

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	74278-12			Issued on Date	30/03/2023
Assessment Reference	001	Prop Type Ref	HT 2B3P (Top)		
Property	Flat 12, 32 Brookstone Close, MANCHESTER, M21 7AE				
SAP Rating	86 B	DER	27.00	TER	26.32
Environmental	82 B	% DER<TER	-2.60		
CO ₂ Emissions (t/year)	1.34	DFEE	36.54	TFEE	45.50
General Requirements Compliance	Fail	% DFEE<TFEE	19.69		
Assessor Details	Mr. Paul Goddard, Anderson Goddard Limited, Tel: 01925 733 942, paul.goddard@andersongoddard.com			Assessor ID	B342-0001
Client					

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

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DWELLING AS BUILT

Top-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) 26.32 kgCO₂/m²
 Dwelling Carbon Dioxide Emission Rate (DER) 27.00 kgCO₂/m²Fail
 Excess emissions =0.68 kgCO₂/m² (2.6%)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.5 kWh/m²/yr
 Dwelling Fabric Energy Efficiency (DFEE)36.5 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	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.35 (max. 2.00)	1.35 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.039

3 Air permeability

Air permeability at 50 pascals: 3.15 (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: 4.74 m², No overhang
 Windows facing South West: 5.19 m², No overhang
 Windows facing North West: 2.02 m², No overhang
 Air change rate: 4.00 ach
 Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
 Thermal bridging y-value 0.039 W/m²K
 Air permeability 3.2 m³/m²h
 Photovoltaic array 488.00 kWh/Year

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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					3.1500
Infiltration rate					0.1575 (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) =				0.1339 (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	0.1707	0.1673	0.1640	0.1473	0.1439	0.1272	0.1272	0.1238	0.1339	0.1439	0.1506	0.1573 (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 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)			11.9500	1.2808	15.3060			(27)
Main	58.3000	11.9500	46.3500	0.1800	8.3430	110.0000	5098.5000	(29a)
PIJ	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800	(30)
Total net area of external elements Aum(A, m2)			119.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.5816			(33)
Party Wall 1			19.3200	0.0000	0.0000	45.0000	869.4000	(32)
Party Floor 1			61.0200			40.0000	2440.8000	(32d)
Internal Wall 1			121.4300			9.0000	1092.8700	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			10050.7500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							164.7124	(35)
Thermal bridges (User defined value 0.039 * total exposed area)							4.6535	(36)
Total fabric heat loss						(33) + (36) =	36.2351	(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 =	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898 (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												
	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)

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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	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	15.7940	14.0281	11.4084	8.6369	6.4562	5.4506	5.8896	7.6555	10.2752	13.0467	15.2274	16.2330 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.5119	177.3331	172.7436	162.9371	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	326.8010	324.9635	313.8234	295.9374	277.9536	260.4710	249.0136	254.2785	263.3780	281.4512	302.2110	317.6109 (73)

[Jan]				Area	Solar flux	g	FF			Access	Gains	
				m2	Table 6a	Specific data	Specific data			factor	W	
					W/m2	or Table 6b	or Table 6c			Table 6d		
Northeast				4.7400	11.2829	0.6700	0.7000			0.7700	17.3823 (75)	
Southwest				5.1900	36.7938	0.6700	0.7000			0.7700	62.0652 (79)	
Northwest				2.0200	11.2829	0.6700	0.7000			0.7700	7.4076 (81)	

Solar gains	86.8552	156.1807	235.5648	328.5362	401.4495	413.2650	392.3064	335.6596	267.4063	178.5100	105.5320	73.3596 (83)
Total gains	413.6562	481.1441	549.3882	624.4736	679.4031	673.7361	641.3200	589.9381	530.7843	459.9612	407.7430	390.9705 (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	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239
alpha	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816
util living area												
	0.9843	0.9706	0.9387	0.8608	0.7204	0.5468	0.4077	0.4592	0.6963	0.9056	0.9723	0.9874 (86)
MIT	19.8907	20.0594	20.3146	20.6076	20.8201	20.9151	20.9394	20.9348	20.8641	20.5753	20.1688	19.8429 (87)
Th 2	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918 (88)
util rest of house												
	0.9810	0.9646	0.9262	0.8337	0.6720	0.4781	0.3265	0.3735	0.6288	0.8805	0.9656	0.9847 (89)
MIT 2	18.6046	18.8477	19.2114	19.6145	19.8848	19.9895	20.0102	20.0074	19.9418	19.5813	19.0085	18.5355 (90)
Living area fraction												
MIT	19.1205	19.3338	19.6540	20.0129	20.2600	20.3608	20.3830	20.3794	20.3118	19.9801	19.4740	19.0600 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1205	19.3338	19.6540	20.0129	20.2600	20.3608	20.3830	20.3794	20.3118	19.9801	19.4740	19.0600 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9765	0.9584	0.9191	0.8311	0.6815	0.4990	0.3529	0.4012	0.6462	0.8770	0.9598	0.9807 (94)
Useful gains	403.9368	461.1104	504.9698	518.9835	463.0102	336.1973	226.2990	236.6674	342.9701	403.3800	391.3663	383.4358 (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	895.1459	871.7878	794.4889	671.2089	517.0177	347.9469	228.4890	240.3529	375.1870	566.5478	747.3763	897.5304 (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	365.4596	275.9752	215.4022	109.6022	40.1815	0.0000	0.0000	0.0000	0.0000	121.3969	256.3272	382.4864 (98)
Space heating												1766.8313 (98)
Space heating per m2												28.9550 (99)
										(98) / (4) =		

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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													1766.8313 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	365.4596	275.9752	215.4022	109.6022	40.1815	0.0000	0.0000	0.0000	0.0000	121.3969	256.3272	382.4864	(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)	365.4596	275.9752	215.4022	109.6022	40.1815	0.0000	0.0000	0.0000	0.0000	121.3969	256.3272	382.4864	(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													1766.8313 (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)													278.9274 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3662.5877 (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	1766.8313	0.5190	916.9855	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	0.5190	797.5921	(264)
Space and water heating			1714.5776	(265)
Pumps and fans	80.0426	0.5190	41.5421	(267)
Energy for lighting	278.9274	0.5190	144.7633	(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			1647.6110	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			27.0000	(273)

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

DER			27.0000	ZC1
Total Floor Area		TFA	61.0200	
Assumed number of occupants		N	2.0103	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.0444	ZC2
CO2 emissions from cooking, equation (L16)			2.7409	ZC3
Total CO2 emissions			46.7852	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			46.7852	ZC8

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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)			11.9500	1.3258	15.8428		(27)					
Main	58.3000	11.9500	46.3500	0.1800	8.3430		(29a)					
PIJ	61.0200		61.0200	0.1300	7.9326		(30)					
Total net area of external elements Aum(A, m2)			119.3200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	32.1184		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3498 (36)					
Total fabric heat loss						(33) + (36) =	37.4682 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 28.4050	Feb 28.2403	Mar 28.0789	Apr 27.3207	May 27.1788	Jun 26.5184	Jul 26.5184	Aug 26.3961	Sep 26.7728	Oct 27.1788	Nov 27.4658	Dec 27.7658 (38)
Heat transfer coeff	65.8732	65.7085	65.5471	64.7889	64.6470	63.9866	63.9866	63.8644	64.2410	64.6470	64.9340	65.2340 (39)
Average = Sum(39)m / 12 =												64.7882 (39)
HLP	Jan 1.0795	Feb 1.0768	Mar 1.0742	Apr 1.0618	May 1.0594	Jun 1.0486	Jul 1.0486	Aug 1.0466	Sep 1.0528	Oct 1.0594	Nov 1.0641	Dec 1.0691 (40)
HLP (average)												1.0618 (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	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)

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If cylinder contains dedicated solar storage	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)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	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)
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	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)
Heat gains from water heating, kWh/month	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)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	15.7940	14.0281	11.4084	8.6369	6.4562	5.4506	5.8896	7.6555	10.2752	13.0467	15.2274	16.2330 (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	357.3031	355.4655	344.3255	326.4395	308.4557	290.9731	279.5157	284.7805	293.8800	311.9532	332.7131	348.1130 (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				4.7400	11.2829	0.6300	0.7000	0.7700	16.3445 (75)						
Southwest				5.1900	36.7938	0.6300	0.7000	0.7700	58.3599 (79)						
Northwest				2.0200	11.2829	0.6300	0.7000	0.7700	6.9654 (81)						
Solar gains				81.6698	146.8565	221.5012	308.9221	377.4824	388.5925	368.8851	315.6202	251.4417	167.8527	99.2316	68.9799 (83)
Total gains				438.9729	502.3220	565.8267	635.3615	685.9380	679.5656	648.4008	600.4007	545.3218	479.8059	431.9447	417.0929 (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	64.3281	64.4894	64.6482	65.4047	65.5483	66.2248	66.2248	66.3516	65.9625	65.5483	65.2586	64.9584
alpha	5.2885	5.2993	5.3099	5.3603	5.3699	5.4150	5.4150	5.4234	5.3975	5.3699	5.3506	5.3306
util living area	0.9953	0.9898	0.9732	0.9167	0.7826	0.5866	0.4315	0.4841	0.7452	0.9470	0.9898	0.9964 (86)
MIT	19.9661	20.1253	20.3761	20.6848	20.8992	20.9829	20.9973	20.9951	20.9422	20.6590	20.2572	19.9372 (87)
Th 2	20.0176	20.0198	20.0220	20.0322	20.0341	20.0430	20.0430	20.0447	20.0396	20.0341	20.0302	20.0262 (88)
util rest of house	0.9938	0.9865	0.9645	0.8910	0.7268	0.5057	0.3391	0.3863	0.6657	0.9249	0.9859	0.9952 (89)
MIT 2	18.6495	18.8821	19.2435	19.6767	19.9418	20.0324	20.0420	20.0427	19.9970	19.6533	19.0827	18.6138 (90)
Living area fraction	19.1777	19.3809	19.6979	20.0811	20.3259	20.4137	20.4253	20.4248	20.3762	20.0568	19.5539	19.1447 (92)
Temperature adjustment	19.1777	19.3809	19.6979	20.0811	20.3259	20.4137	20.4253	20.4248	20.3762	20.0568	19.5539	19.1447 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9921	0.9837	0.9610	0.8924	0.7447	0.5377	0.3763	0.4256	0.6952	0.9255	0.9834	0.9938 (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	980.0393	951.5161	865.0832	724.4122	557.6408	372.0015	244.7655	257.0413	403.1870	611.3520	808.6829	974.9052 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	405.1484	307.3539	239.0574	113.3192	34.8397	0.0000	0.0000	0.0000	0.0000	124.4631	276.4034	416.9435 (98)
Space heating												1917.5286 (98)
Space heating per m2												31.4246 (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													2050.8327 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	405.1484	307.3539	239.0574	113.3192	34.8397	0.0000	0.0000	0.0000	0.0000	124.4631	276.4034	416.9435	(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)	433.3138	328.7207	255.6764	121.1970	37.2618	0.0000	0.0000	0.0000	0.0000	133.1156	295.6186	445.9289	(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	86.9115	86.5437	85.7664	84.0733	81.6442	79.8000	79.8000	79.8000	79.8000	84.2221	86.1913	87.0353	(216)
Fuel for water heating, kWh/month	207.4173	183.7204	194.9927	178.7387	180.6832	165.6395	159.5177	174.4356	173.9380	184.9939	190.6270	202.2760	(219)
Water heating fuel used												2196.9800	(219)
Annual totals kWh/year													
Space heating fuel - main system												2050.8327	(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)												278.9274	(232)
Total delivered energy for all uses												4601.7400	(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	2050.8327	0.2160	442.9799 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2196.9800	0.2160	474.5477 (264)
Space and water heating			917.5275 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	278.9274	0.5190	144.7633 (268)
Total CO2, kg/m2/year			1101.2158 (272)
Emissions per m2 for space and water heating			15.0365 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3724 (272b)
Emissions per m2 for pumps and fans			0.6379 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.0365 * 1.55) + 2.3724 + 0.6379, rounded to 2 d.p.			26.3200 (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					3.1500
Infiltration rate					0.2941 (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) =				0.2500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3187	0.3124	0.3062	0.2750	0.2687	0.2375	0.2375	0.2312	0.2500	0.2687	0.2812	0.2937 (22b)
	0.5508	0.5488	0.5469	0.5378	0.5361	0.5282	0.5282	0.5267	0.5312	0.5361	0.5395	0.5431 (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)			11.9500	1.2808	15.3060		(27)
Main	58.3000	11.9500	46.3500	0.1800	8.3430	110.0000	5098.5000 (29a)
PIJ	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800 (30)
Total net area of external elements Aum(A, m ²)			119.3200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.5816		(33)
Party Wall 1			19.3200	0.0000	0.0000	45.0000	869.4000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10050.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							164.7124 (35)
Thermal bridges (User defined value 0.039 * total exposed area)							4.6535 (36)
Total fabric heat loss						(33) + (36) =	36.2351 (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	26.6182	26.5229	26.4295	25.9907	25.9086	25.5264	25.5264	25.4557	25.6736	25.9086	26.0747	26.2483 (38)
Heat transfer coeff	62.8532	62.7579	62.6645	62.2257	62.1437	61.7615	61.7615	61.6907	61.9087	62.1437	62.3097	62.4833 (39)
Average = Sum(39)m / 12 =												62.2254 (39)
HLP	1.0300	1.0285	1.0270	1.0198	1.0184	1.0122	1.0122	1.0110	1.0146	1.0184	1.0211	1.0240 (40)
HLP (average)												1.0198 (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	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	15.7940	14.0281	11.4084	8.6369	6.4562	5.4506	5.8896	7.6555	10.2752	13.0467	15.2274	16.2330	(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	282.6406	281.4862	271.7648	255.8074	239.0758	223.3563	213.3975	216.7422	225.1595	241.2365	259.7424	274.1308	(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	4.7400	11.2829	0.6700	0.7000	0.7700	17.3823 (75)
Southwest	5.1900	36.7938	0.6700	0.7000	0.7700	62.0652 (79)
Northwest	2.0200	11.2829	0.6700	0.7000	0.7700	7.4076 (81)

Solar gains	86.8552	156.1807	235.5648	328.5362	401.4495	413.2650	392.3064	335.6596	267.4063	178.5100	105.5320	73.3596	(83)
Total gains	369.4958	437.6669	507.3296	584.3436	640.5253	636.6213	605.7038	552.4018	492.5658	419.7466	365.2743	347.4904	(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	44.4190	44.4864	44.5527	44.8669	44.9261	45.2041	45.2041	45.2560	45.0966	44.9261	44.8064	44.6819	
alpha	3.9613	3.9658	3.9702	3.9911	3.9951	4.0136	4.0136	4.0171	4.0064	3.9951	3.9871	3.9788	
util living area	0.9896	0.9791	0.9538	0.8866	0.7567	0.5826	0.4386	0.4959	0.7396	0.9293	0.9812	0.9917	(86)
MIT	19.5140	19.7354	20.0765	20.4884	20.7969	20.9468	20.9867	20.9785	20.8629	20.4417	19.8945	19.4658	(87)
Th 2	20.0584	20.0597	20.0609	20.0669	20.0680	20.0732	20.0732	20.0742	20.0712	20.0680	20.0658	20.0634	(88)
util rest of house	0.9873	0.9746	0.9437	0.8624	0.7092	0.5105	0.3506	0.4035	0.6727	0.9088	0.9764	0.9899	(89)
MIT 2	18.6991	18.9190	19.2542	19.6510	19.9247	20.0448	20.0685	20.0659	19.9877	19.6171	19.0832	18.6552	(90)
Living area fraction										fLA = Living area / (4) =		0.4012	(91)
MIT	19.0261	19.2466	19.5841	19.9869	20.2746	20.4067	20.4368	20.4320	20.3388	19.9479	19.4087	18.9804	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0261	19.2466	19.5841	19.9869	20.2746	20.4067	20.4368	20.4320	20.3388	19.9479	19.4087	18.9804	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9840	0.9697	0.9376	0.8600	0.7204	0.5373	0.3857	0.4401	0.6934	0.9056	0.9721	0.9871	(94)
Useful gains	363.5917	424.4262	475.6544	502.5528	461.4333	342.0464	233.6022	243.0911	341.5329	380.1387	355.0845	343.0208	(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	925.5800	900.3597	819.9092	689.8921	532.8567	358.6277	236.9695	248.7395	386.2350	580.9143	766.9523	923.5271	(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	418.1193	319.8273	256.1255	134.8843	53.1390	0.0000	0.0000	0.0000	0.0000	149.3770	296.5449	431.8967	(98)
Space heating												2059.9140	(98)
Space heating per m2										(98) / (4) =		33.7580	(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	580.5582	457.0351	468.8496	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9110	0.9483	0.9297	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	528.9035	433.4015	435.8770	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	819.1792	781.5675	720.4536	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	208.9986	259.0355	211.7249	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												679.7590 (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	52.2496	64.7589	52.9312	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												169.9398 (107)
Space cooling per m2												2.7850 (108)
Energy for space heating												33.7580 (99)
Energy for space cooling												2.7850 (108)
Total												36.5430 (109)
Dwelling Fabric Energy Efficiency (DFEE)												36.5 (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) =				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)			11.9500	1.3258	15.8428		(27)					
Main	58.3000	11.9500	46.3500	0.1800	8.3430		(29a)					
PIJ	61.0200		61.0200	0.1300	7.9326		(30)					
Total net area of external elements Aum(A, m2)			119.3200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	32.1184		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3498 (36)					
Total fabric heat loss						(33) + (36) =	37.4682 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 28.4050	Feb 28.2403	Mar 28.0789	Apr 27.3207	May 27.1788	Jun 26.5184	Jul 26.5184	Aug 26.3961	Sep 26.7728	Oct 27.1788	Nov 27.4658	Dec 27.7658 (38)
Heat transfer coeff	65.8732	65.7085	65.5471	64.7889	64.6470	63.9866	63.9866	63.8644	64.2410	64.6470	64.9340	65.2340 (39)
Average = Sum(39)m / 12 =												64.7882 (39)
HLP	Jan 1.0795	Feb 1.0768	Mar 1.0742	Apr 1.0618	May 1.0594	Jun 1.0486	Jul 1.0486	Aug 1.0466	Sep 1.0528	Oct 1.0594	Nov 1.0641	Dec 1.0691 (40)
HLP (average)												1.0618 (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	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)
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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	15.7940	14.0281	11.4084	8.6369	6.4562	5.4506	5.8896	7.6555	10.2752	13.0467	15.2274	16.2330	(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	282.6406	281.4862	271.7648	255.8074	239.0758	223.3563	213.3975	216.7422	225.1595	241.2365	259.7424	274.1308	(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				4.7400	11.2829	0.6300	0.7000		0.7700	16.3445 (75)		
Southwest				5.1900	36.7938	0.6300	0.7000		0.7700	58.3599 (79)		
Northwest				2.0200	11.2829	0.6300	0.7000		0.7700	6.9654 (81)		
Solar gains	81.6698	146.8565	221.5012	308.9221	377.4824	388.5925	368.8851	315.6202	251.4417	167.8527	99.2316	68.9799 (83)
Total gains	364.3104	428.3427	493.2660	564.7295	616.5582	611.9488	582.2826	532.3624	476.6013	409.0893	358.9739	343.1108 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

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	64.3281	64.4894	64.6482	65.4047	65.5483	66.2248	66.2248	66.3516	65.9625	65.5483	65.2586	64.9584	21.0000 (85)
alpha	5.2885	5.2993	5.3099	5.3603	5.3699	5.4150	5.4150	5.4234	5.3975	5.3699	5.3506	5.3306	
util living area	0.9981	0.9950	0.9850	0.9450	0.8322	0.6420	0.4786	0.5418	0.8116	0.9716	0.9956	0.9986	(86)
MIT	19.8517	20.0146	20.2750	20.6085	20.8621	20.9739	20.9955	20.9916	20.9115	20.5699	20.1476	19.8232	(87)
Th 2	20.0176	20.0198	20.0220	20.0322	20.0341	20.0430	20.0430	20.0447	20.0396	20.0341	20.0302	20.0262	(88)
util rest of house	0.9974	0.9934	0.9798	0.9259	0.7811	0.5572	0.3771	0.4344	0.7373	0.9581	0.9939	0.9981	(89)
MIT 2	18.9699	19.1338	19.3930	19.7219	19.9446	20.0316	20.0419	20.0423	19.9923	19.6931	19.2753	18.9484	(90)
Living area fraction	19.3237	19.4872	19.7468	20.0776	20.3127	20.4096	20.4245	20.4232	20.3611	20.0448	19.6252	19.2994	(91)
MIT	19.3237	19.4872	19.7468	20.0776	20.3127	20.4096	20.4245	20.4232	20.3611	20.0448	19.6252	19.2994	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3237	19.4872	19.7468	20.0776	20.3127	20.4096	20.4245	20.4232	20.3611	20.0448	19.6252	19.2994	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9968	0.9922	0.9779	0.9269	0.7971	0.5907	0.4180	0.4778	0.7643	0.9583	0.9929	0.9976	(94)
Useful gains	363.1419	425.0035	482.3796	523.4594	491.4381	361.5049	243.4117	254.3559	364.2883	392.0423	356.4382	342.3005	(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	989.6561	958.5011	868.2889	724.1822	556.7861	371.7380	244.7147	256.9369	402.2169	610.5802	813.3144	984.9926	(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	466.1265	358.5103	287.1165	144.5204	48.6189	0.0000	0.0000	0.0000	0.0000	162.5922	328.9508	478.1629	(98)
Space heating												2274.5987	(98)
Space heating per m2												37.2763	(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	601.4745	473.5012	485.3691	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9341	0.9685	0.9527	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	561.8383	458.5778	462.4231	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	790.3412	754.1920	697.0309	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	164.5221	219.9370	174.5482	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												559.0072	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.1305	54.9842	43.6371	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													139.7518 (107)
Space cooling per m2													2.2903 (108)
Energy for space heating													37.2763 (99)
Energy for space cooling													2.2903 (108)
Total													39.5665 (109)
Target Fabric Energy Efficiency (TFEE)													45.5 (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					3.1500
Infiltration rate					0.1575 (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) =				0.1339 (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	0.1439	0.1406	0.1406	0.1305	0.1339	0.1138	0.1104	0.1104	0.1138	0.1272	0.1272	0.1305 (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 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)			11.9500	1.2808	15.3060			(27)
Main	58.3000	11.9500	46.3500	0.1800	8.3430	110.0000	5098.5000	(29a)
PIJ	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800	(30)
Total net area of external elements Aum(A, m2)			119.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		31.5816			(33)
Party Wall 1			19.3200	0.0000	0.0000	45.0000	869.4000	(32)
Party Floor 1			61.0200			40.0000	2440.8000	(32d)
Internal Wall 1			121.4300			9.0000	1092.8700	(32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (User defined value 0.039 * total exposed area)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 10050.7500 (34)
164.7124 (35)
4.6535 (36)
(33) + (36) = 36.2351 (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	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990 (39)
Average = Sum(39)m / 12 =												60.3990 (39)
HLP	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898 (40)
HLP (average)												0.9898 (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)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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	(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	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)	

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	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	39.4851	35.0703	28.5211	21.5923	16.1405	13.6265	14.7239	19.1387	25.6879	32.6167	38.0685	40.5825 (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	473.0621	469.4727	452.1426	425.2870	397.9574	373.2569	358.6438	365.6604	380.9500	407.9928	438.0985	460.7162 (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	4.7400	9.9768	0.6700	0.7000	0.7700	15.3701 (75)
Southwest	5.1900	32.4665	0.6700	0.7000	0.7700	54.7658 (79)
Northwest	2.0200	9.9768	0.6700	0.7000	0.7700	6.5501 (81)

Solar gains	76.6860	141.4778	223.0159	317.3617	378.3206	398.7170	369.3761	311.9754	260.1625	170.1311	95.7590	66.2428 (83)
Total gains	549.7480	610.9505	675.1585	742.6487	776.2779	771.9739	728.0198	677.6358	641.1125	578.1239	533.8575	526.9590 (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	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239
alpha	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816
util living area	0.9525	0.9274	0.8732	0.7601	0.5911	0.4079	0.3052	0.3446	0.5627	0.8085	0.9245	0.9599 (86)
MIT	20.1906	20.3297	20.5398	20.7610	20.8936	20.9378	20.9448	20.9433	20.9122	20.7390	20.4242	20.1382 (87)
Th 2	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918 (88)
util rest of house	0.9432	0.9138	0.8506	0.7216	0.5352	0.3407	0.2312	0.2658	0.4917	0.7677	0.9081	0.9520 (89)
MIT 2	19.0344	19.2299	19.5196	19.8092	19.9656	20.0084	20.0133	20.0126	19.9873	19.7898	19.3670	18.9599 (90)
Living area fraction									fLA = Living area / (4) =			0.4012 (91)
MIT	19.4983	19.6711	19.9289	20.1911	20.3379	20.3813	20.3870	20.3860	20.3584	20.1706	19.7911	19.4326 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4983	19.6711	19.9289	20.1911	20.3379	20.3813	20.3870	20.3860	20.3584	20.1706	19.7911	19.4326 (93)

8. Space heating requirement

[illegible]

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) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.1500
Number of sides sheltered					0.1575 (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) =	0.1339 (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	0.1707	0.1673	0.1640	0.1473	0.1439	0.1272	0.1272	0.1238	0.1339	0.1439	0.1506	0.1573 (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)			11.9500	1.2808	15.3060		(27)
Main	58.3000	11.9500	46.3500	0.1800	8.3430	110.0000	5098.5000 (29a)
PIJ	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800 (30)
Total net area of external elements Aum(A, m ²)			119.3200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.5816		(33)
Party Wall 1			19.3200	0.0000	0.0000	45.0000	869.4000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10050.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							164.7124 (35)
Thermal bridges (User defined value 0.039 * total exposed area)							4.6535 (36)
Total fabric heat loss						(33) + (36) =	36.2351 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(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	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990 (39)
Average = Sum(39)m / 12 =												60.3990 (39)
HLP	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898 (40)
HLP (average)												0.9898 (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	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)

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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													1335.4924 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	286.1502	211.6812	159.3190	76.6164	26.2909	0.0000	0.0000	0.0000	0.0000	80.8933	191.6448	302.8966	(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)	286.1502	211.6812	159.3190	76.6164	26.2909	0.0000	0.0000	0.0000	0.0000	80.8933	191.6448	302.8966	(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													1335.4924 (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)													278.9274 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3231.2488 (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)	1335.4924	5.5000	73.4521 (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)	278.9274	14.3110	39.9173 (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			246.8030 (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] =	0.9777 (257)
SAP value		86.3609
SAP rating (Section 12)		86 (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	1335.4924	0.5190	693.1206 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	0.5190	797.5921 (264)
Space and water heating			1490.7127 (265)
Pumps and fans	80.0426	0.5190	41.5421 (267)
Energy for lighting	278.9274	0.5190	144.7633 (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			1423.7461 (272)
CO2 emissions per m2			23.3300 (273)
EI value			82.0051
EI rating			82 (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) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.1500
Number of sides sheltered					0.1575 (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) = 0.1339 (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	0.1439	0.1406	0.1406	0.1305	0.1339	0.1138	0.1104	0.1104	0.1138	0.1272	0.1272	0.1305 (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)			11.9500	1.2808	15.3060		(27)
Main	58.3000	11.9500	46.3500	0.1800	8.3430	110.0000	5098.5000 (29a)
PIJ	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800 (30)
Total net area of external elements Aum(A, m ²)			119.3200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.5816		(33)
Party Wall 1			19.3200	0.0000	0.0000	45.0000	869.4000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10050.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							164.7124 (35)
Thermal bridges (User defined value 0.039 * total exposed area)							4.6535 (36)
Total fabric heat loss						(33) + (36) =	36.2351 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(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	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990	60.3990 (39)
Average = Sum(39)m / 12 =												60.3990 (39)
HLP	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898	0.9898 (40)
HLP (average)												0.9898 (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	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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		(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)
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)

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	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													
39.4851	35.0703	28.5211	21.5923	16.1405	13.6265	14.7239	19.1387	25.6879	32.6167	38.0685	40.5825		(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		(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													
473.0621	469.4727	452.1426	425.2870	397.9574	373.2569	358.6438	365.6604	380.9500	407.9928	438.0985	460.7162		(73)

6. Solar gains

[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
Northeast			4.7400	9.9768	0.6700	0.7000	0.7700	15.3701 (75)				
Southwest			5.1900	32.4665	0.6700	0.7000	0.7700	54.7658 (79)				
Northwest			2.0200	9.9768	0.6700	0.7000	0.7700	6.5501 (81)				
Solar gains	76.6860	141.4778	223.0159	317.3617	378.3206	398.7170	369.3761	311.9754	260.1625	170.1311	95.7590	66.2428 (83)
Total gains	549.7480	610.9505	675.1585	742.6487	776.2779	771.9739	728.0198	677.6358	641.1125	578.1239	533.8575	526.9590 (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	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239	46.2239		
alpha	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816	4.0816		
util living area	0.9525	0.9274	0.8732	0.7601	0.5911	0.4079	0.3052	0.3446	0.5627	0.8085	0.9245		0.9599 (86)
MIT	20.1906	20.3297	20.5398	20.7610	20.8936	20.9378	20.9448	20.9433	20.9122	20.7390	20.4242		20.1382 (87)
Th 2	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918	20.0918		20.0918 (88)
util rest of house	0.9432	0.9138	0.8506	0.7216	0.5352	0.3407	0.2312	0.2658	0.4917	0.7677	0.9081		0.9520 (89)
MIT 2	19.0344	19.2299	19.5196	19.8092	19.9656	20.0084	20.0133	20.0126	19.9873	19.7898	19.3670		18.9599 (90)
Living area fraction									fLA = Living area / (4) =				0.4012 (91)
MIT	19.4983	19.6711	19.9289	20.1911	20.3379	20.3813	20.3870	20.3860	20.3584	20.1706	19.7911		19.4326 (92)
Temperature adjustment													0.0000
adjusted MIT	19.4983	19.6711	19.9289	20.1911	20.3379	20.3813	20.3870	20.3860	20.3584	20.1706	19.7911		19.4326 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9360	0.9066	0.8462	0.7261	0.5508	0.3624	0.2554	0.2915	0.5132	0.7715	0.9018	0.9451	(94)
Useful gains	514.5842	553.8928	571.2898	539.2273	427.5958	279.7543	185.9161	197.5344	328.9966	446.0404	481.4080	498.0047	(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	863.6000	837.8011	756.7326	621.5689	449.2408	282.7432	186.4506	198.4704	341.7598	535.7759	718.2119	871.7137	(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	259.6678	190.7864	137.9694	59.2860	16.1039	0.0000	0.0000	0.0000	0.0000	66.7632	170.4988	278.0395	(98)
Space heating												1179.1149	(98)
Space heating per m2												(98) / (4) =	19.3234 (99)

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 1179.1149 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	259.6678	190.7864	137.9694	59.2860	16.1039	0.0000	0.0000	0.0000	0.0000	66.7632	170.4988	278.0395	(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)	259.6678	190.7864	137.9694	59.2860	16.1039	0.0000	0.0000	0.0000	0.0000	66.7632	170.4988	278.0395	(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												1179.1149	(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) 278.9274 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
 Total delivered energy for all uses 3074.8712 (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)	1179.1149	12.1400	143.1445	(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)	278.9274	40.2650	112.3101	(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			517.2001	(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	1179.1149	0.5190	611.9606	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	0.5190	797.5921	(264)
Space and water heating			1409.5527	(265)
Pumps and fans	80.0426	0.5190	41.5421	(267)
Energy for lighting	278.9274	0.5190	144.7633	(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			1342.5862	(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	1179.1149	3.0700	3619.8827	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	3.0700	4717.9341	(264)
Space and water heating			8337.8168	(265)
Pumps and fans	80.0426	3.0700	245.7308	(267)
Energy for lighting	278.9274	3.0700	856.3071	(268)

FULL SAP CALCULATION PRINTOUT

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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			7941.6947 (272)
Primary energy kWh/m ² /year			130.1490 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 86
Current environmental impact rating:	B 82

(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 86
Potential environmental impact rating:	B 82

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 £517	Potential £517	Saving £0
Electricity			
Space heating	£171	£171	£0
Water heating	£234	£234	£0
Lighting	£112	£112	£0
Total cost of fuels	£517	£517	£0
Total cost of uses	£517	£517	£0
Delivered energy	50 kWh/m ²	50 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.3 tonnes	1.3 tonnes	0.0 tonnes
CO2 emissions per m ²	22 kg/m ²	22 kg/m ²	0 kg/m ²
Primary energy	130 kWh/m ²	130 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	164.7 (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	36.24 (37)
Summer heat loss coefficient	229.55 (P2)

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

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North East	1.000	0.90	1.000	0.900 (P8)
South West	1.000	0.90	1.000	0.900 (P8)
North 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	4.7400	89.6552	0.6700	0.7000	0.9000	161.4401
South West	5.1900	112.1012	0.6700	0.7000	0.9000	221.0220
North West	2.0200	89.6552	0.6700	0.7000	0.9000	68.7994
total:						451.2615

	Jun	Jul	Aug	
Solar gains	490	451	380	(P3)
Internal gains	373	359	366	
Total summer gains	864	810	745	(P5)

Summer gain/loss ratio	3.76	3.53	3.25	(P6)
Summer external temperature	14.70	16.40	16.30	
Thermal mass temperature increment (TMP = 164.7)	0.85	0.85	0.85	
Threshold temperature	19.31	20.78	20.39	(P7)
Likelihood of high internal temperature	Not significant	Slight	Not significant	

Assessment of likelihood of high internal temperature: Slight