

PREDICTED ENERGY ASSESSMENT

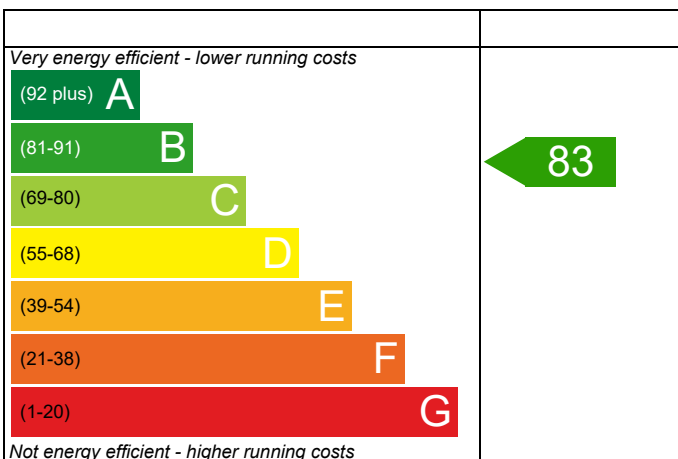
377 - PRJ012318

Dwelling type: House, Semi-Detached
Date of assessment: 13/07/2022
Produced by: Scott Binstead
Total floor area: 80.84 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating

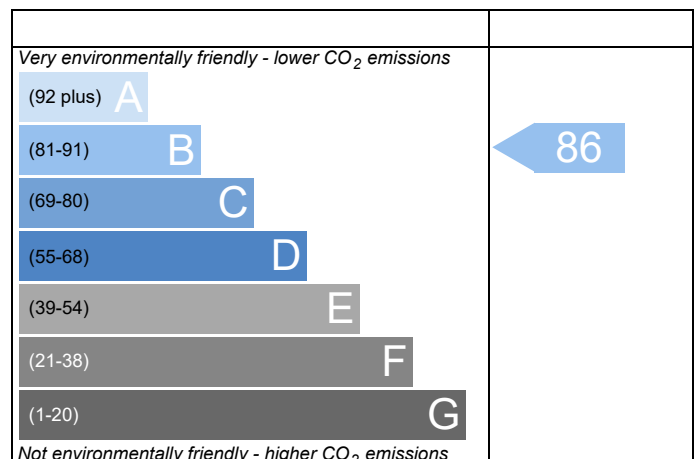


England

EU Directive
2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



England

EU Directive
2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	377 - PRJ012318			Issued on Date	13/07/2022
Assessment Reference	377 S	Prop Type Ref	Preston		
Property	377 - PRJ012318				
SAP Rating	83 B	DER	18.43	TER	19.42
Environmental	86 B	% DER<TER	5.08		
CO ₂ Emissions (t/year)	1.23	DFEE	48.53	TFEE	55.17
General Requirements Compliance	Pass	% DFEE<TFEE	12.04		
Assessor Details	Chris Nicholls, , Tel: ,			Assessor ID	U903-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Semi-Detached House, total floor area 81 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) 19.42 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.43 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)48.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.22 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 5.01 (design value)

Maximum 10.0 OK

4 Heating efficiency

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

Data from database

Ideal LOGIC COMBI ESP1 35

Combi boiler

Efficiency: 89.6% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs 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: 0.1900 0.1800

Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average

Windows facing North: 3.38 m², No overhang

Windows facing South: 3.82 m², No overhang

Air change rate: 4.21 ach

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

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.4200 (1b)	x 2.6100 (2b)	= 105.4962 (1b) - (3b)
First floor	40.4200 (1c)	x 2.6800 (2c)	= 108.3256 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.8218 (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												5.0100
Infiltration rate												0.2505 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2317 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.2954	0.2896	0.2838	0.2549	0.2491	0.2201	0.2201	0.2143	0.2317	0.2491	0.2607	0.2723 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5454	0.5396	0.5338	0.5049	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5107	0.5223 (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
Windows (Uw = 1.40)			7.2000	1.3258	9.5455		(27)
Solid Door			2.1500	1.2000	2.5800		(26)
Half Glazed Door			3.1600	1.3000	4.1080		(26a)
Fir - Ground			40.4210	0.1500	6.0632	75.6000	3055.8276 (28a)
Wl - Brick	81.4800	10.3100	71.1700	0.2200	15.6574	58.3400	4152.0578 (29a)
Wl - Clad	13.7200	2.1960	11.5240	0.2200	2.5353	58.3400	672.3102 (29a)
Rf - Ins Joist	40.4210		40.4210	0.1000	4.0421	5.8200	235.2502 (30)
Total net area of external elements Aum(A, m ²)			176.0460				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.5314		(33)
Party Wall			46.5310	0.0000	0.0000	54.0300	2514.0699 (32)
Ground Floor Stud			86.6885			5.8200	504.5273 (32c)
1st Floor Stud			94.6831			5.8200	551.0555 (32c)
Internal Floor			40.4200			18.0000	727.5600 (32d)
Internal Ceiling			40.4200			5.8200	235.2444 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12647.9029 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.4560 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3638 (36)
Total fabric heat loss						(33) + (36) =	54.8952 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.4864	Feb 38.0777	Mar 37.6689	Apr 35.6252	May 35.2806	Jun 35.2806	Jul 35.2806	Aug 35.2806	Sep 35.2806	Oct 35.2806	Nov 36.0339	Dec 36.8514 (38)
Heat transfer coeff	93.3817	92.9729	92.5642	90.5204	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.9292	91.7467 (39)
Average = Sum(39)m / 12 =												91.0975 (39)
HLP	Jan 1.1551	Feb 1.1501	Mar 1.1450	Apr 1.1197	May 1.1155	Jun 1.1155	Jul 1.1155	Aug 1.1155	Sep 1.1155	Oct 1.1155	Nov 1.1248	Dec 1.1349 (40)
HLP (average)												1.1269 (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	2.4786 (42)
Average daily hot water use (litres/day)	93.0669 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	102.3736	98.6509	94.9282	91.2056	87.4829	83.7602	83.7602	87.4829	91.2056	94.9282	98.6509	102.3736	(44)
Energy conte	151.8171	132.7802	137.0172	119.4550	114.6199	98.9082	91.6530	105.1732	106.4293	124.0331	135.3918	147.0267	(45)
Energy content (annual)										Total =	Sum (45)m =	1464.3046	(45)
Distribution loss (46)m = 0.15 x (45)m	22.7726	19.9170	20.5526	17.9182	17.1930	14.8362	13.7480	15.7760	15.9644	18.6050	20.3088	22.0540	(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	14.1209	12.7397	14.0687	13.5743	13.9972	13.5116	13.9408	13.9774	13.5458	14.0391	13.6334	14.1094	(61)
Total heat required for water heating calculated for each month	165.9380	145.5198	151.0860	133.0292	128.6171	112.4199	105.5938	119.1506	119.9750	138.0722	149.0251	161.1361	(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	165.9380	145.5198	151.0860	133.0292	128.6171	112.4199	105.5938	119.1506	119.9750	138.0722	149.0251	161.1361	(64)
Heat gains from water heating, kWh/month	54.0094	47.3343	49.0754	43.1123	41.6104	36.2649	33.9598	38.4644	38.7742	44.7508	48.4261	52.4137	(65)
										Total per year (kWh/year) =	Sum (64)m =	1629.5629	(64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.1850	20.5927	16.7471	12.6786	9.4774	8.0012	8.6456	11.2379	15.0835	19.1520	22.3532	23.8294	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.1872	223.4824	217.6985	205.3852	189.8420	175.2335	165.4741	163.1789	168.9628	181.2760	196.8193	211.4278	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	(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)	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	(71)
Water heating gains (Table 5)	72.5933	70.4380	65.9616	59.8783	55.9280	50.3679	45.6449	51.6995	53.8530	60.1489	67.2585	70.4486	(72)
Total internal gains	380.1445	377.6922	363.5863	341.1212	318.4265	296.7817	282.9438	289.2954	301.0784	323.7560	349.6101	368.8848	(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				3.3840	10.6334	0.7600		0.7200	0.7700		13.6452 (74)	
South				3.8160	46.7521	0.7600		0.7200	0.7700		67.6532 (78)	
Solar gains	81.2985	136.8753	185.4485	230.6908	262.1044	262.6106	252.1285	227.8167	200.7109	150.5476	97.0253	69.8340 (83)
Total gains	461.4430	514.5675	549.0348	571.8120	580.5308	559.3923	535.0723	517.1121	501.7894	474.3036	446.6354	438.7188 (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	37.6231	37.7885	37.9554	38.8123	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.6378	38.2936		
alpha	3.5082	3.5192	3.5304	3.5875	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5759	3.5529		
util living area	0.9901	0.9846	0.9744	0.9511	0.8995	0.7945	0.6540	0.6894	0.8579	0.9555	0.9842	0.9917	(86)	
MIT	19.1834	19.3664	19.6666	20.0831	20.4733	20.7792	20.9221	20.9030	20.6808	20.1933	19.6311	19.1678	(87)	
Th 2	19.9561	19.9601	19.9642	19.9847	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9806	19.9724	(88)	
util rest of house	0.9880	0.9811	0.9683	0.9381	0.8690	0.7244	0.5357	0.5767	0.8040	0.9412	0.9801	0.9899	(89)	
MIT 2	18.2984	18.4831	18.7836	19.2083	19.5839	19.8539	19.9567	19.9460	19.7759	19.3221	18.7626	18.2951	(90)	
Living area fraction									fLA = Living area / (4) =			0.1597	(91)	
MIT	18.4398	18.6242	18.9246	19.3480	19.7259	20.0017	20.1109	20.0988	19.9204	19.4612	18.9013	18.4344	(92)	
Temperature adjustment												-0.1500		
adjusted MIT	18.2898	18.4742	18.7746	19.1980	19.5759	19.8517	19.9609	19.9488	19.7704	19.3112	18.7513	18.2844	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9830	0.9744	0.9588	0.9251	0.8537	0.7132	0.5321	0.5717	0.7898	0.9284	0.9731	0.9857	(94)
Useful gains	453.6208	501.3736	526.4279	528.9714	495.5917	398.9758	284.7238	295.6285	396.3124	440.3645	434.6340	432.4322	(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	1306.3884	1262.0295	1136.1923	932.1767	710.2176	473.5732	303.0727	320.0178	511.3375	785.5397	1059.4441	1292.2001	(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	634.4590	511.1608	453.6647	290.3078	159.6817	0.0000	0.0000	0.0000	0.0000	256.8103	449.8633	639.6673	(98)
Space heating												3395.6149	(98)
Space heating per m2												42.0041	(99)
												(98) / (4) =	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3752.0607 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	634.4590	511.1608	453.6647	290.3078	159.6817	0.0000	0.0000	0.0000	0.0000	256.8103	449.8633	639.6673	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	701.0597	564.8185	501.2869	320.7821	176.4438	0.0000	0.0000	0.0000	0.0000	283.7683	497.0865	706.8147	(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	165.9380	145.5198	151.0860	133.0292	128.6171	112.4199	105.5938	119.1506	119.9750	138.0722	149.0251	161.1361	(64)
Efficiency of water heater (217)m	89.8174	89.7708	89.6788	89.4694	89.0439	87.3000	87.3000	87.3000	87.3000	89.3548	89.6820	87.3000	(216)
Fuel for water heating, kWh/month	184.7503	162.1015	168.4747	148.6868	144.4424	128.7742	120.9551	136.4840	137.4285	154.5214	166.1706	179.3642	(219)
Water heating fuel used												1832.1536	(219)
Annual totals kWh/year													
Space heating fuel - main system												3752.0607	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 6.9550, total flow = 29.0000, SFP = 0.2398)													
mechanical ventilation fans (SFP = 0.2398)													62.5620 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													137.5620 (231)
Electricity for lighting (calculated in Appendix L)													409.4541 (232)
Total delivered energy for all uses													6131.2305 (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	3752.0607	0.2160	810.4451 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1832.1536	0.2160	395.7452 (264)
Space and water heating			1206.1903 (265)
Pumps and fans	137.5620	0.5190	71.3947 (267)
Energy for lighting	409.4541	0.5190	212.5067 (268)
Total CO2, kg/year			1490.0917 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.4300 (273)

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

DER			18.4300 ZC1
Total Floor Area		TFA	80.8400
Assumed number of occupants		N	2.4786
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.2136 ZC2
CO2 emissions from cooking, equation (L16)			2.2079 ZC3
Total CO2 emissions			36.8515 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			36.8515 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	40.4200 (1b)	x 2.6100 (2b)	= 105.4962 (1b) - (3b)
First floor	40.4200 (1c)	x 2.6800 (2c)	= 108.3256 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.8218 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (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) =					30.0000 / (5) = 0.1403 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3903 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3610 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4603	0.4513	0.4423	0.3971	0.3881	0.3430	0.3430	0.3340	0.3610	0.3881	0.4062	0.4242 (22b)
Effective ac	0.6059	0.6018	0.5978	0.5789	0.5753	0.5588	0.5588	0.5558	0.5652	0.5753	0.5825	0.5900 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Semi-glazed door			3.1600	1.2000	3.7920		(26a)
TER Opening Type (Uw = 1.40)			7.2000	1.3258	9.5455		(27)
Flr - Ground			40.4210	0.1300	5.2547		(28a)
Wl - Brick	81.4800	10.3100	71.1700	0.1800	12.8106		(29a)
Wl - Clad	13.7200	2.1960	11.5240	0.1800	2.0743		(29a)
Rf - Ins Joist	40.4210		40.4210	0.1300	5.2547		(30)
Total net area of external elements Aum(A, m ²)			176.0460				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.8818		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0508 (36)
Total fabric heat loss						(33) + (36) =	49.9326 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	42.7562	42.4659	42.1814	40.8449	40.5948	39.4308	39.4308	39.2153	39.8792	40.5948	41.1007	41.6295 (38)
Heat transfer coeff	92.6888	92.3985	92.1140	90.7775	90.5275	89.3635	89.3635	89.1479	89.8118	90.5275	91.0333	91.5622 (39)
Average = Sum(39)m / 12 =												90.7763 (39)
HLP	1.1466	1.1430	1.1395	1.1229	1.1198	1.1054	1.1054	1.1028	1.1110	1.1198	1.1261	1.1326 (40)
HLP (average)												1.1229 (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												2.4786 (42)
Average daily hot water use (litres/day)												93.0669 (43)
Daily hot water use	102.3736	98.6509	94.9282	91.2056	87.4829	83.7602	83.7602	87.4829	91.2056	94.9282	98.6509	102.3736 (44)
Energy conte	151.8171	132.7802	137.0172	119.4550	114.6199	98.9082	91.6530	105.1732	106.4293	124.0331	135.3918	147.0267 (45)
Energy content (annual)										Total = Sum(45)m =		1464.3046 (45)
Distribution loss (46)m = 0.15 x (45)m												
22.7726	19.9170	20.5526	17.9182	17.1930	14.8362	13.7480	15.7760	15.9644	18.6050	20.3088	22.0540 (46)	
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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	45.4064	48.3744	44.9781	44.5803	41.3064	42.6833	44.5803	44.9781	48.3744	48.6498	50.9589 (61)
Solar input	202.7760	178.1866	185.3916	164.4330	159.2002	140.2146	134.3363	149.7535	151.4074	172.4075	184.0416	197.9856 (62)
Output from w/h	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)
Heat gains from water heating, kWh/month	202.7760	178.1866	185.3916	164.4330	159.2002	140.2146	134.3363	149.7535	151.4074	172.4075	184.0416	197.9856 (64)
	63.2189	55.5010	57.6518	50.9633	49.2562	43.2136	41.1454	46.1152	46.6323	53.3346	57.1802	61.6261 (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	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.3161	20.7091	16.8418	12.7503	9.5310	8.0465	8.6945	11.3015	15.1688	19.2603	22.4796	23.9641	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.1872	223.4824	217.6985	205.3852	189.8420	175.2335	165.4741	163.1789	168.9628	181.2760	196.8193	211.4278	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	(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)	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	(71)
Water heating gains (Table 5)	84.9716	82.5908	77.4890	70.7824	66.2046	60.0189	55.3030	61.9827	64.7670	71.6863	79.4170	82.8308	(72)
Total internal gains	392.6540	389.9614	375.2084	352.0970	328.7566	306.4779	292.6507	299.6422	312.0777	335.4017	361.8949	381.4018	(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					3.3840	10.6334	0.6300	0.7000			0.7700	10.9970	(74)
South					3.8160	46.7521	0.6300	0.7000			0.7700	54.5232	(78)
Solar gains	65.5202	110.3107	149.4569	185.9185	211.2354	211.6434	203.1957	183.6023	161.7572	121.3295	78.1947	56.2807	(83)
Total gains	458.1741	500.2721	524.6652	538.0155	539.9921	518.1213	495.8464	483.2444	473.8349	456.7312	440.0897	437.6824	(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	60.5671	60.7573	60.9450	61.8423	62.0131	62.8209	62.8209	62.9728	62.5072	62.0131	61.6685	61.3123	
alpha	5.0378	5.0505	5.0630	5.1228	5.1342	5.1881	5.1881	5.1982	5.1671	5.1342	5.1112	5.0875	
util living area	0.9985	0.9973	0.9946	0.9867	0.9608	0.8768	0.7283	0.7629	0.9273	0.9873	0.9970	0.9988	(86)
MIT	19.7324	19.8499	20.0527	20.3374	20.6226	20.8622	20.9624	20.9515	20.7890	20.4269	20.0355	19.7168	(87)
Th 2	19.9630	19.9659	19.9687	19.9822	19.9847	19.9964	19.9964	19.9986	19.9919	19.9847	19.9796	19.9743	(88)
util rest of house	0.9979	0.9963	0.9926	0.9807	0.9402	0.8069	0.5926	0.6351	0.8804	0.9805	0.9958	0.9984	(89)
MIT 2	18.2696	18.4434	18.7414	19.1642	19.5701	19.8863	19.9798	19.9747	19.7999	19.2973	18.7248	18.2548	(90)
Living area fraction	18.5032	18.6680	18.9509	19.3515	19.7382	20.0422	20.1367	20.1307	19.9579	19.4777	18.9341	18.4883	(92)
Temperature adjustment	18.5032	18.6680	18.9509	19.3515	19.7382	20.0422	20.1367	20.1307	19.9579	19.4777	18.9341	18.4883	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	456.7060	497.5391	519.1887	524.8687	504.1260	420.0566	304.2467	316.0866	416.1826	445.5475	437.3975	436.5719	(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	1316.4816	1272.1440	1146.8978	948.7632	727.6763	486.3296	316.0521	332.5818	526.1060	803.6736	1077.2991	1308.2631	(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	639.6731	520.5345	467.0156	305.2041	166.3214	0.0000	0.0000	0.0000	0.0000	266.4458	460.7291	648.5383	(98)
Space heating												3474.4618	(98)
Space heating per m2												42.9795	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3719.9805 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	639.6731	520.5345	467.0156	305.2041	166.3214	0.0000	0.0000	0.0000	0.0000	266.4458	460.7291	648.5383	(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)	684.8748	557.3174	500.0167	326.7710	178.0743	0.0000	0.0000	0.0000	0.0000	285.2739	493.2860	694.3665	(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	202.7760	178.1866	185.3916	164.4330	159.2002	140.2146	134.3363	149.7535	151.4074	172.4075	184.0416	197.9856	(64)
Efficiency of water heater (217)m	87.7436	87.5905	87.2804	86.5868	85.1614	80.3000	80.3000	80.3000	80.3000	86.1434	87.2670	87.8167	(217)
Fuel for water heating, kWh/month	231.1006	203.4315	212.4092	189.9053	186.9393	174.6135	167.2930	186.4925	188.5521	200.1401	210.8949	225.4533	(219)
Water heating fuel used												2377.2254	(219)
Annual totals kWh/year													
Space heating fuel - main system												3719.9805	(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)												411.7690	(232)
Total delivered energy for all uses												6583.9749	(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	3719.9805	0.2160	803.5158 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2377.2254	0.2160	513.4807 (264)
Space and water heating			1316.9965 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	411.7690	0.5190	213.7081 (268)
Total CO2, kg/m2/year			1569.6296 (272)
Emissions per m2 for space and water heating			16.2914 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6436 (272b)
Emissions per m2 for pumps and fans			0.4815 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2914 * 1.00) + 2.6436 + 0.4815, rounded to 2 d.p.			19.4200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.4200 (1b)	x 2.6100 (2b)	= 105.4962 (1b) - (3b)
First floor	40.4200 (1c)	x 2.6800 (2c)	= 108.3256 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.8218 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (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) =					30.0000 / (5) = 0.1403 (8)
Pressure test					Yes
Measured/design AP50					5.0100
Infiltration rate					0.3908 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3615 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4609	0.4519	0.4428	0.3976	0.3886	0.3434	0.3434	0.3344	0.3615	0.3886	0.4067	0.4248 (22b)
Effective ac	0.6062	0.6021	0.5980	0.5791	0.5755	0.5590	0.5590	0.5559	0.5653	0.5755	0.5827	0.5902 (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
Windows (Uw = 1.40)			7.2000	1.3258	9.5455		(27)
Solid Door			2.1500	1.2000	2.5800		(26)
Half Glazed Door			3.1600	1.3000	4.1080		(26a)
F1r - Ground			40.4210	0.1500	6.0632	75.6000	3055.8276 (28a)
W1 - Brick	81.4800	10.3100	71.1700	0.2200	15.6574	58.3400	4152.0578 (29a)
W1 - Clad	13.7200	2.1960	11.5240	0.2200	2.5353	58.3400	672.3102 (29a)
Rf - Ins Joist	40.4210		40.4210	0.1000	4.0421	5.8200	235.2502 (30)
Total net area of external elements Aum(A, m ²)			176.0460				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.5314		(33)
Party Wall			46.5310	0.0000	0.0000	54.0300	2514.0699 (32)
Ground Floor Stud			86.6885			5.8200	504.5273 (32c)
1st Floor Stud			94.6831			5.8200	551.0555 (32c)
Internal Floor			40.4200			18.0000	727.5600 (32d)
Internal Ceiling			40.4200			5.8200	235.2444 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12647.9029 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.4560 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3638 (36)
Total fabric heat loss						(33) + (36) =	54.8952 (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	42.7753	42.4843	42.1991	40.8592	40.6085	39.4415	39.4415	39.2254	39.8910	40.6085	41.1156	41.6458 (38)
Heat transfer coeff	97.6706	97.3795	97.0943	95.7544	95.5037	94.3367	94.3367	94.1206	94.7862	95.5037	96.0108	96.5410 (39)
Average = Sum(39)m / 12 =												95.7532 (39)
HLP	1.2082	1.2046	1.2011	1.1845	1.1814	1.1670	1.1670	1.1643	1.1725	1.1814	1.1877	1.1942 (40)
HLP (average)												1.1845 (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												2.4786 (42)
Average daily hot water use (litres/day)												93.0669 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.3736	98.6509	94.9282	91.2056	87.4829	83.7602	83.7602	87.4829	91.2056	94.9282	98.6509	102.3736 (44)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy conte	151.8171	132.7802	137.0172	119.4550	114.6199	98.9082	91.6530	105.1732	106.4293	124.0331	135.3918	147.0267 (45)
Energy content (annual)										Total =	Sum (45)m =	1464.3046 (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	32.2611	28.2158	29.1162	25.3842	24.3567	21.0180	19.4763	22.3493	22.6162	26.3570	28.7708	31.2432 (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	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.1850	20.5927	16.7471	12.6786	9.4774	8.0012	8.6456	11.2379	15.0835	19.1520	22.3532	23.8294 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.1872	223.4824	217.6985	205.3852	189.8420	175.2335	165.4741	163.1789	168.9628	181.2760	196.8193	211.4278 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930 (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)	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442 (71)
Water heating gains (Table 5)	43.3617	41.9878	39.1346	35.2558	32.7375	29.1917	26.1778	30.0394	31.4114	35.4261	39.9594	41.9935 (72)
Total internal gains	347.9130	346.2420	333.7593	313.4988	292.2360	272.6055	260.4766	264.6353	275.6368	296.0332	319.3110	337.4298 (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					3.3840	10.6334	0.7600	0.7200			0.7700	13.6452 (74)
South					3.8160	46.7521	0.7600	0.7200			0.7700	67.6532 (78)
Solar gains	81.2985	136.8753	185.4485	230.6908	262.1044	262.6106	252.1285	227.8167	200.7109	150.5476	97.0253	69.8340 (83)
Total gains	429.2114	483.1173	519.2078	544.1895	554.3404	535.2161	512.6051	492.4519	476.3477	446.5808	416.3363	407.2637 (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	35.9710	36.0785	36.1845	36.6908	36.7871	37.2422	37.2422	37.3277	37.0656	36.7871	36.5928	36.3918
alpha	3.3981	3.4052	3.4123	3.4461	3.4525	3.4828	3.4828	3.4885	3.4710	3.4525	3.4395	3.4261
util living area	0.9921	0.9874	0.9788	0.9594	0.9159	0.8212	0.6890	0.7248	0.8807	0.9641	0.9874	0.9934 (86)
MIT	19.0411	19.2255	19.5351	19.9591	20.3773	20.7303	20.8983	20.8750	20.6153	20.0792	19.4912	19.0145 (87)
Th 2	19.9134	19.9163	19.9191	19.9324	19.9349	19.9465	19.9465	19.9487	19.9421	19.9349	19.9299	19.9246 (88)
util rest of house	0.9903	0.9845	0.9735	0.9480	0.8882	0.7533	0.5665	0.6100	0.8308	0.9519	0.9840	0.9919 (89)
MIT 2	18.1257	18.3112	18.6207	19.0486	19.4537	19.7803	19.9050	19.8934	19.6829	19.1716	18.5867	18.1074 (90)
Living area fraction									fLA = Living area / (4) =			0.1597 (91)
MIT	18.2719	18.4572	18.7667	19.1940	19.6012	19.9320	20.0636	20.0502	19.8318	19.3166	18.7311	18.2523 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2719	18.4572	18.7667	19.1940	19.6012	19.9320	20.0636	20.0502	19.8318	19.3166	18.7311	18.2523 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	423.3992	473.0081	501.5251	510.3049	486.4054	402.6022	298.2773	306.6395	392.6974	420.8630	407.4549	402.6236 (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	1364.6459	1320.1980	1191.0258	985.6948	754.5904	503.0064	326.7455	343.5564	543.2981	832.4655	1116.7130	1356.6209 (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	700.2875	569.3116	512.9885	342.2807	199.5296	0.0000	0.0000	0.0000	0.0000	306.2322	510.6659	709.7740 (98)
Space heating												3851.0700 (98)
Space heating per m2										(98) / (4) =		47.6382 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	886.7649	698.0915	715.3164	0.0000	0.0000	0.0000	0.0000 (100)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6899	0.7732	0.7510	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	611.8081	539.7376	537.2381	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	719.6071	691.3862	669.8863	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	77.6153	112.8266	98.6903	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												289.1322 (104)
Cooled fraction									FC = cooled area / (4) =			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	19.4038	28.2066	24.6726	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												72.2830 (107)
Space cooling per m2												0.8941 (108)
Energy for space heating												47.6382 (99)
Energy for space cooling												0.8941 (108)
Total												48.5323 (109)
Dwelling Fabric Energy Efficiency (DFEE)												48.5 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.4200 (1b)	x 2.6100 (2b)	= 105.4962 (1b) - (3b)
First floor	40.4200 (1c)	x 2.6800 (2c)	= 108.3256 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.8218 (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					3 * 10 = 30.0000 (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) =					30.0000 / (5) = 0.1403 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3903 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3610 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4603	0.4513	0.4423	0.3971	0.3881	0.3430	0.3430	0.3340	0.3610	0.3881	0.4062	0.4242 (22b)
Effective ac	0.6059	0.6018	0.5978	0.5789	0.5753	0.5588	0.5588	0.5558	0.5652	0.5753	0.5825	0.5900 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Semi-glazed door			3.1600	1.2000	3.7920		(26a)
TER Opening Type (Uw = 1.40)			7.2000	1.3258	9.5455		(27)
Flr - Ground			40.4210	0.1300	5.2547		(28a)
Wl - Brick	81.4800	10.3100	71.1700	0.1800	12.8106		(29a)
Wl - Clad	13.7200	2.1960	11.5240	0.1800	2.0743		(29a)
Rf - Ins Joist	40.4210		40.4210	0.1300	5.2547		(30)
Total net area of external elements Aum(A, m ²)			176.0460				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.8818		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0508 (36)
Total fabric heat loss						(33) + (36) =	49.9326 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	42.7562	42.4659	42.1814	40.8449	40.5948	39.4308	39.4308	39.2153	39.8792	40.5948	41.1007	41.6295 (38)
Heat transfer coeff	92.6888	92.3985	92.1140	90.7775	90.5275	89.3635	89.3635	89.1479	89.8118	90.5275	91.0333	91.5622 (39)
Average = Sum(39)m / 12 =												90.7763 (39)
HLP	1.1466	1.1430	1.1395	1.1229	1.1198	1.1054	1.1054	1.1028	1.1110	1.1198	1.1261	1.1326 (40)
HLP (average)												1.1229 (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												2.4786 (42)
Average daily hot water use (litres/day)												93.0669 (43)
Daily hot water use	102.3736	98.6509	94.9282	91.2056	87.4829	83.7602	83.7602	87.4829	91.2056	94.9282	98.6509	102.3736 (44)
Energy conte	151.8171	132.7802	137.0172	119.4550	114.6199	98.9082	91.6530	105.1732	106.4293	124.0331	135.3918	147.0267 (45)
Energy content (annual)										Total = Sum(45)m =		1464.3046 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	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	32.2611	28.2158	29.1162	25.3842	24.3567	21.0180	19.4763	22.3493	22.6162	26.3570	28.7708	31.2432 (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	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	123.9303	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.3161	20.7091	16.8418	12.7503	9.5310	8.0465	8.6945	11.3015	15.1688	19.2603	22.4796	23.9641	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	221.1872	223.4824	217.6985	205.3852	189.8420	175.2335	165.4741	163.1789	168.9628	181.2760	196.8193	211.4278	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	35.3930	(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)	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	(71)
Water heating gains (Table 5)	43.3617	41.9878	39.1346	35.2558	32.7375	29.1917	26.1778	30.0394	31.4114	35.4261	39.9594	41.9935	(72)
Total internal gains	348.0441	346.3584	333.8540	313.5704	292.2896	272.6507	260.5255	264.6988	275.7221	296.1415	319.4374	337.5645	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W
North				3.3840	10.6334	0.6300		0.7000		0.7700		10.9970
South				3.8160	46.7521	0.6300		0.7000		0.7700		54.5232 (78)
Solar gains	65.5202	110.3107	149.4569	185.9185	211.2354	211.6434	203.1957	183.6023	161.7572	121.3295	78.1947	56.2807 (83)
Total gains	413.5642	456.6691	483.3109	499.4890	503.5250	484.2941	463.7212	448.3011	437.4793	417.4710	397.6321	393.8452 (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	60.5671	60.7573	60.9450	61.8423	62.0131	62.8209	62.8209	62.9728	62.5072	62.0131	61.6685	61.3123	
alpha	5.0378	5.0505	5.0630	5.1228	5.1342	5.1881	5.1881	5.1982	5.1671	5.1342	5.1112	5.0875	
util living area	0.9991	0.9982	0.9963	0.9903	0.9700	0.8994	0.7623	0.7991	0.9449	0.9914	0.9982	0.9993	(86)
MIT	19.6809	19.7998	20.0058	20.2951	20.5871	20.8403	20.9535	20.9393	20.7586	20.3837	19.9866	19.6659	(87)
Th 2	19.9630	19.9659	19.9687	19.9822	19.9847	19.9964	19.9964	19.9986	19.9919	19.9847	19.9796	19.9743	(88)
util rest of house	0.9987	0.9976	0.9948	0.9859	0.9535	0.8366	0.6275	0.6747	0.9061	0.9866	0.9974	0.9990	(89)
MIT 2	18.7555	18.8765	19.0843	19.3825	19.6694	19.9061	19.9817	19.9771	19.8366	19.4734	19.0743	18.7496	(90)
Living area fraction									fLA = Living area / (4) =			0.1597	(91)
MIT	18.9033	19.0240	19.2314	19.5283	19.8159	20.0553	20.1369	20.1308	19.9838	19.6187	19.2200	18.8959	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9033	19.0240	19.2314	19.5283	19.8159	20.0553	20.1369	20.1308	19.9838	19.6187	19.2200	18.8959	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	412.8324	455.1893	480.1017	491.0765	478.2677	407.3668	300.8773	311.0132	396.2418	410.8457	396.2490	393.3074	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1353.5580	1305.0334	1172.7442	964.8086	734.7154	487.5052	316.0694	332.5888	528.4354	816.4431	1103.3202	1345.5880	(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	699.8998	571.0952	515.3261	341.0871	190.7971	0.0000	0.0000	0.0000	0.0000	301.7644	509.0913	708.4968	(98)
Space heating												3837.5578	(98)
Space heating per m ²										(98) / (4) =		47.4710	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	840.0165	661.2896	677.5241	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7237	0.8204	0.7981	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	607.8880	542.5525	540.7029	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	660.1481	634.3141	618.3660	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	37.6273	68.2707	57.7814	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												163.6793 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)	
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	9.4068	17.0677	14.4453	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												40.9198 (107)
Space cooling per m2												0.5062 (108)
Energy for space heating												47.4710 (99)
Energy for space cooling												0.5062 (108)
Total												47.9772 (109)
Target Fabric Energy Efficiency (TFEE)												55.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.4200 (1b)	x 2.6100 (2b)	= 105.4962 (1b) - (3b)
First floor	40.4200 (1c)	x 2.6800 (2c)	= 108.3256 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.8218 (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												5.0100
Infiltration rate												0.2505 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2317 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
	0.2433	0.2317	0.2317	0.2143	0.2143	0.1912	0.1970	0.1854	0.1912	0.2027	0.2027	0.2201 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			7.2000	1.3258	9.5455		(27)
Solid Door			2.1500	1.2000	2.5800		(26)
Half Glazed Door			3.1600	1.3000	4.1080		(26a)
Fir - Ground			40.4210	0.1500	6.0632	75.6000	3055.8276 (28a)
Wl - Brick	81.4800	10.3100	71.1700	0.2200	15.6574	58.3400	4152.0578 (29a)
Wl - Clad	13.7200	2.1960	11.5240	0.2200	2.5353	58.3400	672.3102 (29a)
Rf - Ins Joist	40.4210		40.4210	0.1000	4.0421	5.8200	235.2502 (30)
Total net area of external elements Aum(A, m ²)			176.0460				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	44.5314			(33)
Party Wall			46.5310	0.0000	0.0000	54.0300	2514.0699 (32)
Ground Floor Stud			86.6885			5.8200	504.5273 (32c)
1st Floor Stud			94.6831			5.8200	551.0555 (32c)
Internal Floor			40.4200			18.0000	727.5600 (32d)
Internal Ceiling			40.4200			5.8200	235.2444 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				12647.9029 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.4560 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3638 (36)
Total fabric heat loss			(33) + (36) =				54.8952 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.2806	Feb 35.2806	Mar 35.2806	Apr 35.2806	May 35.2806	Jun 35.2806	Jul 35.2806	Aug 35.2806	Sep 35.2806	Oct 35.2806	Nov 35.2806	Dec 35.2806 (38)
Heat transfer coeff	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758 (39)
Average = Sum(39)m / 12 =												90.1758 (39)
HLP	Jan 1.1155	Feb 1.1155	Mar 1.1155	Apr 1.1155	May 1.1155	Jun 1.1155	Jul 1.1155	Aug 1.1155	Sep 1.1155	Oct 1.1155	Nov 1.1155	Dec 1.1155 (40)
HLP (average)												1.1155 (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	2.4786 (42)
Average daily hot water use (litres/day)	93.0669 (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	102.3736	98.6509	94.9282	91.2056	87.4829	83.7602	83.7602	87.4829	91.2056	94.9282	98.6509	102.3736	(44)
Energy conte	151.8171	132.7802	137.0172	119.4550	114.6199	98.9082	91.6530	105.1732	106.4293	124.0331	135.3918	147.0267	(45)
Energy content (annual)	Total = Sum (45)m = 1464.3046												(45)
Distribution loss (46)m = 0.15 x (45)m	22.7726	19.9170	20.5526	17.9182	17.1930	14.8362	13.7480	15.7760	15.9644	18.6050	20.3088	22.0540	(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	14.1209	12.7397	14.0687	13.5743	13.9972	13.5116	13.9408	13.9774	13.5458	14.0391	13.6334	14.1094	(61)
Total heat required for water heating calculated for each month	165.9380	145.5198	151.0860	133.0292	128.6171	112.4199	105.5938	119.1506	119.9750	138.0722	149.0251	161.1361	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum (63)m =	0.0000												(63)
Output from w/h	165.9380	145.5198	151.0860	133.0292	128.6171	112.4199	105.5938	119.1506	119.9750	138.0722	149.0251	161.1361	(64)
Total per year (kWh/year) = Sum (64)m =	1629.5629												(64)
RHI water heating demand	54.0094	47.3343	49.0754	43.1123	41.6104	36.2649	33.9598	38.4644	38.7742	44.7508	48.4261	52.4137	(65)
Heat gains from water heating, kWh/month	1630												(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	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.9625	51.4818	41.8678	31.6966	23.6936	20.0031	21.6141	28.0948	37.7088	47.8799	55.8830	59.5734	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	330.1301	333.5558	324.9231	306.5451	283.3462	261.5425	246.9763	243.5506	252.1833	270.5613	293.7602	315.5639	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	(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)	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	(71)
Water heating gains (Table 5)	72.5933	70.4380	65.9616	59.8783	55.9280	50.3679	45.6449	51.6995	53.8530	60.1489	67.2585	70.4486	(72)
Total internal gains	565.6082	560.3979	537.6748	503.0423	467.8901	436.8359	419.1577	428.2672	448.6674	483.5125	521.8240	550.5082	(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				3.3840	11.9814	0.7600	0.7200	0.7700	15.3751 (74)			
South				3.8160	50.9848	0.7600	0.7200	0.7700	73.7783 (78)			
Solar gains	89.1534	135.1123	181.4602	234.4201	261.3101	281.0191	266.5497	244.9065	213.4565	158.8028	108.9987	75.8531 (83)
Total gains	654.7616	695.5102	719.1350	737.4624	729.2003	717.8550	685.7074	673.1737	662.1240	642.3152	630.8227	626.3613 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	
alpha	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	
util living area	0.9667	0.9567	0.9337	0.8837	0.7783	0.5784	0.3979	0.4168	0.6826	0.8761	0.9472	0.9707	(86)
MIT	19.6669	19.7960	20.0762	20.4187	20.7438	20.9406	20.9889	20.9867	20.8817	20.5257	20.0433	19.6254	(87)
Th 2	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	(88)
util rest of house	0.9598	0.9478	0.9191	0.8563	0.7222	0.4793	0.2727	0.2906	0.5954	0.8415	0.9345	0.9646	(89)
MIT 2	18.7995	18.9257	19.1989	19.5250	19.8158	19.9623	19.9860	19.9854	19.9257	19.6288	19.1700	18.7591	(90)
Living area fraction	18.9380	19.0647	19.3390	19.6677	19.9640	20.1185	20.1462	20.1453	20.0784	19.7720	19.3095	18.8974	(91)
MIT	18.9380	19.0647	19.3390	19.6677	19.9640	20.1185	20.1462	20.1453	20.0784	19.7720	19.3095	18.8974	(92)
Temperature adjustment	18.7880	18.9147	19.1890	19.5177	19.8140	19.9685	19.9962	19.9953	19.9284	19.6220	19.1595	-0.1500	
adjusted MIT	18.7880	18.9147	19.1890	19.5177	19.8140	19.9685	19.9962	19.9953	19.9284	19.6220	19.1595	18.7474	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9493	0.9358	0.9049	0.8410	0.7112	0.4772	0.2737	0.2915	0.5897	0.8264	0.9213	0.9547	(94)
Useful gains	621.5390	650.8305	650.7781	620.2359	518.6032	342.5707	187.6931	196.2456	390.4712	530.8232	581.1537	598.0024	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1234.3294	1200.6650	1063.0840	867.2873	614.4598	357.8634	189.0249	197.9625	426.3881	723.3929	1006.3132	1230.6694	(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	455.9161	369.4888	306.7556	177.8770	71.3174	0.0000	0.0000	0.0000	0.0000	143.2718	306.1148	470.7042	(98)
Space heating	2301.4457												(98)
RHI space heating demand	2301												(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.4200 (1b)	x 2.6100 (2b)	= 105.4962 (1b) - (3b)
First floor	40.4200 (1c)	x 2.6800 (2c)	= 108.3256 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.8218 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
											Air changes per hour	
Infiltration due to chimneys, flues and fans					= (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) =	0.0000 (8)	
Pressure test											Yes	
Measured/design AP50											5.0100	
Infiltration rate											0.2505 (18)	
Number of sides sheltered											1 (19)	
Shelter factor										(20) = 1 - [0.075 x (19)] =	0.9250 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =	0.2317 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.2954	0.2896	0.2838	0.2549	0.2491	0.2201	0.2201	0.2143	0.2317	0.2491	0.2607	0.2723 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5454	0.5396	0.5338	0.5049	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5107	0.5223 (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					
Windows (Uw = 1.40)			7.2000	1.3258	9.5455		(27)					
Solid Door			2.1500	1.2000	2.5800		(26)					
Half Glazed Door			3.1600	1.3000	4.1080		(26a)					
F1r - Ground			40.4210	0.1500	6.0632	75.6000	3055.8276 (28a)					
W1 - Brick	81.4800	10.3100	71.1700	0.2200	15.6574	58.3400	4152.0578 (29a)					
W1 - Clad	13.7200	2.1960	11.5240	0.2200	2.5353	58.3400	672.3102 (29a)					
Rf - Ins Joist	40.4210		40.4210	0.1000	4.0421	5.8200	235.2502 (30)					
Total net area of external elements Aum(A, m2)			176.0460				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	44.5314			(33)					
Party Wall			46.5310	0.0000	0.0000	54.0300	2514.0699 (32)					
Ground Floor Stud			86.6885			5.8200	504.5273 (32c)					
1st Floor Stud			94.6831			5.8200	551.0555 (32c)					
Internal Floor			40.4200			18.0000	727.5600 (32d)					
Internal Ceiling			40.4200			5.8200	235.2444 (32e)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	12647.9029 (34)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							156.4560 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3638 (36)					
Total fabric heat loss					(33) + (36) =		54.8952 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.4864	Feb 38.0777	Mar 37.6689	Apr 35.6252	May 35.2806	Jun 35.2806	Jul 35.2806	Aug 35.2806	Sep 35.2806	Oct 35.2806	Nov 36.0339	Dec 36.8514 (38)
Heat transfer coeff	93.3817	92.9729	92.5642	90.5204	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.9292	91.7467 (39)
Average = Sum(39)m / 12 =												91.0975 (39)
HLP	Jan 1.1551	Feb 1.1501	Mar 1.1450	Apr 1.1197	May 1.1155	Jun 1.1155	Jul 1.1155	Aug 1.1155	Sep 1.1155	Oct 1.1155	Nov 1.1248	Dec 1.1349 (40)
HLP (average)												1.1269 (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	2.4786 (42)
Average daily hot water use (litres/day)	93.0669 (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	102.3736	98.6509	94.9282	91.2056	87.4829	83.7602	83.7602	87.4829	91.2056	94.9282	98.6509	102.3736	(44)
Energy conte	151.8171	132.7802	137.0172	119.4550	114.6199	98.9082	91.6530	105.1732	106.4293	124.0331	135.3918	147.0267	(45)
Energy content (annual)	Total = Sum (45)m = 1464.3046												(45)
Distribution loss (46)m = 0.15 x (45)m	22.7726	19.9170	20.5526	17.9182	17.1930	14.8362	13.7480	15.7760	15.9644	18.6050	20.3088	22.0540	(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	14.1209	12.7397	14.0687	13.5743	13.9972	13.5116	13.9408	13.9774	13.5458	14.0391	13.6334	14.1094	(61)
Total heat required for water heating calculated for each month	165.9380	145.5198	151.0860	133.0292	128.6171	112.4199	105.5938	119.1506	119.9750	138.0722	149.0251	161.1361	(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	165.9380	145.5198	151.0860	133.0292	128.6171	112.4199	105.5938	119.1506	119.9750	138.0722	149.0251	161.1361	(64)
Heat gains from water heating, kWh/month	54.0094	47.3343	49.0754	43.1123	41.6104	36.2649	33.9598	38.4644	38.7742	44.7508	48.4261	52.4137	(65)
Total per year (kWh/year) = Sum (64)m = 1629.5629													(64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.9625	51.4818	41.8678	31.6966	23.6936	20.0031	21.6141	28.0948	37.7088	47.8799	55.8830	59.5734	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	330.1301	333.5558	324.9231	306.5451	283.3462	261.5425	246.9763	243.5506	252.1833	270.5613	293.7602	315.5639	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	(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)	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	(71)
Water heating gains (Table 5)	72.5933	70.4380	65.9616	59.8783	55.9280	50.3679	45.6449	51.6995	53.8530	60.1489	67.2585	70.4486	(72)
Total internal gains	565.6082	560.3979	537.6748	503.0423	467.8901	436.8359	419.1577	428.2672	448.6674	483.5125	521.8240	550.5082	(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				3.3840	10.6334	0.7600		0.7200	0.7700		13.6452 (74)	
South				3.8160	46.7521	0.7600		0.7200	0.7700		67.6532 (78)	
Solar gains	81.2985	136.8753	185.4485	230.6908	262.1044	262.6106	252.1285	227.8167	200.7109	150.5476	97.0253	69.8340 (83)
Total gains	646.9067	697.2732	723.1233	733.7331	729.9945	699.4465	671.2862	656.0839	649.3784	634.0601	618.8493	620.3422 (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	37.6231	37.7885	37.9554	38.8123	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.6378	38.2936		
alpha	3.5082	3.5192	3.5304	3.5875	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5759	3.5529		
util living area	0.9728	0.9625	0.9447	0.9067	0.8332	0.7020	0.5510	0.5814	0.7655	0.9051	0.9587	0.9761	(86)	
MIT	19.4675	19.6378	19.9113	20.2850	20.6165	20.8566	20.9553	20.9444	20.7917	20.3941	19.8864	19.4500	(87)	
Th 2	19.9561	19.9601	19.9642	19.9847	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9806	19.9724	(88)	
util rest of house	0.9673	0.9549	0.9329	0.8853	0.7916	0.6243	0.4401	0.4727	0.6979	0.8793	0.9491	0.9712	(89)	
MIT 2	18.5783	18.7487	19.0198	19.3964	19.7060	19.9063	19.9714	19.9659	19.8588	19.5070	19.0110	18.5736	(90)	
Living area fraction	18.7203	18.8906	19.1622	19.5383	19.8514	20.0580	20.1285	20.1222	20.0078	19.6487	19.1508	18.7136	(91)	
MIT	18.7203	18.8906	19.1622	19.5383	19.8514	20.0580	20.1285	20.1222	20.0078	19.6487	19.1508	18.7136	(92)	
Temperature adjustment	18.5703	18.7406	19.0122	19.3883	19.7014	19.9080	19.9785	19.9722	19.8578	19.4987	19.0008	18.5636	(93)	
adjusted MIT	18.5703	18.7406	19.0122	19.3883	19.7014	19.9080	19.9785	19.9722	19.8578	19.4987	19.0008	18.5636	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9576	0.9434	0.9192	0.8700	0.7779	0.6174	0.4390	0.4709	0.6880	0.8640	0.9371	0.9624	(94)	
Useful gains	619.4755	657.8253	664.7096	638.3612	567.8633	431.8697	294.6963	308.9327	446.7657	547.8358	579.9131	597.0072	(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	1332.5812	1286.8055	1158.1794	949.4049	721.5340	478.6560	304.6634	322.1216	519.2125	802.4485	1082.1322	1317.8104	(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	530.5506	422.6747	367.1415	223.9515	114.3310	0.0000	0.0000	0.0000	0.0000	189.4318	361.5978	536.2776	(98)	
Space heating													2745.9565	(98)
Space heating per m2													33.9678	(99)
													(98) / (4) =	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3034.2061 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	530.5506	422.6747	367.1415	223.9515	114.3310	0.0000	0.0000	0.0000	0.0000	189.4318	361.5978	536.2776	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	586.2438	467.0438	405.6813	247.4602	126.3326	0.0000	0.0000	0.0000	0.0000	209.3169	399.5556	592.5719	(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	165.9380	145.5198	151.0860	133.0292	128.6171	112.4199	105.5938	119.1506	119.9750	138.0722	149.0251	161.1361	(64)
Efficiency of water heater	89.7165	89.6583	89.5431	89.2805	88.7772	87.3000	87.3000	87.3000	87.3000	89.1227	89.5421	87.3000	(216)
Fuel for water heating, kWh/month	184.9582	162.3049	168.7299	149.0015	144.8762	128.7742	120.9551	136.4840	137.4285	154.9236	166.4303	179.5589	(219)
Water heating fuel used												1834.4253	(219)
Annual totals kWh/year													
Space heating fuel - main system												3034.2061	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 6.9550, total flow = 29.0000, SFP = 0.2398)													
mechanical ventilation fans (SFP = 0.2398)													62.5620 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													137.5620 (231)
Electricity for lighting (calculated in Appendix L)													409.4541 (232)
Total delivered energy for all uses													5415.6476 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3034.2061	3.4800	105.5904 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1834.4253	3.4800	63.8380 (247)
Mechanical ventilation fans	62.5620	13.1900	8.2519 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	409.4541	13.1900	54.0070 (250)
Additional standing charges			120.0000 (251)
Total energy cost			361.5798 (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] =	1.2068 (257)
SAP value		83.1652
SAP rating (Section 12)		83 (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	3034.2061	0.2160	655.3885 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1834.4253	0.2160	396.2359 (264)
Space and water heating			1051.6244 (265)
Pumps and fans	137.5620	0.5190	71.3947 (267)
Energy for lighting	409.4541	0.5190	212.5067 (268)
Total kg/year			1335.5258 (272)
CO2 emissions per m2			16.5200 (273)
EI value			85.7787
EI rating			86 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9050 = 3.845$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9050 = 0.2387$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water heating energy efficiency
Water heating environmental impact

$3.48 / 0.8872 = 3.923$, stars = 4
 $0.216 / 0.8872 = 0.2435$, 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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.4200 (1b)	x 2.6100 (2b)	= 105.4962 (1b) - (3b)
First floor	40.4200 (1c)	x 2.6800 (2c)	= 108.3256 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.8218 (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												5.0100
Infiltration rate												0.2505 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2317 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
	0.2433	0.2317	0.2317	0.2143	0.2143	0.1912	0.1970	0.1854	0.1912	0.2027	0.2027	0.2201 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	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						
Windows (Uw = 1.40)			7.2000	1.3258	9.5455			(27)					
Solid Door			2.1500	1.2000	2.5800			(26)					
Half Glazed Door			3.1600	1.3000	4.1080			(26a)					
Flr - Ground			40.4210	0.1500	6.0632	75.6000	3055.8276	(28a)					
Wl - Brick	81.4800	10.3100	71.1700	0.2200	15.6574	58.3400	4152.0578	(29a)					
Wl - Clad	13.7200	2.1960	11.5240	0.2200	2.5353	58.3400	672.3102	(29a)					
Rf - Ins Joist	40.4210		40.4210	0.1000	4.0421	5.8200	235.2502	(30)					
Total net area of external elements Aum(A, m2)			176.0460					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	44.5314				(33)					
Party Wall			46.5310	0.0000	0.0000	54.0300	2514.0699	(32)					
Ground Floor Stud			86.6885			5.8200	504.5273	(32c)					
1st Floor Stud			94.6831			5.8200	551.0555	(32c)					
Internal Floor			40.4200			18.0000	727.5600	(32d)					
Internal Ceiling			40.4200			5.8200	235.2444	(32e)					
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =	12647.9029			(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							156.4560	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3638	(36)					
Total fabric heat loss				(33) + (36) =	54.8952			(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.2806	Feb 35.2806	Mar 35.2806	Apr 35.2806	May 35.2806	Jun 35.2806	Jul 35.2806	Aug 35.2806	Sep 35.2806	Oct 35.2806	Nov 35.2806	Dec 35.2806	(38)
Heat transfer coeff	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	(39)
Average = Sum(39)m / 12 =												90.1758	(39)
HLP	Jan 1.1155	Feb 1.1155	Mar 1.1155	Apr 1.1155	May 1.1155	Jun 1.1155	Jul 1.1155	Aug 1.1155	Sep 1.1155	Oct 1.1155	Nov 1.1155	Dec 1.1155	(40)
HLP (average)												1.1155	(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	2.4786 (42)
Average daily hot water use (litres/day)	93.0669 (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	102.3736	98.6509	94.9282	91.2056	87.4829	83.7602	83.7602	87.4829	91.2056	94.9282	98.6509	102.3736	(44)
Energy conte	151.8171	132.7802	137.0172	119.4550	114.6199	98.9082	91.6530	105.1732	106.4293	124.0331	135.3918	147.0267	(45)
Energy content (annual)	Total = Sum (45)m = 1464.3046												(45)
Distribution loss (46)m = 0.15 x (45)m	22.7726	19.9170	20.5526	17.9182	17.1930	14.8362	13.7480	15.7760	15.9644	18.6050	20.3088	22.0540	(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	14.1209	12.7397	14.0687	13.5743	13.9972	13.5116	13.9408	13.9774	13.5458	14.0391	13.6334	14.1094	(61)
Total heat required for water heating calculated for each month	165.9380	145.5198	151.0860	133.0292	128.6171	112.4199	105.5938	119.1506	119.9750	138.0722	149.0251	161.1361	(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	165.9380	145.5198	151.0860	133.0292	128.6171	112.4199	105.5938	119.1506	119.9750	138.0722	149.0251	161.1361	(64)
Heat gains from water heating, kWh/month	54.0094	47.3343	49.0754	43.1123	41.6104	36.2649	33.9598	38.4644	38.7742	44.7508	48.4261	52.4137	(65)
Total per year (kWh/year) = Sum (64)m = 1629.5629													(64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.9625	51.4818	41.8678	31.6966	23.6936	20.0031	21.6141	28.0948	37.7088	47.8799	55.8830	59.5734	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	330.1301	333.5558	324.9231	306.5451	283.3462	261.5425	246.9763	243.5506	252.1833	270.5613	293.7602	315.5639	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	(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)	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	(71)
Water heating gains (Table 5)	72.5933	70.4380	65.9616	59.8783	55.9280	50.3679	45.6449	51.6995	53.8530	60.1489	67.2585	70.4486	(72)
Total internal gains	565.6082	560.3979	537.6748	503.0423	467.8901	436.8359	419.1577	428.2672	448.6674	483.5125	521.8240	550.5082	(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				3.3840	11.9814	0.7600	0.7200	0.7700	15.3751 (74)			
South				3.8160	50.9848	0.7600	0.7200	0.7700	73.7783 (78)			
Solar gains	89.1534	135.1123	181.4602	234.4201	261.3101	281.0191	266.5497	244.9065	213.4565	158.8028	108.9987	75.8531 (83)
Total gains	654.7616	695.5102	719.1350	737.4624	729.2003	717.8550	685.7074	673.1737	662.1240	642.3152	630.8227	626.3613 (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	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	
alpha	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	
util living area	0.9667	0.9567	0.9337	0.8837	0.7783	0.5784	0.3979	0.4168	0.6826	0.8761	0.9472	0.9707	(86)
MIT	19.6669	19.7960	20.0762	20.4187	20.7438	20.9406	20.9889	20.9867	20.8817	20.5257	20.0433	19.6254	(87)
Th 2	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	(88)
util rest of house	0.9598	0.9478	0.9191	0.8563	0.7222	0.4793	0.2727	0.2906	0.5954	0.8415	0.9345	0.9646	(89)
MIT 2	18.7995	18.9257	19.1989	19.5250	19.8158	19.9623	19.9860	19.9854	19.9257	19.6288	19.1700	18.7591	(90)
Living area fraction	18.9380	19.0647	19.3390	19.6677	19.9640	20.1185	20.1462	20.1453	20.0784	19.7720	19.3095	18.8974	(91)
MIT	18.9380	19.0647	19.3390	19.6677	19.9640	20.1185	20.1462	20.1453	20.0784	19.7720	19.3095	18.8974	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.7880	18.9147	19.1890	19.5177	19.8140	19.9685	19.9962	19.9953	19.9284	19.6220	19.1595	18.7474	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9493	0.9358	0.9049	0.8410	0.7112	0.4772	0.2737	0.2915	0.5897	0.8264	0.9213	0.9547	(94)
Useful gains	621.5390	650.8305	650.7781	620.2359	518.6032	342.5707	187.6931	196.2456	390.4712	530.8232	581.1537	598.0024	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1234.3294	1200.6650	1063.0840	867.2873	614.4598	357.8634	189.0249	197.9625	426.3881	723.3929	1006.3132	1230.6694	(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	455.9161	369.4888	306.7556	177.8770	71.3174	0.0000	0.0000	0.0000	0.0000	143.2718	306.1148	470.7042	(98)
Space heating													
Space heating per m2	(98) / (4) = 28.4691												(99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2543.0339 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	455.9161	369.4888	306.7556	177.8770	71.3174	0.0000	0.0000	0.0000	0.0000	143.2718	306.1148	470.7042	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	503.7747	408.2749	338.9564	196.5492	78.8037	0.0000	0.0000	0.0000	0.0000	158.3114	338.2484	520.1152	(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	165.9380	145.5198	151.0860	133.0292	128.6171	112.4199	105.5938	119.1506	119.9750	138.0722	149.0251	161.1361	(64)
Efficiency of water heater (217)m	89.6234	89.5723	89.4184	89.1025	88.4152	87.3000	87.3000	87.3000	87.3000	88.9008	89.4267	87.3000	(216)
Fuel for water heating, kWh/month	185.1503	162.4608	168.9652	149.2991	145.4695	128.7742	120.9551	136.4840	137.4285	155.3105	166.6450	179.7154	(219)
Water heating fuel used												1836.6576	(219)
Annual totals kWh/year													
Space heating fuel - main system												2543.0339	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 6.9550, total flow = 29.0000, SFP = 0.2398)													
mechanical ventilation fans (SFP = 0.2398)													62.5620 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													137.5620 (231)
Electricity for lighting (calculated in Appendix L)													409.4541 (232)
Total delivered energy for all uses													4926.7077 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2543.0339	3.6300	92.3121 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1836.6576	3.6300	66.6707 (247)
Mechanical ventilation fans	62.5620	19.4400	12.1621 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Energy for lighting	409.4541	19.4400	79.5979 (250)
Additional standing charges			95.0000 (251)
Total energy cost			360.3227 (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	2543.0339	0.2160	549.2953 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1836.6576	0.2160	396.7180 (264)
Space and water heating			946.0134 (265)
Pumps and fans	137.5620	0.5190	71.3947 (267)
Energy for lighting	409.4541	0.5190	212.5067 (268)
Total kg/year			1229.9148 (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	2543.0339	1.2200	3102.5014 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1836.6576	1.2200	2240.7223 (264)
Space and water heating			5343.2237 (265)
Pumps and fans	137.5620	3.0700	422.3155 (267)
Energy for lighting	409.4541	3.0700	1257.0242 (268)
Primary energy kWh/year			7022.5634 (272)
Primary energy kWh/m2/year			86.8699 (273)

SAP 2012 EPC IMPROVEMENTS

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Current energy efficiency rating: B 83
Current environmental impact rating: B 86

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 25	-182 kg (14.8%)
U Solar photovoltaic panels	+ 10.6	-£ 355	-947 kg (90.3%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£25	2.25 kg/m²	B 84	B 88
Solar photovoltaic panels	£355	11.71 kg/m²	A 95	A 97
Total Savings	£380	13.96 kg/m²		

Potential energy efficiency rating: A 95
Potential environmental impact rating: A 97

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, Thames Valley):			
	Current	Potential	Saving
Electricity	£106	£116	-£10
Mains gas	£254	£219	£35
Space heating	£214	£214	£0
Water heating	£67	£41	£25
Lighting	£80	£80	£0
Generated (PV)	-£0	-£355	£355
Total cost of fuels	£360	-£20	£380
Total cost of uses	£361	-£20	£380
Delivered energy	61 kWh/m²	27 kWh/m²	34 kWh/m²
Carbon dioxide emissions	1.2 tonnes	0.1 tonnes	1.1 tonnes
CO2 emissions per m²	15 kg/m²	1 kg/m²	14 kg/m²
Primary energy	87 kWh/m²	5 kWh/m²	82 kWh/m²

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.4200 (1b)	x 2.6100 (2b)	= 105.4962 (1b) - (3b)
First floor	40.4200 (1c)	x 2.6800 (2c)	= 108.3256 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.8218 (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												5.0100
Infiltration rate												0.2505 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2317 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.2954	0.2896	0.2838	0.2549	0.2491	0.2201	0.2201	0.2143	0.2317	0.2491	0.2607	0.2723 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5454	0.5396	0.5338	0.5049	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5107	0.5223 (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
Windows (Uw = 1.40)			7.2000	1.3258	9.5455		(27)
Solid Door			2.1500	1.2000	2.5800		(26)
Half Glazed Door			3.1600	1.3000	4.1080		(26a)
Fir - Ground			40.4210	0.1500	6.0632	75.6000	3055.8276 (28a)
Wl - Brick	81.4800	10.3100	71.1700	0.2200	15.6574	58.3400	4152.0578 (29a)
Wl - Clad	13.7200	2.1960	11.5240	0.2200	2.5353	58.3400	672.3102 (29a)
Rf - Ins Joist	40.4210		40.4210	0.1000	4.0421	5.8200	235.2502 (30)
Total net area of external elements Aum(A, m ²)			176.0460				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	44.5314			(33)
Party Wall			46.5310	0.0000	0.0000	54.0300	2514.0699 (32)
Ground Floor Stud			86.6885			5.8200	504.5273 (32c)
1st Floor Stud			94.6831			5.8200	551.0555 (32c)
Internal Floor			40.4200			18.0000	727.5600 (32d)
Internal Ceiling			40.4200			5.8200	235.2444 (32e)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				12647.9029 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.4560 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3638 (36)
Total fabric heat loss			(33) + (36) =				54.8952 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.4864	Feb 38.0777	Mar 37.6689	Apr 35.6252	May 35.2806	Jun 35.2806	Jul 35.2806	Aug 35.2806	Sep 35.2806	Oct 35.2806	Nov 36.0339	Dec 36.8514 (38)
Heat transfer coeff	93.3817	92.9729	92.5642	90.5204	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.9292	91.7467 (39)
Average = Sum(39)m / 12 =												91.0975 (39)
HLP	Jan 1.1551	Feb 1.1501	Mar 1.1450	Apr 1.1197	May 1.1155	Jun 1.1155	Jul 1.1155	Aug 1.1155	Sep 1.1155	Oct 1.1155	Nov 1.1248	Dec 1.1349 (40)
HLP (average)												1.1269 (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	2.4786 (42)
Average daily hot water use (litres/day)	93.0669 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	102.3736	98.6509	94.9282	91.2056	87.4829	83.7602	83.7602	87.4829	91.2056	94.9282	98.6509	102.3736	(44)
Energy content (annual)	151.8171	132.7802	137.0172	119.4550	114.6199	98.9082	91.6530	105.1732	106.4293	124.0331	135.3918	147.0267	(45)
Distribution loss (46)m = 0.15 x (45)m	22.7726	19.9170	20.5526	17.9182	17.1930	14.8362	13.7480	15.7760	15.9644	18.6050	20.3088	22.0540	(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	14.1209	12.7397	14.0687	13.5743	13.9972	13.5116	13.9408	13.9774	13.5458	14.0391	13.6334	14.1094	(61)
Total heat required for water heating calculated for each month	165.9380	145.5198	151.0860	133.0292	128.6171	112.4199	105.5938	119.1506	119.9750	138.0722	149.0251	161.1361	(62)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.7000 (H2)
Collector heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0050 (H3a)
Collector effective heat loss coefficient													1.8063 (H3b)
Collector performance ratio													2.5804 (H4)
Annual solar radiation per m2													1079.5246 (H5)
Overshading factor													0.8000 (H6)
Solar energy available													1813.6014 (H7)
Adjustment factor for showers													1.0000 (H7a)
Solar-to-load ratio													1.2385 (H8)
Utilisation factor													0.5540 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													75.0000 (H13)
Daily hot water demand													93.0669 (H14)
Volume ratio Veff/V													0.8059 (H15)
Solar storage volume factor													0.9568 (H16)
Solar input	-24.5120	-40.9034	-69.6632	-93.3624	-115.3414	-113.3990	-111.9003	-97.7679	-76.5719	-52.2896	-29.0747	-20.5123	(63)
Solar input (sum of months) = Sum(63)m =													-845.2980 (63)
Output from w/h	141.4260	104.6164	81.4228	39.6668	13.2757	0.0000	0.0000	21.3827	43.4032	85.7826	119.9504	140.6238	(64)
Total per year (kWh/year) = Sum(64)m =													791.5505 (64)
Heat gains from water heating, kWh/month	54.0094	47.3343	49.0754	43.1123	41.6104	36.2649	33.9598	38.4644	38.7742	44.7508	48.4261	52.4137	(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	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.9625	51.4818	41.8678	31.6966	23.6936	20.0031	21.6141	28.0948	37.7088	47.8799	55.8830	59.5734	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	330.1301	333.5558	324.9231	306.5451	283.3462	261.5425	246.9763	243.5506	252.1833	270.5613	293.7602	315.5639	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	(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)	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	(71)
Water heating gains (Table 5)	72.5933	70.4380	65.9616	59.8783	55.9280	50.3679	45.6449	51.6995	53.8530	60.1489	67.2585	70.4486	(72)
Total internal gains	565.6082	560.3979	537.6748	503.0423	467.8901	436.8359	419.1577	428.2672	448.6674	483.5125	521.8240	550.5082	(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												3.3840		10.6334		0.7600		0.7200		0.7700		13.6452	(74)
South												3.8160		46.7521		0.7600		0.7200		0.7700		67.6532	(78)
Solar gains	81.2985	136.8753	185.4485	230.6908	262.1044	262.6106	252.1285	227.8167	200.7109	150.5476	97.0253			69.8340	(83)								
Total gains	646.9067	697.2732	723.1233	733.7331	729.9945	699.4465	671.2862	656.0839	649.3784	634.0601	618.8493			620.3422	(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	37.6231	37.7885	37.9554	38.8123	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.6378	38.2936	
alpha	3.5082	3.5192	3.5304	3.5875	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5759	3.5529	
util living area	0.9728	0.9625	0.9447	0.9067	0.8332	0.7020	0.5510	0.5814	0.7655	0.9051	0.9587	0.9761	(86)
MIT	19.4675	19.6378	19.9113	20.2850	20.6165	20.8566	20.9553	20.9444	20.7917	20.3941	19.8864	19.4500	(87)
Th 2	19.9561	19.9601	19.9642	19.9847	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9806	19.9724	(88)
util rest of house	0.9673	0.9549	0.9329	0.8853	0.7916	0.6243	0.4401	0.4727	0.6979	0.8793	0.9491	0.9712	(89)
MIT 2	18.5783	18.7487	19.0198	19.3964	19.7060	19.9063	19.9714	19.9659	19.8588	19.5070	19.0110	18.5736	(90)
Living area fraction													0.1597 (91)
MIT	18.7203	18.8906	19.1622	19.5383	19.8514	20.0580	20.1285	20.1222	20.0078	19.6487	19.1508	18.7136	(92)
Temperature adjustment													-0.1500
adjusted MIT	18.5703	18.7406	19.0122	19.3883	19.7014	19.9080	19.9785	19.9722	19.8578	19.4987	19.0008	18.5636	(93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9576	0.9434	0.9192	0.8700	0.7779	0.6174	0.4390	0.4709	0.6880	0.8640	0.9371	0.9624	(94)
Useful gains	619.4755	657.8253	664.7096	638.3612	567.8633	431.8697	294.6963	308.9327	446.7657	547.8358	579.9131	597.0072	(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	1332.5812	1286.8055	1158.1794	949.4049	721.5340	478.6560	304.6634	322.1216	519.2125	802.4485	1082.1322	1317.8104	(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	530.5506	422.6747	367.1415	223.9515	114.3310	0.0000	0.0000	0.0000	0.0000	189.4318	361.5978	536.2776	(98)
Space heating												2745.9565	(98)
Space heating per m2												33.9678	(99)
												(98) / (4) =	

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3034.2061 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	530.5506	422.6747	367.1415	223.9515	114.3310	0.0000	0.0000	0.0000	0.0000	189.4318	361.5978	536.2776	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	586.2438	467.0438	405.6813	247.4602	126.3326	0.0000	0.0000	0.0000	0.0000	209.3169	399.5556	592.5719	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	141.4260	104.6164	81.4228	39.6668	13.2757	0.0000	0.0000	21.3827	43.4032	85.7826	119.9504	140.6238	(64)
Efficiency of water heater (217)m	89.8072	89.8466	89.9018	90.0036	90.1562	87.3000	87.3000	87.3000	87.3000	89.4777	89.6812	87.3000	(216)
Fuel for water heating, kWh/month	157.4774	116.4389	90.5685	44.0725	14.7252	0.0000	0.0000	24.4933	49.7173	95.8704	133.7521	156.5687	(219)
Water heating fuel used												883.6844	(219)
Annual totals kWh/year													
Space heating fuel - main system												3034.2061	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 6.9550, total flow = 29.0000, SFP = 0.2398)													
mechanical ventilation fans (SFP = 0.2398)													62.5620 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													187.5620 (231)
Electricity for lighting (calculated in Appendix L)													409.4541 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1080 * 0.80) =									-1727.2394			-1727.2394	(233)
Total delivered energy for all uses												2787.6673	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3034.2061	3.4800	105.5904 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	883.6844	3.4800	30.7522 (247)
Mechanical ventilation fans	62.5620	13.1900	8.2519 (249)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Pump for solar water heating	50.0000	13.1900	6.5950 (249)
Energy for lighting	409.4541	13.1900	54.0070 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			107.2661 (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] =	0.3580 (257)
SAP value		95.0058
SAP rating (Section 12)		95 (258)
SAP band		A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3034.2061	0.2160	655.3885 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	883.6844	0.2160	190.8758 (264)
Space and water heating			846.2644 (265)
Pumps and fans	187.5620	0.5190	97.3447 (267)
Energy for lighting	409.4541	0.5190	212.5067 (268)
Energy saving/generation technologies			
PV Unit			
Total kg/year	-1727.2394	0.5190	-896.4372 (269)
CO2 emissions per m2			259.6785 (272)
EI value			3.2100 (273)
EI rating			97.2348
EI band			97 (274) A

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	40.4200 (1b)	x 2.6100 (2b)	= 105.4962 (1b) - (3b)
First floor	40.4200 (1c)	x 2.6800 (2c)	= 108.3256 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.8400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 213.8218 (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												5.0100
Infiltration rate												0.2505 (18)
Number of sides sheltered												1 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2317 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate												
	0.2433	0.2317	0.2317	0.2143	0.2143	0.1912	0.1970	0.1854	0.1912	0.2027	0.2027	0.2201 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.40)			7.2000	1.3258	9.5455		(27)
Solid Door			2.1500	1.2000	2.5800		(26)
Half Glazed Door			3.1600	1.3000	4.1080		(26a)
Fir - Ground			40.4210	0.1500	6.0632	75.6000	3055.8276 (28a)
Wl - Brick	81.4800	10.3100	71.1700	0.2200	15.6574	58.3400	4152.0578 (29a)
Wl - Clad	13.7200	2.1960	11.5240	0.2200	2.5353	58.3400	672.3102 (29a)
Rf - Ins Joist	40.4210		40.4210	0.1000	4.0421	5.8200	235.2502 (30)
Total net area of external elements Aum(A, m ²)			176.0460				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	44.5314			(33)
Party Wall			46.5310	0.0000	0.0000	54.0300	2514.0699 (32)
Ground Floor Stud			86.6885			5.8200	504.5273 (32c)
1st Floor Stud			94.6831			5.8200	551.0555 (32c)
Internal Floor			40.4200			18.0000	727.5600 (32d)
Internal Ceiling			40.4200			5.8200	235.2444 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12647.9029 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							156.4560 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3638 (36)
Total fabric heat loss						(33) + (36) =	54.8952 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.2806	Feb 35.2806	Mar 35.2806	Apr 35.2806	May 35.2806	Jun 35.2806	Jul 35.2806	Aug 35.2806	Sep 35.2806	Oct 35.2806	Nov 35.2806	Dec 35.2806 (38)
Heat transfer coeff	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758	90.1758 (39)
Average = Sum(39)m / 12 =												90.1758 (39)
HLP	Jan 1.1155	Feb 1.1155	Mar 1.1155	Apr 1.1155	May 1.1155	Jun 1.1155	Jul 1.1155	Aug 1.1155	Sep 1.1155	Oct 1.1155	Nov 1.1155	Dec 1.1155 (40)
HLP (average)												1.1155 (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	2.4786 (42)
Average daily hot water use (litres/day)	93.0669 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	102.3736	98.6509	94.9282	91.2056	87.4829	83.7602	83.7602	87.4829	91.2056	94.9282	98.6509	102.3736	(44)
Energy content (annual)	151.8171	132.7802	137.0172	119.4550	114.6199	98.9082	91.6530	105.1732	106.4293	124.0331	135.3918	147.0267	(45)
Distribution loss (46)m = 0.15 x (45)m	22.7726	19.9170	20.5526	17.9182	17.1930	14.8362	13.7480	15.7760	15.9644	18.6050	20.3088	22.0540	(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	14.1209	12.7397	14.0687	13.5743	13.9972	13.5116	13.9408	13.9774	13.5458	14.0391	13.6334	14.1094	(61)
Total heat required for water heating calculated for each month	165.9380	145.5198	151.0860	133.0292	128.6171	112.4199	105.5938	119.1506	119.9750	138.0722	149.0251	161.1361	(62)
Aperture area of solar collector													3.0000 (H1)
Zero-loss collector efficiency													0.7000 (H2)
Collector heat loss coefficient													1.8000 (H3)
Collector 2nd order heat loss coefficient													0.0050 (H3a)
Collector effective heat loss coefficient													1.8063 (H3b)
Collector performance ratio													2.5804 (H4)
Annual solar radiation per m2													1140.0998 (H5)
Overshading factor													0.8000 (H6)
Solar energy available													1915.3676 (H7)
Adjustment factor for showers													1.0000 (H7a)
Solar-to-load ratio													1.3080 (H8)
Utilisation factor													0.5344 (H9)
Collector performance factor													0.8793 (H10)
Dedicated solar storage volume													75.0000 (H11)
Effective solar volume													75.0000 (H13)
Daily hot water demand													93.0669 (H14)
Volume ratio Veff/V													0.8059 (H15)
Solar storage volume factor													0.9568 (H16)
Solar input	-26.5081	-39.8416	-67.0984	-92.7505	-111.7028	-117.5623	-114.7394	-102.4630	-79.9727	-54.4040	-32.2213	-21.9621	(63)
Solar input (sum of months) = Sum(63)m =													-861.2263 (63)
Output from w/h	139.4299	105.6782	83.9876	40.2787	16.9143	0.0000	0.0000	16.6876	40.0023	83.6682	116.8038	139.1740	(64)
Total per year (kWh/year) = Sum(64)m =													782.6247 (64)
Heat gains from water heating, kWh/month	54.0094	47.3343	49.0754	43.1123	41.6104	36.2649	33.9598	38.4644	38.7742	44.7508	48.4261	52.4137	(65)

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	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	148.7164	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	57.9625	51.4818	41.8678	31.6966	23.6936	20.0031	21.6141	28.0948	37.7088	47.8799	55.8830	59.5734	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	330.1301	333.5558	324.9231	306.5451	283.3462	261.5425	246.9763	243.5506	252.1833	270.5613	293.7602	315.5639	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	52.3502	(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)	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	-99.1442	(71)
Water heating gains (Table 5)	72.5933	70.4380	65.9616	59.8783	55.9280	50.3679	45.6449	51.6995	53.8530	60.1489	67.2585	70.4486	(72)
Total internal gains	565.6082	560.3979	537.6748	503.0423	467.8901	436.8359	419.1577	428.2672	448.6674	483.5125	521.8240	550.5082	(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					3.3840	11.9814	0.7600	0.7200			0.7700			15.3751 (74)
South					3.8160	50.9848	0.7600	0.7200			0.7700			73.7783 (78)

Solar gains	89.1534	135.1123	181.4602	234.4201	261.3101	281.0191	266.5497	244.9065	213.4565	158.8028	108.9987			75.8531 (83)
Total gains	654.7616	695.5102	719.1350	737.4624	729.2003	717.8550	685.7074	673.1737	662.1240	642.3152	630.8227			626.3613 (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	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	38.9606	
Feb	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	3.5974	
Mar	0.9667	0.9567	0.9337	0.8837	0.7783	0.5784	0.3979	0.4168	0.6826	0.8761	0.9472	0.9707	(86)
Apr	19.6669	19.7960	20.0762	20.4187	20.7438	20.9406	20.9889	20.9867	20.8817	20.5257	20.0433	19.6254	(87)
May	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	19.9882	(88)
Jun	0.9598	0.9478	0.9191	0.8563	0.7222	0.4793	0.2727	0.2906	0.5954	0.8415	0.9345	0.9646	(89)
Jul	18.7995	18.9257	19.1989	19.5250	19.8158	19.9623	19.9860	19.9854	19.9257	19.6288	19.1700	18.7591	(90)
Aug	18.9380	19.0647	19.3390	19.6677	19.9640	20.1185	20.1462	20.1453	20.0784	19.7720	19.3095	18.8974	(92)
Sep	18.7880	18.9147	19.1890	19.5177	19.8140	19.9685	19.9962	19.9953	19.9284	19.6220	19.1595	18.7474	(93)
Oct													
Nov													
Dec													
Temperature adjustment													-0.1500
adjusted MIT													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9493	0.9358	0.9049	0.8410	0.7112	0.4772	0.2737	0.2915	0.5897	0.8264	0.9213	0.9547	(94)
Useful gains	621.5390	650.8305	650.7781	620.2359	518.6032	342.5707	187.6931	196.2456	390.4712	530.8232	581.1537	598.0024	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1234.3294	1200.6650	1063.0840	867.2873	614.4598	357.8634	189.0249	197.9625	426.3881	723.3929	1006.3132	1230.6694	(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	455.9161	369.4888	306.7556	177.8770	71.3174	0.0000	0.0000	0.0000	0.0000	143.2718	306.1148	470.7042	(98)
Space heating												2301.4457	(98)
Space heating per m2											(98) / (4) =	28.4691	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2543.0339 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	455.9161	369.4888	306.7556	177.8770	71.3174	0.0000	0.0000	0.0000	0.0000	143.2718	306.1148	470.7042	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	503.7747	408.2749	338.9564	196.5492	78.8037	0.0000	0.0000	0.0000	0.0000	158.3114	338.2484	520.1152	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	139.4299	105.6782	83.9876	40.2787	16.9143	0.0000	0.0000	16.6876	40.0023	83.6682	116.8038	139.1740	(64)
Efficiency of water heater (217)m	89.7297	89.7682	89.7925	89.8916	89.8685	87.3000	87.3000	87.3000	87.3000	89.2933	89.5930	87.3000	(216)
Fuel for water heating, kWh/month	155.3888	117.7234	93.5352	44.8081	18.8212	0.0000	0.0000	19.1152	45.8217	93.7005	130.3716	155.0698	(219)
Water heating fuel used												874.3554	(219)
Annual totals kWh/year													
Space heating fuel - main system												2543.0339	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 6.9550, total flow = 29.0000, SFP = 0.2398)													
mechanical ventilation fans (SFP = 0.2398)													62.5620 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													187.5620 (231)
Electricity for lighting (calculated in Appendix L)													409.4541 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 2.50 * 1140 * 0.80) =									-1824.1596			-1824.1596	(233)
Total delivered energy for all uses												2190.2458	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2543.0339	3.6300	92.3121 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	874.3554	3.6300	31.7391 (247)
Mechanical ventilation fans	62.5620	19.4400	12.1621 (249)
Pumps and fans for heating	75.0000	19.4400	14.5800 (249)
Pump for solar water heating	50.0000	19.4400	9.7200 (249)
Energy for lighting	409.4541	19.4400	79.5979 (250)
Additional standing charges			95.0000 (251)
Energy saving/generation technologies			
PV Unit	-1824.1596	19.4400	-354.6166 (252)
Total energy cost			-19.5055 (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	2543.0339	0.2160	549.2953 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	874.3554	0.2160	188.8608 (264)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Space and water heating			738.1561 (265)
Pumps and fans	187.5620	0.5190	97.3447 (267)
Energy for lighting	409.4541	0.5190	212.5067 (268)
Energy saving/generation technologies			
PV Unit	-1824.1596	0.5190	-946.7389 (269)
Total kg/year			101.2686 (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	2543.0339	1.2200	3102.5014 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	874.3554	1.2200	1066.7135 (264)
Space and water heating			4169.2149 (265)
Pumps and fans	187.5620	3.0700	575.8155 (267)
Energy for lighting	409.4541	3.0700	1257.0242 (268)
Energy saving/generation technologies			
PV Unit	-1824.1596	3.0700	-5600.1701 (269)
Primary energy kWh/year			401.8845 (272)
Primary energy kWh/m2/year			4.9714 (273)

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

Overheating Calculation Input Data

Dwelling type	SemiDetached House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	156.5 (calculated from construction elements)
Night ventilation	Yes
Ventilation rate during hot weather (ach)	4.21 (Calculated rate)

Overheating Calculation

Summer ventilation heat loss coefficient	297.02 (P1)
Transmission heat loss coefficient	54.90 (37)
Summer heat loss coefficient	351.92 (P2)

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

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North	0.850	0.90	1.000	0.765 (P8)
South	0.850	0.90	1.000	0.765 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North	3.3840	81.1852	0.7600	0.7200	0.7650	103.5040
South	3.8160	112.2060	0.7600	0.7200	0.7650	161.3149
total:						264.8189

	Jun	Jul	Aug	
Solar gains	279	265	243	(P3)
Internal gains	434	416	425	
Total summer gains	713	681	669	(P5)

Summer gain/loss ratio	2.03	1.94	1.90	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 156.5)	0.90	0.90	0.90	
Threshold temperature	18.93	20.74	20.60	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	377 - PRJ012318				Issued on Date	13/07/2022
Assessment Reference	377 S			Prop Type Ref	Preston	
Property	377 - PRJ012318					
SAP Rating	83 B	DER	18.43	TER	19.42	
Environmental	86 B	% DER<TER	5.08			
CO ₂ Emissions (t/year)	1.23	DFEE	48.53	TFEE	55.17	
General Requirements Compliance	Pass	% DFEE<TFEE	12.04			
Assessor Details	Chris Nicholls , Tel: ,				Assessor ID	U903-0001
Client						

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	19.42	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.43	kgCO ₂ /m ²	Pass
	-0.99 (-5.1%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.17	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	48.53	kWh/m ² /yr	
	-6.7 (-12.1%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.22 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.34 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.01 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Ideal LOGIC COMBI ESP1 35 Combi boiler Efficiency: 89.6% SEDBUK2009 Minimum: 88.0%	Pass
---------------------	---	------

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Continuous extract system (decentralised)

Specific fan power

0.1900 0.1800

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

3.38 m², No overhang

Windows facing South

3.82 m², No overhang

Air change rate

4.21 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.01 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K