1432.3520	1104.5364	893.8794	485.6347	200.1892	0.0000	0.0000	0.0000	0.0000	517.7743	1012.0820	1458.7680	(98)
Space heating efficiency (main heating system 1)	91.4000	91.4000	91.4000	91.4000	91.4000	0.0000	0.0000	0.0000	0.0000	91.4000	91.4000	91.4000	(210)
Space heating fuel (main heating system)	1410.4123	1087.6179	880.1876	478.1961	197.1229	0.0000	0.0000	0.0000	0.0000	509.8434	996.5797	1436.4236	(211)
Water heating requirement	220.3618	169.9287	137.5199	74.7130	30.7983	0.0000	0.0000	0.0000	0.0000	79.6576	155.7049	224.4258	(215)
Water heating requirement	221.1753	194.8998	204.5819	183.2473	178.4944	157.2079	150.6171	167.9028	168.6430	190.0241	201.1156	215.8044	(64)
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	248.5116	218.9885	229.8673	205.8958	200.5555	176.6380	169.2327	188.6548	189.4865	213.5102	225.9726	242.4769	(219)
Water heating fuel used												2509.7904	(219)
Annual totals kWh/year													
Space heating fuel - main system												6996.3834	(211)
Space heating fuel - secondary												1093.1102	(215)

Electricity for pumps and fans:

(MEV)Decentralised, Database: total watage = 10.6720, total flow = 58.0000, SFP = 0.1840
 mechanical ventilation fans (SFP = 0.1840) 95.9162 (230a)
 central heating pump 30.0000 (230c)
 main heating flue fan 45.0000 (230e)
 Total electricity for the above, kWh/year 170.9162 (231)
 Electricity for lighting (calculated in Appendix L) 540.5382 (232)

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

PV Unit 0 (0.80 * 2.00 * 908 * 1.00) = -1452.5668 -1452.5668 (233)
 Total delivered energy for all uses 9858.1715 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6996.3834	3.4800	243.4741	(240)
Space heating - secondary	1093.1102	4.2300	46.2386	(242)
Water heating (other fuel)	2509.7904	3.4800	87.3407	(247)
Mechanical ventilation fans	95.9162	13.1900	12.6513	(249)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Energy for lighting	540.5382	13.1900	71.2970	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-1452.5668	13.1900	-191.5936	(252)
Total energy cost			399.3007	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.4200 (256)
 Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.8050 (257)
 SAP value 88.7697
 SAP rating (Section 12) 89 (258)
 SAP band B

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	6996.3834	0.2160	1511.2188	(261)
Space heating - secondary	1093.1102	0.0190	20.7691	(263)
Water heating (other fuel)	2509.7904	0.2160	542.1147	(264)
Space and water heating			2074.1026	(265)
Pumps and fans	170.9162	0.5190	88.7055	(267)
Energy for lighting	540.5382	0.5190	280.5393	(268)
Energy saving/generation technologies				
PV Unit	-1452.5668	0.5190	-753.8822	(269)
Total kg/year			1689.4653	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

CO2 emissions per m2	10.3400 (273)
EI value	89.1327
EI rating	89 (274)
EI band	B

Calculation of stars for heating and DHW

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	77.0400 (1b)	x 2.5000 (2b)	= 192.6000 (1b) - (3b)
First floor	86.2800 (1c)	x 2.7200 (2c)	= 234.6816 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	163.3200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 427.2816 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					0 * 10 = 0.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.2500 (18)							
Number of sides sheltered					2 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2125 (21)							
Wind speed	Jan 5.0000	Feb 5.0000	Mar 4.9000	Apr 4.3000	May 4.2000	Jun 3.9000	Jul 3.7000	Aug 3.5000	Sep 3.9000	Oct 4.2000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2500	1.2500	1.2250	1.0750	1.0500	0.9750	0.9250	0.8750	0.9750	1.0500	1.1250	1.1750 (22a)
Adj infilt rate	0.2656	0.2656	0.2603	0.2284	0.2231	0.2072	0.1966	0.1859	0.2072	0.2231	0.2391	0.2497 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5156	0.5156	0.5103	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1			4.0300	1.8000	7.2540		(26)
Opening Type 2 (Uw = 1.60)			27.5900	1.5038	41.4887		(27)
Opening Type 3 (Uw = 1.60)			0.8600	1.5038	1.2932		(27a)
Heat Loss Floor 1			77.0400	0.1300	10.0152	75.0000	5778.0000 (28a)
Heat Loss Floor 2			22.2000	0.1886	4.1872	20.0000	444.0000 (28b)
External Wall 1	197.7000	31.6200	166.0800	0.1800	29.8944	110.0000	18268.8000 (29a)
External Roof 2	86.2800		86.2800	0.1300	11.2164	9.0000	776.5200 (30)
External Roof 2	13.5500	0.8600	12.6900	0.1700	2.1573	0.0000	0.0000 (30)
Total net area of external elements Aum(A, m2)			396.7700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 107.5064		(33)
Internal Wall 1			70.2300			75.0000	5267.2500 (32c)
Internal Wall 2			104.2100			9.0000	937.8900 (32c)
Internal Floor 1			64.0800			18.0000	1153.4400 (32d)
Internal Ceiling 1			64.0800			18.0000	1153.4400 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 33779.3400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							206.8292 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							27.6441 (36)
Total fabric heat loss							(33) + (36) = 135.1505 (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	72.7046	72.7046	71.9556	70.5015	70.5015	70.5015	70.5015	70.5015	70.5015	70.5015	70.5015	70.5015 (38)
Average = Sum(39)m / 12 =	207.8552	207.8552	207.1061	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520	205.6520	206.1404 (39)
HLP	1.2727	1.2727	1.2681	1.2592	1.2592	1.2592	1.2592	1.2592	1.2592	1.2592	1.2592	1.2592 (40)
HLP (average)												1.2622 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9535 (42)
Average daily hot water use (litres/day)	104.3461 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	114.7807	110.6068	106.4330	102.2592	98.0853	93.9115	93.9115	98.0853	102.2592	106.4330	110.6068	114.7807 (44)
Energy cont	170.2164	148.8724	153.6230	133.9322	128.5112	110.8954	102.7609	117.9196	119.3279	139.0652	151.8005	164.8455 (45)
Energy content (annual)	Total = Sum(45)m = 1641.7701 (45)											
Distribution loss (46)m = 0.15 x (45)m	25.5325	22.3309	23.0434	20.0898	19.2767	16.6343	15.4141	17.6879	17.8992	20.8598	22.7701	24.7268 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.9832	46.3125	47.8563	49.9832	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	221.1753	194.8998	204.5819	183.2473	178.4944	157.2079	150.6171	167.9028	168.6430	190.0241	201.1156	215.8044 (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	221.1753	194.8998	204.5819	183.2473	178.4944	157.2079	150.6171	167.9028	168.6430	190.0241	201.1156	215.8044 (64)
Heat gains from water heating, kWh/month	69.3367	61.0069	63.8194	56.8612	55.2258	48.4508	46.1320	51.7041	52.0053	58.9789	62.8024	67.5509 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 2233.7135 (64)												

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111	177.2111 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5188	67.9633	55.2715	41.8441	31.2789	26.4070	28.5337	37.0892	49.7810	63.2084	73.7735	78.6455 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	499.5116	504.6950	491.6331	463.8258	428.7241	395.7334	373.6937	368.5103	381.5722	409.3795	444.4812	477.4718 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746	55.6746 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408	-118.1408 (71)
Water heating gains (Table 5)	93.1945	90.7841	85.7787	78.9739	74.2282	67.2928	62.0054	69.4947	72.2296	79.2727	87.2256	90.7942 (72)
Total internal gains	786.9699	781.1874	750.4283	702.3888	651.9762	607.1783	581.9778	592.8392	621.3278	669.6056	723.2254	764.6565 (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	4.4800	9.8938	0.7600	0.7000	0.7700	16.3413 (74)						
East	10.3700	18.2144	0.7600	0.7000	0.7700	69.6367 (76)						
South	6.0400	43.9264	0.7600	0.7000	0.7700	97.8154 (78)						
West	6.7000	18.2144	0.7600	0.7000	0.7700	44.9919 (80)						
East	0.8600	24.6525	0.7600	0.7000	1.0000	10.1511 (82)						
Solar gains	238.9363	437.6274	694.5849	963.9189	1141.7872	1148.8961	1094.9168	944.3118	775.4017	501.5552	277.8348	196.6746 (83)
Total gains	1025.9062	1218.8148	1445.0132	1666.3077	1793.7634	1756.0744	1676.8946	1537.1509	1396.7295	1171.1608	1001.0602	961.3311 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	45.1427	45.1427	45.3060	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264	45.6264
alpha	4.0095	4.0095	4.0204	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418	4.0418
util living area	0.9954	0.9908	0.9774	0.9413	0.8622	0.7466	0.6481	0.7054	0.8692	0.9696	0.9923	0.9965 (86)
MIT	19.6689	19.8001	20.0566	20.3735	20.6540	20.8201	20.8814	20.8601	20.7025	20.3329	19.9421	19.6437 (87)
Th 2	19.8623	19.8623	19.8659	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729	19.8729 (88)
util rest of house	0.9941	0.9883	0.9710	0.9242	0.8213	0.6711	0.5456	0.6064	0.8176	0.9580	0.9898	0.9955 (89)
MIT 2	18.0804	18.2713	18.6452	19.1008	19.4794	19.6804	19.7420	19.7248	19.5513	19.0518	18.4874	18.0515 (90)
Living area fraction	fLA = Living area / (4) = 0.2853 (91)											
MIT	18.5336	18.7075	19.0479	19.4639	19.8146	20.0056	20.0671	20.0488	19.8798	19.4173	18.9025	18.5058 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.3836	18.5575	18.8979	19.3139	19.6646	19.8556	19.9171	19.8988	19.7298	19.2673	18.7525	18.3558 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9918	0.9842	0.9639	0.9137	0.8125	0.6698	0.5500	0.6089	0.8096	0.9496	0.9862	0.9936 (94)
Useful gains	1017.4692	1199.6172	1392.7813	1522.5461	1457.3993	1176.2147	922.2926	936.0195	1130.8494	1112.0938	987.2492	955.1585 (95)
Ext temp.	3.6000	4.0000	5.5000	7.8000	10.7000	13.5000	15.2000	15.0000	12.8000	9.5000	6.3000	3.5000 (96)
Heat loss rate W	3072.8526	3025.8550	2774.7955	2367.8572	1843.5800	1307.0434	970.0783	1007.4394	1425.1279	2008.6671	2560.8799	3055.1218 (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	1529.2052	1227.2318	1028.2186	608.6240	287.3185	0.0000	0.0000	0.0000	0.0000	667.0506	1133.0141	1562.3727 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Space heating 8043.0354 (98)
 Space heating per m2 (98) / (4) = 49.2471 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.1000 (201)
 Fraction of space heat from main system(s) 0.9000 (202)
 Efficiency of main space heating system 1 (in %) 91.4000 (206)
 Efficiency of secondary/supplementary heating system, % 65.0000 (208)
 Space heating requirement 7919.8379 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1529.2052	1227.2318	1028.2186	608.6240	287.3185	0.0000	0.0000	0.0000	0.0000	667.0506	1133.0141	1562.3727	(98)
Space heating efficiency (main heating system 1)	91.4000	91.4000	91.4000	91.4000	91.4000	0.0000	0.0000	0.0000	0.0000	91.4000	91.4000	91.4000	(210)
Space heating fuel (main heating system)	1505.7819	1208.4339	1012.4691	599.3015	282.9175	0.0000	0.0000	0.0000	0.0000	656.8332	1115.6594	1538.4414	(211)
Water heating requirement	235.2623	188.8049	158.1875	93.6345	44.2028	0.0000	0.0000	0.0000	0.0000	102.6232	174.3099	240.3650	(215)
Water heating requirement	221.1753	194.8998	204.5819	183.2473	178.4944	157.2079	150.6171	167.9028	168.6430	190.0241	201.1156	215.8044	(64)
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	248.5116	218.9885	229.8673	205.8958	200.5555	176.6380	169.2327	188.6548	189.4865	213.5102	225.9726	242.4769	(219)
Water heating fuel used												2509.7904	(219)
Annual totals kWh/year													
Space heating fuel - main system													7919.8379 (211)
Space heating fuel - secondary													1237.3901 (215)

Electricity for pumps and fans:

(MEV)Decentralised, Database: total watage = 10.6720, total flow = 58.0000, SFP = 0.1840
 mechanical ventilation fans (SFP = 0.1840) 95.9162 (230a)
 central heating pump 30.0000 (230c)
 main heating flue fan 45.0000 (230e)
 Total electricity for the above, kWh/year 170.9162 (231)
 Electricity for lighting (calculated in Appendix L) 540.5382 (232)

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

PV Unit 0 (0.80 * 2.00 * 870 * 1.00) = -1391.7323 -1391.7323 (233)
 Total delivered energy for all uses 10986.7405 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	7919.8379	3.6300	287.4901 (240)	
Space heating - secondary	1237.3901	5.1600	63.8493 (242)	
Water heating (other fuel)	2509.7904	3.6300	91.1054 (247)	
Mechanical ventilation fans	95.9162	19.4400	18.6461 (249)	
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)	
Energy for lighting	540.5382	19.4400	105.0806 (250)	
Additional standing charges			95.0000 (251)	
Energy saving/generation technologies				
PV Unit	-1391.7323	19.4400	-270.5528 (252)	
Total energy cost			405.1988 (255)	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	7919.8379	0.2160	1710.6850 (261)	
Space heating - secondary	1237.3901	0.0190	23.5104 (263)	
Water heating (other fuel)	2509.7904	0.2160	542.1147 (264)	
Space and water heating			2276.3101 (265)	
Pumps and fans	170.9162	0.5190	88.7055 (267)	
Energy for lighting	540.5382	0.5190	280.5393 (268)	
Energy saving/generation technologies				
PV Unit	-1391.7323	0.5190	-722.3091 (269)	
Total kg/year			1923.2459 (272)	

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	7919.8379	1.2200	9662.2023 (261)	
Space heating - secondary	1237.3901	1.0400	1286.8857 (263)	
Water heating (other fuel)	2509.7904	1.2200	3061.9443 (264)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Space and water heating			14011.0322 (265)
Pumps and fans	170.9162	3.0700	524.7127 (267)
Energy for lighting	540.5382	3.0700	1659.4523 (268)
Energy saving/generation technologies			
PV Unit	-1391.7323	3.0700	-4272.6181 (269)
Primary energy kWh/year			11922.5791 (272)
Primary energy kWh/m ² /year			73.0013 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 89
 Current environmental impact rating: B 89

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	SAP increase too small
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
A2	Not considered
A3	Not considered
T2	Not considered
M	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
(none)			
Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.8	-£ 26	-186 kg (9.7%)

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

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

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

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

	Current	Potential	Saving
Electricity	£138	£138	£0
Mains gas	£474	£474	£0
Wood	£64	£64	£0
Space heating	£480	£480	£0
Water heating	£91	£91	£0
Lighting	£105	£105	£0
Generated (PV)	-£271	-£271	£0
Total cost of fuels	£405	£405	£0
Total cost of uses	£405	£405	£0
Delivered energy	67 kWh/m ²	67 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.9 tonnes	1.9 tonnes	0.0 tonnes
CO2 emissions per m ²	12 kg/m ²	12 kg/m ²	0 kg/m ²
Primary energy	73 kWh/m ²	73 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	Detached House
Number of storeys	2
Cross ventilation possible	No
SAP Region	North East England
Front of dwelling faces	West
Overshading	Average or unknown
Thermal mass parameter	206.8 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	2.50 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	352.51 (P1)
Transmission heat loss coefficient	135.15 (P7)
Summer heat loss coefficient	487.66 (P2)

Overhangs

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

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North	0.800	0.90	1.000	0.720 (P8)
East	0.800	0.90	1.000	0.720 (P8)
East	0.800	1.00	1.000	0.800 (P8)
South	0.800	0.90	1.000	0.720 (P8)
West	0.800	0.90	1.000	0.720 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	4.4800	74.6426	0.7600	0.7000	0.7200	115.2794
East	10.3700	111.2086	0.7600	0.7000	0.7200	397.5610
South	6.0400	110.4126	0.7600	0.7000	0.7200	229.9018
West	6.7000	111.2086	0.7600	0.7000	0.7200	256.8619
East	0.8600	184.6622	0.7600	0.7000	0.8000	60.8304
total:						1060.4344

	Jun	Jul	Aug	
Solar gains	1093	1060	918	(P3)
Internal gains	604	579	590	
Total summer gains	1697	1639	1508	(P5)
Summer gain/loss ratio	3.48	3.36	3.09	(P6)
Summer external temperature	13.80	15.80	15.60	
Thermal mass temperature increment (TMP = 206.8)	0.55	0.55	0.55	
Threshold temperature	17.83	19.71	19.24	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			