

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	74278-06			Issued on Date	30/03/2023
Assessment Reference	001	Prop Type Ref	HT 2B3P (Mid)		
Property	Flat 6, 32 Brookstone Close, MANCHESTER, M21 7AE				
SAP Rating	88 B	DER	21.89	TER	22.73
Environmental	85 B	% DER<TER	3.70		
CO ₂ Emissions (t/year)	1.10	DFEE	27.51	TFEE	33.74
General Requirements Compliance	Pass	% DFEE<TFEE	18.47		
Assessor Details	Mr. Paul Goddard, Anderson Goddard Limited, Tel: 01925 733 942, paul.goddard@andersongoddard.com			Assessor ID	B342-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

DWELLING AS BUILT

Mid-floor flat, total floor area 61 m²

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

1a TER and DER

Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 22.73 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 21.89 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)33.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)27.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.35 (max. 2.00)	1.35 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.110

3 Air permeability

Air permeability at 50 pascals: 3.22 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Electric storage heaters with radiators or underfloor - Electric
High heat retention storage heaters

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured store loss: 1.13 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Controls for high heat retention storage heaters OK

Hot water controls: Cylinderstat OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system
Specific fan power: 0.32
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (West Pennines (England)):Slight OK

Based on:

Overshading: Average
Windows facing North East: 1.19 m², No overhang
Windows facing South East: 5.19 m², No overhang
Windows facing South West: 6.76 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Air permeability 3.2 m³/m²h
Photovoltaic array 488.00 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.2200
Infiltration rate					0.1610 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1369 (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	0.1745	0.1711	0.1676	0.1505	0.1471	0.1300	0.1300	0.1266	0.1369	0.1471	0.1540	0.1608 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
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
Window (Uw = 1.35)			13.1400	1.2808	16.8302		(27)
Main	54.5000	13.1400	41.3600	0.1800	7.4448	110.0000	4549.6000 (29a)
Total net area of external elements Aum(A, m ²)			54.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	24.2750			(33)
Party Wall 1			24.0800	0.0000	0.0000	70.0000	1685.6000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11569.4700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		189.6013 (35)
Thermal bridges (User defined value 0.110 * total exposed area)		5.9950 (36)
Total fabric heat loss	(33) + (36) =	30.2700 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639 (38)
Average = Sum(39)m / 12 =	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339 (39)
HLP	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921 (40)
HLP (average)												0.8921 (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												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397 (44)
Energy content (annual)	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)

Anderson Goddard Ltd
eco-survey.com

Independent Energy Specialists, SAP, SBEM, EPC's, U-Value & Condensation Risk, 2D & 3D Thermal Modelling

Water storage loss:													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.1300 (48)	
Temperature factor from Table 2b												0.6000 (49)	
Enter (49) or (54) in (55)												0.6780 (55)	
Total storage loss													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180	20.3400	21.0180	20.3400	21.0180	(56)
If cylinder contains dedicated solar storage													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180	20.3400	21.0180	20.3400	21.0180	(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)
Total heat required for water heating calculated for each month													
	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(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	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(64)
								Total per year (kWh/year) = Sum (64)m =					1536.7864 (64)
Heat gains from water heating, kWh/month													
	61.2612	54.0606	56.9283	51.2443	50.3711	45.2289	43.6472	47.6055	47.4308	53.1270	55.9100	59.8587	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.6662	13.9146	11.3161	8.5670	6.4039	5.4065	5.8419	7.5935	10.1920	12.9411	15.1041	16.1016 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516 (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)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129 (71)
Water heating gains (Table 5)	82.3403	80.4474	76.5165	71.1726	67.7031	62.8179	58.6656	63.9858	65.8761	71.4072	77.6528	80.4553 (72)
Total internal gains	326.6732	324.8499	313.7311	295.8675	277.9014	260.4269	248.9660	254.2165	263.2948	281.3456	302.0878	317.4795 (73)

[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			
Northeast				1.1900	11.2829	0.6700	0.7000	0.7700	4.3639 (75)			
Southeast				5.1900	36.7938	0.6700	0.7000	0.7700	62.0652 (77)			
Southwest				6.7600	36.7938	0.6700	0.7000	0.7700	80.8403 (79)			
Solar gains	147.2694	252.3038	349.0633	438.9598	497.5620	496.5549	477.6536	433.5376	380.1339	279.8876	176.6588	125.8611 (83)
Total gains	473.9426	577.1538	662.7943	734.8273	775.4634	756.9818	726.6196	687.7542	643.4287	561.2332	478.7466	443.3407 (84)

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	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394
alpha	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360
util living area	0.9804	0.9526	0.8952	0.7830	0.6228	0.4548	0.3287	0.3625	0.5660	0.8351	0.9589	0.9853 (86)
MIT	20.2380	20.4283	20.6393	20.8215	20.9184	20.9494	20.9549	20.9543	20.9375	20.7986	20.4753	20.1842 (87)
Th 2	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742 (88)
util rest of house	0.9760	0.9430	0.8759	0.7490	0.5754	0.3982	0.2675	0.2982	0.5044	0.7993	0.9489	0.9820 (89)
MIT 2	19.1596	19.4302	19.7222	19.9600	20.0741	20.1051	20.1093	20.1090	20.0953	19.9381	19.5007	19.0824 (90)
Living area fraction									fLA = Living area / (4) =			0.4012 (91)
MIT	19.5922	19.8306	20.0901	20.3056	20.4129	20.4438	20.4486	20.4481	20.4332	20.2833	19.8917	19.5244 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5922	19.8306	20.0901	20.3056	20.4129	20.4438	20.4486	20.4481	20.4332	20.2833	19.8917	19.5244 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9723	0.9384	0.8737	0.7547	0.5894	0.4168	0.2879	0.3196	0.5241	0.8044	0.9449	0.9788 (94)
Useful gains	460.8191	541.6113	579.1030	554.5695	457.0782	315.5311	209.1710	219.8082	337.2016	451.4674	452.3481	433.9481 (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	832.4155	812.7326	739.7631	620.8518	474.2747	318.1008	209.4928	220.3527	344.7414	527.1015	696.2998	834.1677 (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	276.4678	182.1935	119.5311	47.7233	12.7942	0.0000	0.0000	0.0000	0.0000	56.2717	175.6452	297.7634 (98)
Space heating												1168.3902 (98)
Space heating per m2												19.1477 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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 %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1168.3902 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	276.4678	182.1935	119.5311	47.7233	12.7942	0.0000	0.0000	0.0000	0.0000	56.2717	175.6452	297.7634	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	276.4678	182.1935	119.5311	47.7233	12.7942	0.0000	0.0000	0.0000	0.0000	56.2717	175.6452	297.7634	(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	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(219)
Water heating fuel used												1536.7864	(219)
Annual totals kWh/year													
Space heating fuel - main system												1168.3902	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.4000, SFP = 0.4480)													
mechanical ventilation fans (SFP = 0.4480)													80.0426 (230a)
Total electricity for the above, kWh/year													80.0426 (231)
Electricity for lighting (calculated in Appendix L)													276.6697 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3061.8890 (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	1168.3902	0.5190	606.3945	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	0.5190	797.5921	(264)
Space and water heating			1403.9867	(265)
Pumps and fans	80.0426	0.5190	41.5421	(267)
Energy for lighting	276.6697	0.5190	143.5916	(268)
Energy saving/generation technologies				
PV Unit (0.90*43.39 + 0.10*12.14)	-488.0000	0.5190	-253.2720	(269)
Total CO2, kg/year			1335.8484	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			21.8900	(273)

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

DER		21.8900	ZC1
Total Floor Area		61.0200	
Assumed number of occupants		2.0103	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		17.0444	ZC2
CO2 emissions from cooking, equation (L16)		2.7409	ZC3
Total CO2 emissions		41.6752	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		41.6752	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (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					2 * 10 = 20.0000 (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) =					20.0000 / (5) = 0.1366 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3866 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3286 (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												
	0.4189	0.4107	0.4025	0.3614	0.3532	0.3122	0.3122	0.3039	0.3286	0.3532	0.3697	0.3861 (22b)
Effective ac	0.5878	0.5843	0.5810	0.5653	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5683	0.5745 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opening Type (Uw = 1.40)			13.1400	1.3258	17.4205			(27)				
Main	54.5000	13.1400	41.3600	0.1800	7.4448			(29a)				
Total net area of external elements Aum(A, m2)			54.5000					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			24.8653		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.1209 (36)				
Total fabric heat loss								(33) + (36) = 30.9862 (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	28.4050	28.2403	28.0789	27.3207	27.1788	26.5184	26.5184	26.3961	26.7728	27.1788	27.4658	27.7658 (38)
Heat transfer coeff	59.3911	59.2265	59.0650	58.3068	58.1650	57.5046	57.5046	57.3823	57.7590	58.1650	58.4519	58.7520 (39)
Average = Sum(39)m / 12 =												58.3061 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9733	0.9706	0.9680	0.9555	0.9532	0.9424	0.9424	0.9404	0.9466	0.9532	0.9579	0.9628 (40)
HLP (average)												0.9555 (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												
Average daily hot water use (litres/day)												2.0103 (42)
												81.9452 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397 (44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)										Total = Sum(45)m =		1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	180.2694	158.9983	167.2382	150.2716	147.5174	132.1803	127.2951	139.1996	138.8025	155.8057	164.3040	176.0515 (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	180.2694	158.9983	167.2382	150.2716	147.5174	132.1803	127.2951	139.1996	138.8025	155.8057	164.3040	176.0515 (64)
	81.7227	72.5420	77.3898	71.0457	70.8327	65.0304	64.1088	68.0670	67.2323	73.5885	75.7115	80.3203 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.6662	13.9146	11.3161	8.5670	6.4039	5.4065	5.8419	7.5935	10.1920	12.9411	15.1041	16.1016	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	(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)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	(71)
Water heating gains (Table 5)	109.8423	107.9494	104.0186	98.6746	95.2052	90.3200	86.1677	91.4879	93.3782	98.9093	105.1549	107.9573	(72)
Total internal gains	357.1752	355.3520	344.2331	326.3695	308.4034	290.9289	279.4680	284.7186	293.7969	311.8476	332.5898	347.9816	(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	
Northeast	1.1900				11.2829		0.6300		0.7000		0.7700		4.1034 (75)	
Southeast	5.1900				36.7938		0.6300		0.7000		0.7700		58.3599 (77)	
Southwest	6.7600				36.7938		0.6300		0.7000		0.7700		76.0140 (79)	
Solar gains	138.4772	237.2409	328.2237	412.7532	467.8568	466.9098	449.1370	407.6548	357.4393	263.1779	166.1120	118.3470	(83)	
Total gains	495.6525	592.5929	672.4568	739.1228	776.2602	757.8387	728.6050	692.3734	651.2362	575.0255	498.7018	466.3286	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.3490	71.5474	71.7430	72.6759	72.8531	73.6898	73.6898	73.8468	73.3652	72.8531	72.4954	72.1252	
alpha	5.7566	5.7698	5.7829	5.8451	5.8569	5.9127	5.9127	5.9231	5.8910	5.8569	5.8330	5.8083	
util living area	0.9907	0.9747	0.9342	0.8333	0.6690	0.4821	0.3468	0.3805	0.5983	0.8749	0.9768	0.9932	(86)
MIT	20.2036	20.4018	20.6367	20.8570	20.9655	20.9957	20.9995	20.9991	20.9858	20.8374	20.4811	20.1652	(87)
Th 2	20.1056	20.1079	20.1101	20.1206	20.1225	20.1316	20.1316	20.1333	20.1281	20.1225	20.1186	20.1144	(88)
util rest of house	0.9879	0.9675	0.9171	0.7971	0.6147	0.4183	0.2786	0.3092	0.5283	0.8377	0.9690	0.9911	(89)
MIT 2	19.0597	19.3450	19.6736	19.9685	20.0927	20.1291	20.1314	20.1330	20.1185	19.9537	19.4698	19.0109	(90)
Living area fraction	19.5186	19.7690	20.0600	20.3250	20.4429	20.4768	20.4797	20.4805	20.4664	20.3083	19.8755	19.4740	(91)
MIT	19.5186	19.7690	20.0600	20.3250	20.4429	20.4768	20.4797	20.4805	20.4664	20.3083	19.8755	19.4740	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5186	19.7690	20.0600	20.3250	20.4429	20.4768	20.4797	20.4805	20.4664	20.3083	19.8755	19.4740	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	488.4827	571.4306	615.9478	595.7918	492.9438	336.3546	222.9582	233.8942	362.0880	486.6412	481.9176	461.2693	(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	903.8497	880.6378	800.9214	666.1548	508.5294	337.9405	223.0997	234.1463	367.7195	564.6806	746.7522	897.3790	(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	309.0331	207.7872	137.6203	50.6614	11.5957	0.0000	0.0000	0.0000	0.0000	58.0613	190.6809	324.4656	(98)
Space heating												1289.9055	(98)
Space heating per m2												21.1391	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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 %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1379.5781 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	309.0331	207.7872	137.6203	50.6614	11.5957	0.0000	0.0000	0.0000	0.0000	58.0613	190.6809	324.4656 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	330.5167	222.2323	147.1875	54.1833	12.4018	0.0000	0.0000	0.0000	0.0000	62.0976	203.9368	347.0221 (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	180.2694	158.9983	167.2382	150.2716	147.5174	132.1803	127.2951	139.1996	138.8025	155.8057	164.3040	176.0515 (64)
Efficiency of water heater (217)m	86.2398	85.5287	84.2993	82.2519	80.4936	79.8000	79.8000	79.8000	79.8000	82.4464	85.2117	79.8000 (216)
Fuel for water heating, kWh/month	209.0328	185.9006	198.3863	182.6968	183.2661	165.6395	159.5177	174.4356	173.9380	188.9782	192.8186	203.7068 (219)
Water heating fuel used												2218.3171 (219)
Annual totals kWh/year												
Space heating fuel - main system												1379.5781 (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)												276.6697 (232)
Total delivered energy for all uses												3949.5649 (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	1379.5781	0.2160	297.9889 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2218.3171	0.2160	479.1565 (264)
Space and water heating			777.1454 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	276.6697	0.5190	143.5916 (268)
Total CO2, kg/m2/year			959.6619 (272)
Emissions per m2 for space and water heating			12.7359 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3532 (272b)
Emissions per m2 for pumps and fans			0.6379 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.7359 * 1.55) + 2.3532 + 0.6379, rounded to 2 d.p.			22.7300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (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					2 * 10 = 20.0000 (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) =				20.0000 / (5) = 0.1366 (8)
Pressure test					Yes
Measured/design AP50					3.2200
Infiltration rate					0.2976 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2529 (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	0.3225	0.3162	0.3098	0.2782	0.2719	0.2403	0.2403	0.2340	0.2529	0.2719	0.2845	0.2972 (22b)
Effective ac	0.5520	0.5500	0.5480	0.5387	0.5370	0.5289	0.5289	0.5274	0.5320	0.5370	0.5405	0.5442 (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	
Window (Uw = 1.35)							13.1400	1.2808	16.8302			(27)
Main			54.5000	13.1400			41.3600	0.1800	7.4448	110.0000	4549.6000	(29a)
Total net area of external elements Aum(A, m2)							54.5000					(31)
Fabric heat loss, W/K = Sum (A x U)							(26)...(30) + (32) =		24.2750			(33)
Party Wall 1							24.0800	0.0000	0.0000	70.0000	1685.6000	(32)
Party Floor 1							61.0200			40.0000	2440.8000	(32d)
Party Ceilings 1							60.0200			20.0000	1200.4000	(32b)
Internal Wall 1							121.4300			9.0000	1092.8700	(32c)
Heat capacity Cm = Sum(A x k)								(28)...(30) + (32) + (32a)...(32e) =		10969.2700	(34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K										179.7652	(35)	
Thermal bridges (User defined value 0.110 * total exposed area)										5.9950	(36)	
Total fabric heat loss								(33) + (36) =		30.2700	(37)	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	26.6769	26.5794	26.4837	26.0344	25.9504	25.5591	25.5591	25.4866	25.7098	25.9504	26.1204	26.2982 (38)
Average = Sum(39)m / 12 =	56.9469	56.8493	56.7537	56.3044	56.2203	55.8290	55.8290	55.7566	55.9798	56.2203	56.3904	56.5682 (39)
												56.3040 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9332	0.9317	0.9301	0.9227	0.9213	0.9149	0.9149	0.9137	0.9174	0.9213	0.9241	0.9270 (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												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397 (44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)											Total = Sum(45)m =	1289.3164 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	28.4058	24.8439	25.6367	22.3507	21.4460	18.5063	17.1488	19.6785	19.9135	23.2073	25.3326	27.5095 (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	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.6662	13.9146	11.3161	8.5670	6.4039	5.4065	5.8419	7.5935	10.1920	12.9411	15.1041	16.1016	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	(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)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	(71)
Water heating gains (Table 5)	38.1799	36.9701	34.4579	31.0426	28.8253	25.7032	23.0495	26.4496	27.6577	31.1926	35.1841	36.9752	(72)
Total internal gains	282.5128	281.3727	271.6725	255.7375	239.0236	223.3122	213.3498	216.6803	225.0764	241.1309	259.6191	273.9994	(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		
Northeast				1.1900	11.2829		0.6700	0.7000	0.7700		4.3639 (75)		
Southeast				5.1900	36.7938		0.6700	0.7000	0.7700		62.0652 (77)		
Southwest				6.7600	36.7938		0.6700	0.7000	0.7700		80.8403 (79)		
Solar gains	147.2694	252.3038	349.0633	438.9598	497.5620	496.5549	477.6536	433.5376	380.1339	279.8876	176.6588	125.8611	(83)
Total gains	429.7822	533.6765	620.7357	694.6973	736.5855	719.8670	691.0034	650.2179	605.2103	521.0185	436.2779	399.8606	(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	53.5063	53.5982	53.6885	54.1169	54.1978	54.5777	54.5777	54.6486	54.4307	54.1978	54.0344	53.8646	
alpha	4.5671	4.5732	4.5792	4.6078	4.6132	4.6385	4.6385	4.6432	4.6287	4.6132	4.6023	4.5910	
util living area	0.9853	0.9628	0.9148	0.8136	0.6602	0.4865	0.3536	0.3913	0.6068	0.8657	0.9689	0.9890	(86)
MIT	19.9004	20.1629	20.4679	20.7574	20.9236	20.9851	20.9973	20.9956	20.9602	20.7207	20.2457	19.8417	(87)
Th 2	20.1393	20.1407	20.1420	20.1482	20.1494	20.1548	20.1548	20.1558	20.1527	20.1494	20.1470	20.1446	(88)
util rest of house	0.9820	0.9551	0.8983	0.7817	0.6118	0.4258	0.2866	0.3209	0.5424	0.8339	0.9612	0.9866	(89)
MIT 2	19.1390	19.3969	19.6901	19.9596	20.0984	20.1473	20.1539	20.1543	20.1306	19.9354	19.4861	19.0852	(90)
Living area fraction	19.4444	19.7042	20.0021	20.2796	20.4295	20.4834	20.4922	20.4918	20.4634	20.2504	19.7908	19.3887	(92)
MIT	19.4444	19.7042	20.0021	20.2796	20.4295	20.4834	20.4922	20.4918	20.4634	20.2504	19.7908	19.3887	(93)
Temperature adjustment													0.0000
adjusted MIT	19.4444	19.7042	20.0021	20.2796	20.4295	20.4834	20.4922	20.4918	20.4634	20.2504	19.7908	19.3887	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	420.6344	507.2757	555.7313	546.6742	462.7413	323.7183	216.6035	226.9987	342.9467	436.6514	417.6533	393.3896	(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	862.4281	841.6098	766.2958	640.7239	490.7741	328.4658	217.3005	228.1462	356.2237	542.5501	715.6408	859.1981	(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	328.6946	224.6725	156.6600	67.7158	20.8563	0.0000	0.0000	0.0000	0.0000	78.7887	214.5510	346.5615	(98)
Space heating												1438.5004	(98)
Space heating per m2												23.5742	(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	524.7930	413.1349	423.7500	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9664	0.9840	0.9784	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	507.1366	406.5062	414.5905	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	916.4207	881.2049	834.7016	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	294.6845	353.1758	312.5627	0.0000	0.0000	0.0000	0.0000	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling												960.4230 (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	73.6711	88.2940	78.1407	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												240.1058 (107)
Space cooling per m2												3.9349 (108)
Energy for space heating												23.5742 (99)
Energy for space cooling												3.9349 (108)
Total												27.5091 (109)
Dwelling Fabric Energy Efficiency (DFEE)												27.5 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (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				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3866 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3286 (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	0.4189	0.4107	0.4025	0.3614	0.3532	0.3122	0.3122	0.3039	0.3286	0.3532	0.3697	0.3861 (22b)
Effective ac	0.5878	0.5843	0.5810	0.5653	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5683	0.5745 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.40)			13.1400	1.3258	17.4205		(27)
Main	54.5000	13.1400	41.3600	0.1800	7.4448		(29a)
Total net area of external elements Aum(A, m ²)			54.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.8653		(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)							6.1209 (36)
Total fabric heat loss						(33) + (36) =	30.9862 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	28.4050	28.2403	28.0789	27.3207	27.1788	26.5184	26.5184
Heat transfer coeff	59.3911	59.2265	59.0650	58.3068	58.1650	57.5046	57.5046
Average = Sum(39)m / 12 =						57.3823	57.7590
						58.1650	58.4519
						58.7520	58.3061 (39)
HLP	0.9733	0.9706	0.9680	0.9555	0.9532	0.9424	0.9424
HLP (average)						0.9404	0.9466
Days in month	31	28	31	30	31	30	31
						30	31
						31	30
						31	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397 (44)
Energy content (annual)	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m =											1289.3164 (45)
	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	28.4058	24.8439	25.6367	22.3507	21.4460	18.5063	17.1488	19.6785	19.9135	23.2073	25.3326	27.5095 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.6662	13.9146	11.3161	8.5670	6.4039	5.4065	5.8419	7.5935	10.1920	12.9411	15.1041	16.1016	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	(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)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	(71)
Water heating gains (Table 5)	38.1799	36.9701	34.4579	31.0426	28.8253	25.7032	23.0495	26.4496	27.6577	31.1926	35.1841	36.9752	(72)
Total internal gains	282.5128	281.3727	271.6725	255.7375	239.0236	223.3122	213.3498	216.6803	225.0764	241.1309	259.6191	273.9994	(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			
Northeast				1.1900	11.2829	0.6300	0.7000	0.7700	4.1034 (75)			
Southeast				5.1900	36.7938	0.6300	0.7000	0.7700	58.3599 (77)			
Southwest				6.7600	36.7938	0.6300	0.7000	0.7700	76.0140 (79)			
Solar gains	138.4772	237.2409	328.2237	412.7532	467.8568	466.9098	449.1370	407.6548	357.4393	263.1779	166.1120	118.3470 (83)
Total gains	420.9900	518.6136	599.8961	668.4908	706.8803	690.2219	662.4868	624.3351	582.5157	504.3088	425.7311	392.3465 (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	71.3490	71.5474	71.7430	72.6759	72.8531	73.6898	73.6898	73.8468	73.3652	72.8531	72.4954	72.1252		
alpha	5.7566	5.7698	5.7829	5.8451	5.8569	5.9127	5.9127	5.9231	5.8910	5.8569	5.8330	5.8083		
util living area	0.9958	0.9862	0.9580	0.8759	0.7206	0.5271	0.3811	0.4213	0.6592	0.9196	0.9889	0.9972	(86)	
MIT	20.0894	20.2966	20.5515	20.8085	20.9497	20.9932	20.9992	20.9985	20.9768	20.7747	20.3756	20.0506	(87)	
Th 2	20.1056	20.1079	20.1101	20.1206	20.1225	20.1316	20.1316	20.1333	20.1281	20.1225	20.1186	20.1144	(88)	
util rest of house	0.9945	0.9820	0.9459	0.8445	0.6660	0.4583	0.3064	0.3427	0.5858	0.8910	0.9848	0.9962	(89)	
MIT 2	19.2786	19.4851	19.7337	19.9775	20.0920	20.1288	20.1314	20.1329	20.1170	19.9556	19.5736	19.2474	(90)	
Living area fraction									fLA = Living area / (4) =			0.4012	(91)	
MIT	19.6039	19.8107	20.0618	20.3109	20.4361	20.4756	20.4795	20.4802	20.4619	20.2842	19.8954	19.5696	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.6039	19.8107	20.0618	20.3109	20.4361	20.4756	20.4795	20.4802	20.4619	20.2842	19.8954	19.5696	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9936	0.9803	0.9451	0.8519	0.6862	0.4858	0.3364	0.3743	0.6147	0.8969	0.9836	0.9955	(94)
Useful gains	418.2839	508.4111	566.9658	569.4738	485.0704	335.3293	222.8535	233.6902	358.0782	452.3351	418.7280	390.5890	(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	908.9166	883.1057	801.0279	665.3328	508.1340	337.8736	223.0910	234.1296	367.4583	563.2824	747.9133	902.9965	(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	365.0307	251.7948	174.1422	69.0185	17.1593	0.0000	0.0000	0.0000	0.0000	82.5448	237.0134	381.2312	(98)
Space heating												1577.9348	(98)
Space heating per m ²										(98) / (4) =		25.8593	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
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	540.5432	425.5340	436.1055	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9778	0.9915	0.9876	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	528.5500	421.9053	430.7147	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	881.7706	847.8737	804.4489	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	254.3188	316.9205	278.0583	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												849.2976	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	63.5797	79.2301	69.5146	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													212.3244 (107)
Space cooling per m2													3.4796 (108)
Energy for space heating													25.8593 (99)
Energy for space cooling													3.4796 (108)
Total													29.3389 (109)
Target Fabric Energy Efficiency (TFEE)													33.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.2200
Infiltration rate					0.1610 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1369 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.2000	4.2000	3.9000	4.0000	3.4000	3.3000	3.3000	3.4000	3.8000	3.8000	3.9000 (22)
Wind factor	1.0750	1.0500	1.0500	0.9750	1.0000	0.8500	0.8250	0.8250	0.8500	0.9500	0.9500	0.9750 (22a)
Adj infilt rate	0.1471	0.1437	0.1437	0.1334	0.1369	0.1163	0.1129	0.1129	0.1163	0.1300	0.1300	0.1334 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												
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
Window (Uw = 1.35)			13.1400	1.2808	16.8302		(27)
Main	54.5000	13.1400	41.3600	0.1800	7.4448	110.0000	4549.6000 (29a)
Total net area of external elements Aum(A, m ²)			54.5000				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				24.2750		(33)
Party Wall 1			24.0800	0.0000	0.0000	70.0000	1685.6000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11569.4700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		189.6013 (35)
Thermal bridges (User defined value 0.110 * total exposed area)		5.9950 (36)
Total fabric heat loss	(33) + (36) =	30.2700 (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	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639 (38)
Heat transfer coeff	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339 (39)
Average = Sum(39)m / 12 =												54.4339 (39)
HLP	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921 (40)
HLP (average)												0.8921 (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												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397	(44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)												Total = Sum(45)m = 1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)

Anderson Goddard Ltd
eco-survey.com

Independent Energy Specialists, SAP, SBEM, EPC's, U-Value & Condensation Risk, 2D & 3D Thermal Modelling

Water storage loss:													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.1300 (48)	
Temperature factor from Table 2b												0.6000 (49)	
Enter (49) or (54) in (55)												0.6780 (55)	
Total storage loss													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180 (56)	
If cylinder contains dedicated solar storage													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	20.3400	21.0180	20.3400	21.0180 (57)		
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)		
Total heat required for water heating calculated for each month													
	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746 (62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)		
												Solar input (sum of months) = Sum(63)m =	0.0000 (63)
Output from w/h													
	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746 (64)	
												Total per year (kWh/year) = Sum(64)m =	1536.7864 (64)
												1537 (64)	
RHI water heating demand													
Heat gains from water heating, kWh/month													
	61.2612	54.0606	56.9283	51.2443	50.3711	45.2289	43.6472	47.6055	47.4308	53.1270	55.9100	59.8587 (65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.1655	34.7864	28.2902	21.4175	16.0098	13.5162	14.6047	18.9838	25.4800	32.3527	37.7603	40.2540 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	261.9580	264.6763	257.8263	243.2434	224.8350	207.5338	195.9755	193.2572	200.1073	214.6902	233.0985	250.3997 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723 (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)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129 (71)
Water heating gains (Table 5)	82.3403	80.4474	76.5165	71.1726	67.7031	62.8179	58.6656	63.9858	65.8761	71.4072	77.6528	80.4553 (72)
Total internal gains	472.7425	469.1888	451.9117	425.1122	397.8267	373.1466	358.5246	365.5055	380.7421	407.7288	437.7904	460.3877 (73)

[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
Northeast	1.1900	9.9768	0.6700	0.7000	0.7700	3.8587 (75)
Southeast	5.1900	32.4665	0.6700	0.7000	0.7700	54.7658 (77)
Southwest	6.7600	32.4665	0.6700	0.7000	0.7700	71.3327 (79)

RHI space heating demand 7/13 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.2200
Infiltration rate					0.1610 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1369 (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	0.1745	0.1711	0.1676	0.1505	0.1471	0.1300	0.1300	0.1266	0.1369	0.1471	0.1540	0.1608 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												
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
Window (Uw = 1.35)			13.1400	1.2808	16.8302		(27)
Main	54.5000	13.1400	41.3600	0.1800	7.4448	110.0000	4549.6000 (29a)
Total net area of external elements Aum(A, m ²)			54.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			24.2750	(33)
Party Wall 1			24.0800	0.0000	0.0000	70.0000	1685.6000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11569.4700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		189.6013 (35)
Thermal bridges (User defined value 0.110 * total exposed area)		5.9950 (36)
Total fabric heat loss	(33) + (36) =	30.2700 (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	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639 (38)
Heat transfer coeff	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339 (39)
Average = Sum(39)m / 12 =												54.4339 (39)
HLP	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921 (40)
HLP (average)												0.8921 (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												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397	(44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)												Total = Sum(45)m = 1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)

Anderson Goddard Ltd
eco-survey.com

Independent Energy Specialists, SAP, SBEM, EPC's, U-Value & Condensation Risk, 2D & 3D Thermal Modelling

Water storage loss:													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.1300 (48)	
Temperature factor from Table 2b												0.6000 (49)	
Enter (49) or (54) in (55)												0.6780 (55)	
Total storage loss													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180	20.3400	21.0180	20.3400	21.0180	(56)
If cylinder contains dedicated solar storage	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180	20.3400	21.0180	20.3400	21.0180	(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)
Total heat required for water heating calculated for each month													
Solar input	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(62)
	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	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(64)
								Total per year (kWh/year) = Sum(64)m =				1536.7864	(64)
Heat gains from water heating, kWh/month													
	61.2612	54.0606	56.9283	51.2443	50.3711	45.2289	43.6472	47.6055	47.4308	53.1270	55.9100	59.8587	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.1655	34.7864	28.2902	21.4175	16.0098	13.5162	14.6047	18.9838	25.4800	32.3527	37.7603	40.2540 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	261.9580	264.6763	257.8263	243.2434	224.8350	207.5338	195.9755	193.2572	200.1073	214.6902	233.0985	250.3997 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723 (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)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129 (71)
Water heating gains (Table 5)	82.3403	80.4474	76.5165	71.1726	67.7031	62.8179	58.6656	63.9858	65.8761	71.4072	77.6528	80.4553 (72)
Total internal gains	472.7425	469.1888	451.9117	425.1122	397.8267	373.1466	358.5246	365.5055	380.7421	407.7288	437.7904	460.3877 (73)

[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			
Northeast				1.1900	11.2829	0.6700	0.7000	0.7700	4.3639 (75)			
Southeast				5.1900	36.7938	0.6700	0.7000	0.7700	62.0652 (77)			
Southwest				6.7600	36.7938	0.6700	0.7000	0.7700	80.8403 (79)			
Solar gains	147.2694	252.3038	349.0633	438.9598	497.5620	496.5549	477.6536	433.5376	380.1339	279.8876	176.6588	125.8611 (83)
Total gains	620.0119	721.4927	800.9750	864.0720	895.3887	869.7015	836.1782	799.0432	760.8759	687.6164	614.4492	586.2489 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{li,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394
alpha	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360
util living area	0.9464	0.9012	0.8254	0.7030	0.5501	0.3979	0.2860	0.3127	0.4859	0.7419	0.9052	0.9569 (86)
MIT	20.4353	20.5905	20.7489	20.8732	20.9340	20.9523	20.9554	20.9551	20.9465	20.8656	20.6321	20.3849 (87)
Th 2	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742 (88)
util rest of house	0.9362	0.8846	0.7997	0.6665	0.5055	0.3476	0.2325	0.2569	0.4305	0.7000	0.8863	0.9485 (89)
MIT 2	19.4386	19.6527	19.8641	20.0204	20.0894	20.1072	20.1096	20.1094	20.1026	20.0157	19.7144	19.3680 (90)
Living area fraction												0.4012 (91)
MIT	19.8385	20.0289	20.2191	20.3625	20.4282	20.4463	20.4489	20.4487	20.4411	20.3566	20.0826	19.7759 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8385	20.0289	20.2191	20.3625	20.4282	20.4463	20.4489	20.4487	20.4411	20.3566	20.0826	19.7759 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9315	0.8814	0.8011	0.6751	0.5194	0.3643	0.2504	0.2755	0.4486	0.7097	0.8840	0.9438 (94)
Useful gains	577.5565	635.9495	641.6877	583.3053	465.1095	316.8200	209.3422	220.1087	341.3245	488.0093	543.1588	553.2875 (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	845.8192	823.5256	746.7817	623.9494	475.1113	318.2354	209.5117	220.3855	345.1713	531.0917	706.6921	847.8578 (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	199.5875	126.0512	78.1899	29.2638	7.4413	0.0000	0.0000	0.0000	0.0000	32.0533	117.7440	219.1603 (98)
Space heating												809.4913 (98)
Space heating per m2												13.2660 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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 %) 100.0000 (206)
 Efficiency of secondary/supplementary heating system, % 0.0000 (208)
 Space heating requirement 809.4913 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	199.5875	126.0512	78.1899	29.2638	7.4413	0.0000	0.0000	0.0000	0.0000	32.0533	117.7440	219.1603	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	199.5875	126.0512	78.1899	29.2638	7.4413	0.0000	0.0000	0.0000	0.0000	32.0533	117.7440	219.1603	(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	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(219)
Water heating fuel used												1536.7864	(219)
Annual totals kWh/year													
Space heating fuel - main system												809.4913	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:
 (MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4480)
 mechanical ventilation fans (SFP = 0.4480) 80.0426 (230a)
 Total electricity for the above, kWh/year 80.0426 (231)
 Electricity for lighting (calculated in Appendix L) 276.6697 (232)
 Energy saving/generation technologies (Appendices M ,N and Q)
 Total delivered energy for all uses 2702.9900 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1 (0.00*15.29 + 1.00*5.50)	809.4913	5.5000	44.5220 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (electric off-peak tariff)			
High-rate fraction			0.0993 (243)
Low-rate fraction			0.9007 (244)
High-rate cost	152.6495	15.2900	23.3401 (245)
Low-rate cost	1384.1369	5.5000	76.1275 (246)
Mechanical ventilation fans (0.71*15.29 + 0.29*5.50)	80.0426	12.4509	9.9660 (249)
Pumps and fans for heating (0.90*15.29 + 0.10*5.50)	0.0000	0.0000	0.0000 (249)
Energy for lighting (0.90*15.29 + 0.10*5.50)	276.6697	14.3110	39.5942 (250)
Additional standing charges			24.0000 (251)
Energy saving/generation technologies			
PV Unit (0.90*43.39 + 0.10*12.14)	0.0000	13.7505	0.0000 (252)
Total energy cost			217.5499 (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] = 0.8618 (257)
 SAP value 87.9775
 SAP rating (Section 12) 88 (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	809.4913	0.5190	420.1260 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	0.5190	797.5921 (264)
Space and water heating			1217.7181 (265)
Pumps and fans	80.0426	0.5190	41.5421 (267)
Energy for lighting	276.6697	0.5190	143.5916 (268)
Energy saving/generation technologies			
PV Unit (0.90*43.39 + 0.10*12.14)	-488.0000	0.5190	-253.2720 (269)
Total kg/year			1149.5798 (272)
CO2 emissions per m2			18.8400 (273)
EI value			85.4703
EI rating			85 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$5.50 \times (1 + 0.29 \times 0.20) / 1.0000 = 5.819$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.20) / 1.0000 = 0.5491$, stars = 2
Water heating energy efficiency	$6.47 / 1.0000 = 6.472$, stars = 3
Water heating environmental impact	$0.519 / 1.0000 = 0.5190$, stars = 2

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

SAP 2012 WORKSHEET FOR New Build (As Built) (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	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.2200
Infiltration rate					0.1610 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1369 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.2000	4.2000	3.9000	4.0000	3.4000	3.3000	3.3000	3.4000	3.8000	3.8000	3.9000 (22)
Wind factor	1.0750	1.0500	1.0500	0.9750	1.0000	0.8500	0.8250	0.8250	0.8500	0.9500	0.9500	0.9750 (22a)
Adj infilt rate	0.1471	0.1437	0.1437	0.1334	0.1369	0.1163	0.1129	0.1129	0.1163	0.1300	0.1300	0.1334 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												
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
Window (Uw = 1.35)			13.1400	1.2808	16.8302		(27)
Main	54.5000	13.1400	41.3600	0.1800	7.4448	110.0000	4549.6000 (29a)
Total net area of external elements Aum(A, m ²)			54.5000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	24.2750			(33)
Party Wall 1			24.0800	0.0000	0.0000	70.0000	1685.6000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11569.4700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		189.6013 (35)
Thermal bridges (User defined value 0.110 * total exposed area)		5.9950 (36)
Total fabric heat loss	(33) + (36) =	30.2700 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639	24.1639 (38)
Average = Sum(39)m / 12 =	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339	54.4339 (39)
HLP	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921	0.8921 (40)
HLP (average)												0.8921 (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												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397 (44)
Energy content (annual)	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)

Anderson Goddard Ltd
eco-survey.com

Independent Energy Specialists, SAP, SBEM, EPC's, U-Value & Condensation Risk, 2D & 3D Thermal Modelling

Water storage loss:												150.0000 (47)	
Store volume													
a) If manufacturer declared loss factor is known (kWh/day):												1.1300 (48)	
Temperature factor from Table 2b												0.6000 (49)	
Enter (49) or (54) in (55)												0.6780 (55)	
Total storage loss													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180	20.3400	21.0180	20.3400	21.0180	(56)
If cylinder contains dedicated solar storage													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180	20.3400	21.0180	20.3400	21.0180	(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	(58)
Total heat required for water heating calculated for each month													
	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(59)
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													
	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(64)
Total per year (kWh/year) = Sum(64)m =													
												1536.7864	(64)
Heat gains from water heating, kWh/month													
	61.2612	54.0606	56.9283	51.2443	50.3711	45.2289	43.6472	47.6055	47.4308	53.1270	55.9100	59.8587	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	39.1655	34.7864	28.2902	21.4175	16.0098	13.5162	14.6047	18.9838	25.4800	32.3527	37.7603	40.2540 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	261.9580	264.6763	257.8263	243.2434	224.8350	207.5338	195.9755	193.2572	200.1073	214.6902	233.0985	250.3997 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723	49.0723 (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)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129 (71)
Water heating gains (Table 5)	82.3403	80.4474	76.5165	71.1726	67.7031	62.8179	58.6656	63.9858	65.8761	71.4072	77.6528	80.4553 (72)
Total internal gains	472.7425	469.1888	451.9117	425.1122	397.8267	373.1466	358.5246	365.5055	380.7421	407.7288	437.7904	460.3877 (73)

[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			
Northeast				1.1900	9.9768	0.6700	0.7000	0.7700	3.8587 (75)			
Southeast				5.1900	32.4665	0.6700	0.7000	0.7700	54.7658 (77)			
Southwest				6.7600	32.4665	0.6700	0.7000	0.7700	71.3327 (79)			
Solar gains	129.9572	228.3940	330.1828	423.6539	468.5375	478.7516	449.4129	402.6062	369.5045	266.5458	160.2058	113.5952 (83)
Total gains	602.6996	697.5828	782.0946	848.7661	866.3642	851.8983	807.9374	768.1117	750.2465	674.2746	597.9962	573.9829 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{li,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394	59.0394
alpha	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360	4.9360
util living area	0.9411	0.8939	0.8079	0.6677	0.4999	0.3376	0.2491	0.2760	0.4518	0.7167	0.8956	0.9525 (86)
MIT	20.4829	20.6267	20.7808	20.8954	20.9433	20.9545	20.9558	20.9556	20.9497	20.8837	20.6692	20.4321 (87)
Th 2	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742	20.1742 (88)
util rest of house	0.9295	0.8755	0.7792	0.6276	0.4518	0.2855	0.1936	0.2178	0.3947	0.6710	0.8741	0.9428 (89)
MIT 2	19.5067	19.7034	19.9065	20.0470	20.0991	20.1090	20.1097	20.1097	20.1054	20.0373	19.7657	19.4357 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.4012 (91)
MIT	19.8983	20.0738	20.2572	20.3873	20.4378	20.4482	20.4492	20.4490	20.4441	20.3769	20.1281	19.8355 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8983	20.0738	20.2572	20.3873	20.4378	20.4482	20.4492	20.4490	20.4441	20.3769	20.1281	19.8355 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9251	0.8730	0.7823	0.6382	0.4673	0.3028	0.2121	0.2372	0.4135	0.6827	0.8728	0.9382 (94)
Useful gains	557.5771	608.9901	611.7949	541.7106	404.8467	257.9635	171.3565	182.1862	310.2338	460.2967	521.9140	538.5298 (95)
Ext temp.	5.2000	5.8000	7.4000	9.9000	12.9000	15.7000	17.3000	17.1000	14.7000	11.3000	7.9000	5.0000 (96)
Heat loss rate W	800.0855	776.9785	699.8691	570.8667	410.3098	258.4635	171.4207	182.3010	312.6723	494.0902	665.6247	807.5523 (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	180.4262	112.8882	65.5272	20.9923	4.0646	0.0000	0.0000	0.0000	0.0000	25.1424	103.4717	200.1527 (98)
Space heating												712.6654 (98)
Space heating per m2												11.6792 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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 %) 100.0000 (206)
 Efficiency of secondary/supplementary heating system, % 0.0000 (208)
 Space heating requirement 712.6654 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	180.4262	112.8882	65.5272	20.9923	4.0646	0.0000	0.0000	0.0000	0.0000	25.1424	103.4717	200.1527	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	180.4262	112.8882	65.5272	20.9923	4.0646	0.0000	0.0000	0.0000	0.0000	25.1424	103.4717	200.1527	(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	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(219)
Water heating fuel used												1536.7864	(219)
Annual totals kWh/year													
Space heating fuel - main system												712.6654	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:
 (MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4480)
 mechanical ventilation fans (SFP = 0.4480) 80.0426 (230a)
 Total electricity for the above, kWh/year 80.0426 (231)
 Electricity for lighting (calculated in Appendix L) 276.6697 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
 Total delivered energy for all uses 2606.1641 (238)

10a. Fuel costs - using BEDF prices (513)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1 (0.00*43.39 + 1.00*12.14)	712.6654	12.1400	86.5176	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (electric off-peak tariff)				
High-rate fraction			0.0993	(243)
Low-rate fraction			0.9007	(244)
High-rate cost	152.6495	43.3900	66.2346	(245)
Low-rate cost	1384.1369	12.1400	168.0342	(246)
Mechanical ventilation fans (0.71*43.39 + 0.29*12.14)	80.0426	34.3275	27.4766	(249)
Pumps and fans for heating (0.90*43.39 + 0.10*12.14)	0.0000	0.0000	0.0000	(249)
Energy for lighting (0.90*43.39 + 0.10*12.14)	276.6697	40.2650	111.4011	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit (0.90*43.39 + 0.10*12.14)	0.0000	38.5575	0.0000	(252)
Total energy cost			459.6641	(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	712.6654	0.5190	369.8733	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	0.5190	797.5921	(264)
Space and water heating			1167.4655	(265)
Pumps and fans	80.0426	0.5190	41.5421	(267)
Energy for lighting	276.6697	0.5190	143.5916	(268)
Energy saving/generation technologies				
PV Unit (0.90*43.39 + 0.10*12.14)	-488.0000	0.5190	-253.2720	(269)
Total kg/year			1099.3272	(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	712.6654	3.0700	2187.8828	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	3.0700	4717.9341	(264)
Space and water heating			6905.8169	(265)
Pumps and fans	80.0426	3.0700	245.7308	(267)
Energy for lighting	276.6697	3.0700	849.3761	(268)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Energy saving/generation technologies			
PV Unit (0.90*43.39 + 0.10*12.14)	-488.0000	3.0700	-1498.1600 (269)
Primary energy kWh/year			6502.7639 (272)
Primary energy kWh/m ² /year			106.5677 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 88
Current environmental impact rating:	B 85

(For testing purposes):

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

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

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

Potential energy efficiency rating:	B 88
Potential environmental impact rating:	B 85

Fuel prices for cost data on this page from database revision number 513 TEST (28 Feb 2023)
 Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, West Pennines (England)):

	Current £460	Potential £460	Saving £0
Electricity			
Space heating	£114	£114	£0
Water heating	£234	£234	£0
Lighting	£111	£111	£0
Total cost of fuels	£460	£460	£0
Total cost of uses	£459	£459	£0
Delivered energy	43 kWh/m ²	43 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m ²	18 kg/m ²	18 kg/m ²	0 kg/m ²
Primary energy	107 kWh/m ²	107 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	No
SAP Region	West Pennines
Front of dwelling faces	South West
Overshading	Average or unknown
Thermal mass parameter	189.6 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	4.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	193.31 (P1)
Transmission heat loss coefficient	30.27 (37)
Summer heat loss coefficient	223.58 (P2)

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

Solar shading Orientation	Z blinds	Solar access	Z overhangs	Z summer
North East	1.000	0.90	1.000	0.900 (P8)
South East	1.000	0.90	1.000	0.900 (P8)
South West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North East	1.1900	89.6552	0.6700	0.7000	0.9000	40.5303
South East	5.1900	112.1012	0.6700	0.7000	0.9000	221.0220
South West	6.7600	112.1012	0.6700	0.7000	0.9000	287.8822
total:						549.4346

Solar gains	Jun	Jul	Aug	
Internal gains	589	549	491	(P3)
Total summer gains	373	359	366	
	962	908	856	(P5)
Summer gain/loss ratio	4.30	4.06	3.83	(P6)
Summer external temperature	14.70	16.40	16.30	
Thermal mass temperature increment (TMP = 189.6)	0.67	0.67	0.67	
Threshold temperature	19.68	21.13	20.80	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			