

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	74278-02			Issued on Date	30/03/2023
Assessment Reference	001	Prop Type Ref	HT 2B3P (GF)		
Property	Flat 2, 32 Brookstone Close, MANCHESTER, M21 7AE				
SAP Rating	87 B	DER	26.12	TER	26.00
Environmental	83 B	% DER<TER	-0.46		
CO ₂ Emissions (t/year)	1.30	DFEE	35.42	TFEE	44.69
General Requirements Compliance	Fail	% DFEE<TFEE	20.76		
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

Ground-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) 26.00 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 26.12 kgCO₂/m² Fail
Excess emissions = 0.12 kgCO₂/m² (0.5%)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 44.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 35.4 kWh/m²/yr OK

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	0.14 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.35 (max. 2.00)	1.35 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified ψ -value of 0.063

3 Air permeability

Air permeability at 50 pascals:	3.02 (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
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Hot water controls:	Cylinderstat	OK
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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
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Based on:

Overshading:	Average
Windows facing North East:	1.19 m ² , No overhang
Windows facing South East:	5.19 m ² , No overhang
Windows facing South West:	6.76 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
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					3.0200
Infiltration rate					0.1510 (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) =				0.1284 (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	0.1636	0.1604	0.1572	0.1412	0.1380	0.1219	0.1219	0.1187	0.1284	0.1380	0.1444	0.1508 (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)
GF			61.0200	0.1400	8.5428	75.0000	4576.5000 (28a)
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)			115.5200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			32.8178	(33)
Party Wall 1			24.0800	0.0000	0.0000	70.0000	1685.6000 (32)
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) =			13705.1700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K						224.6013	(35)
Thermal bridges (User defined value 0.063 * total exposed area)						7.2778	(36)
Total fabric heat loss			(33) + (36) =			40.0955	(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	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595 (39)
Average = Sum(39)m / 12 =												64.2595 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531 (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												Total = Sum(45)m = 1289.3164 (45)
	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

[illegible]

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, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441
alpha	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496
util living area	0.9901	0.9746	0.9384	0.8545	0.7089	0.5308	0.3869	0.4260	0.6510	0.8955	0.9783	0.9928 (86)
MIT	20.1319	20.3118	20.5333	20.7519	20.8907	20.9433	20.9539	20.9526	20.9227	20.7300	20.3762	20.0833 (87)
Th 2	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393 (88)
util rest of house	0.9874	0.9679	0.9227	0.8208	0.6525	0.4563	0.3036	0.3390	0.5741	0.8625	0.9713	0.9907 (89)
MIT 2	18.8886	19.1469	19.4584	19.7499	19.9153	19.9668	19.9742	19.9736	19.9506	19.7302	19.2425	18.8183 (90)
Living area fraction									fLA = Living area / (4) =			0.4012 (91)
MIT	19.3874	19.6142	19.8896	20.1519	20.3066	20.3585	20.3673	20.3664	20.3406	20.1313	19.6973	19.3258 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3874	19.6142	19.8896	20.1519	20.3066	20.3585	20.3673	20.3664	20.3406	20.1313	19.6973	19.3258 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9850	0.9643	0.9199	0.8251	0.6689	0.4815	0.3322	0.3689	0.5992	0.8661	0.9682	0.9887 (94)
Useful gains	466.8305	556.5257	609.7192	606.3239	518.6851	364.4887	241.3815	253.6940	385.5370	486.0693	463.5462	438.3413 (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	969.5075	945.5288	860.4087	723.0401	553.0575	370.0411	242.0829	254.8761	401.0165	612.4745	809.4953	971.9762 (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	373.9917	261.4101	186.5130	84.0357	25.5731	0.0000	0.0000	0.0000	0.0000	94.0454	249.0834	397.0244 (98)
Space heating												1671.6767 (98)
Space heating per m2												27.3956 (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													1671.6767 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	373.9917	261.4101	186.5130	84.0357	25.5731	0.0000	0.0000	0.0000	0.0000	94.0454	249.0834	397.0244	(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)	373.9917	261.4101	186.5130	84.0357	25.5731	0.0000	0.0000	0.0000	0.0000	94.0454	249.0834	397.0244	(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												1671.6767	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.3000, SFP = 0.4160)													
mechanical ventilation fans (SFP = 0.4160)													74.3253 (230a)
Total electricity for the above, kWh/year													74.3253 (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													3559.4581 (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	1671.6767	0.5190	867.6002	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	0.5190	797.5921	(264)
Space and water heating			1665.1923	(265)
Pumps and fans	74.3253	0.5190	38.5748	(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			1594.0868	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			26.1200	(273)

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

DER		26.1200	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		45.9052	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		45.9052	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		Openings		NetArea		U-value		A x U		K-value		A x K	
	m2		m2		m2		W/m2K		W/K		kJ/m2K		kJ/K	
TER Opening Type (Uw = 1.40)					13.1400		1.3258		17.4205				(27)	
GF					61.0200		0.1300		7.9326				(28a)	
Main	54.5000		13.1400		41.3600		0.1800		7.4448				(29a)	
Total net area of external elements Aum(A, m2)					115.5200								(31)	
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =				32.7979				(33)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													250.0000 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													8.9512 (36)	
Total fabric heat loss											(33) + (36) =		41.7491 (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	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)	
	70.1540	69.9894	69.8279	69.0697	68.9279	68.2675	68.2675	68.1452	68.5219	68.9279	69.2148	69.5149	(39)	
Average = Sum(39)m / 12 =												69.0690	(39)	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP (average)	1.1497	1.1470	1.1443	1.1319	1.1296	1.1188	1.1188	1.1168	1.1229	1.1296	1.1343	1.1392	(40)	
Days in month												1.1319	(40)	
	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 90.1397	Feb 86.8619	Mar 83.5841	Apr 80.3063	May 77.0284	Jun 73.7506	Jul 73.7506	Aug 77.0284	Sep 80.3063	Oct 83.5841	Nov 86.8619	Dec 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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	15.6662	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, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	60.4028	60.5449	60.6849	61.3510	61.4773	62.0720	62.0720	62.1834	61.8416	61.4773	61.2224	60.9582
alpha	5.0269	5.0363	5.0457	5.0901	5.0985	5.1381	5.1381	5.1456	5.1228	5.0985	5.0815	5.0639
util living area	0.9923	0.9810	0.9535	0.8826	0.7471	0.5616	0.4097	0.4485	0.6811	0.9130	0.9826	0.9942 (86)
MIT	19.9538	20.1599	20.4279	20.7168	20.9056	20.9825	20.9971	20.9955	20.9548	20.7036	20.2714	19.9140 (87)
Th 2	19.9605	19.9626	19.9648	19.9749	19.9767	19.9855	19.9855	19.9872	19.9821	19.9767	19.9729	19.9689 (88)
util rest of house	0.9899	0.9752	0.9395	0.8498	0.6871	0.4790	0.3166	0.3520	0.5976	0.8807	0.9762	0.9924 (89)
MIT 2	18.5898	18.8883	19.2688	19.6654	19.8927	19.9750	19.9846	19.9855	19.9507	19.6603	19.0593	18.5383 (90)
Living area fraction	19.1370	19.3984	19.7338	20.0872	20.2991	20.3792	20.3908	20.3907	20.3535	20.0789	19.5455	19.0902 (92)
Temperature adjustment	19.1370	19.3984	19.7338	20.0872	20.2991	20.3792	20.3908	20.3907	20.3535	20.0789	19.5455	19.0902 (93)
adjusted MIT	19.1370	19.3984	19.7338	20.0872	20.2991	20.3792	20.3908	20.3907	20.3535	20.0789	19.5455	19.0902 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9873	0.9712	0.9358	0.8538	0.7070	0.5117	0.3541	0.3908	0.6294	0.8845	0.9728	0.9902 (94)
Ext temp.	489.3489	575.5075	629.3162	631.0520	548.8276	387.7981	257.9673	270.5926	409.8985	508.5826	485.1526	461.7729 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1040.8746	1014.7358	924.0905	772.6956	592.7161	394.5295	258.7863	271.9442	428.5019	653.3570	861.4156	1035.0902 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	410.3351	295.1614	219.3120	101.9833	32.6530	0.0000	0.0000	0.0000	0.0000	107.7122	270.9094	426.5481 (98)
												1864.6146 (98)
												30.5574 (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													1994.2402 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	410.3351	295.1614	219.3120	101.9833	32.6530	0.0000	0.0000	0.0000	0.0000	107.7122	270.9094	426.5481	(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)	438.8611	315.6807	234.5583	109.0731	34.9230	0.0000	0.0000	0.0000	0.0000	115.2002	289.7427	456.2012	(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	86.9418	86.4422	85.5379	83.8059	81.5474	79.8000	79.8000	79.8000	79.8000	83.8523	86.1396	87.0884	(216)
Fuel for water heating, kWh/month	207.3450	183.9360	195.5137	179.3091	180.8978	165.6395	159.5177	174.4356	173.9380	185.8096	190.7416	202.1526	(219)
Water heating fuel used												2199.2362	(219)
Annual totals kWh/year													
Space heating fuel - main system												1994.2402	(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												4545.1461	(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	1994.2402	0.2160	430.7559 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2199.2362	0.2160	475.0350 (264)
Space and water heating			905.7909 (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			1088.3075 (272)
Emissions per m2 for space and water heating			14.8442 (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) = (14.8442 * 1.55) + 2.3532 + 0.6379, rounded to 2 d.p.			26.0000 (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					3.0200
Infiltration rate					0.2876 (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) =				0.2444 (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	0.3117	0.3055	0.2994	0.2689	0.2628	0.2322	0.2322	0.2261	0.2444	0.2628	0.2750	0.2872 (22b)
	0.5486	0.5467	0.5448	0.5361	0.5345	0.5270	0.5270	0.5256	0.5299	0.5345	0.5378	0.5412 (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)
GF			61.0200	0.1400	8.5428	75.0000	4576.5000 (28a)
Main	54.5000	13.1400	41.3600	0.1800	7.4448	110.0000	4549.6000 (29a)
Total net area of external elements Aum (m ²)			115.5200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.8178		(33)
Party Wall 1			24.0800	0.0000	0.0000	70.0000	1685.6000 (32)
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) =	13104.9700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							214.7652 (35)
Thermal bridges (User defined value 0.063 * total exposed area)							7.2778 (36)
Total fabric heat loss						(33) + (36) =	40.0955 (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	26.5109	26.4197	26.3304	25.9108	25.8323	25.4669	25.4669	25.3992	25.6076	25.8323	25.9911	26.1572 (38)
Heat transfer coeff	66.6064	66.5153	66.4259	66.0064	65.9279	65.5624	65.5624	65.4947	65.7032	65.9279	66.0867	66.2527 (39)
Average = Sum(39)m / 12 =												66.0060 (39)
HLP	1.0916	1.0901	1.0886	1.0817	1.0804	1.0744	1.0744	1.0733	1.0767	1.0804	1.0830	1.0858 (40)
HLP (average)												1.0817 (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										Total = Sum(45)m =		1289.3164 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
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	(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)
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	(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	54.6534	54.7283	54.8019	55.1503	55.2160	55.5237	55.5237	55.5811	55.4048	55.2160	55.0833	54.9452		
alpha	4.6436	4.6486	4.6535	4.6767	4.6811	4.7016	4.7016	4.7054	4.6937	4.6811	4.6722	4.6630		
util living area	0.9925	0.9799	0.9498	0.8760	0.7411	0.5627	0.4134	0.4566	0.6891	0.9159	0.9836	0.9946	(86)	
MIT	19.7978	20.0391	20.3446	20.6661	20.8818	20.9745	20.9951	20.9923	20.9361	20.6338	20.1403	19.7444	(87)	
Th 2	20.0077	20.0090	20.0102	20.0158	20.0168	20.0218	20.0218	20.0227	20.0199	20.0168	20.0147	20.0125	(88)	
util rest of house	0.9905	0.9745	0.9367	0.8456	0.6856	0.4846	0.3235	0.3629	0.6113	0.8878	0.9783	0.9930	(89)	
MIT 2	18.9199	19.1587	19.4558	19.7588	19.9408	20.0101	20.0204	20.0204	19.9865	19.7387	19.2654	18.8707	(90)	
Living area fraction	19.2721	19.5119	19.8124	20.1228	20.3183	20.3970	20.4114	20.4103	20.3675	20.0978	19.6164	19.2212	(91)	
MIT	19.2721	19.5119	19.8124	20.1228	20.3183	20.3970	20.4114	20.4103	20.3675	20.0978	19.6164	19.2212	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.2721	19.5119	19.8124	20.1228	20.3183	20.3970	20.4114	20.4103	20.3675	20.0978	19.6164	19.2212	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	424.8311	518.3282	579.5153	589.9467	518.2100	370.9193	248.5466	260.4401	387.4830	463.9217	425.6161	396.4352	(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	997.2365	971.9129	884.2882	740.7741	568.1862	380.0640	249.8871	262.6518	411.7924	626.1680	827.1659	995.1939	(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	425.8696	304.8090	226.7510	108.5957	37.1823	0.0000	0.0000	0.0000	0.0000	120.7112	289.1158	445.4764	(98)	
Space heating												1958.5110	(98)	
Space heating per m2												32.0962	(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	616.2867	485.1618	497.7600	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9434	0.9719	0.9626	0.0000	0.0000	0.0000	0.0000	(101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	581.4035	471.5271	479.1397	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	241.2123	304.8003	264.5381	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												810.5507 (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	60.3031	76.2001	66.1345	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												202.6377 (107)
Space cooling per m2												3.3208 (108)
Energy for space heating												32.0962 (99)
Energy for space cooling												3.3208 (108)
Total												35.4171 (109)
Dwelling Fabric Energy Efficiency (DFEE)												35.4 (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 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 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)
GF			61.0200	0.1300	7.9326		(28a)
Main	54.5000	13.1400	41.3600	0.1800	7.4448		(29a)
Total net area of external elements Aum(A, m ²)			115.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.7979		(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)							8.9512 (36)
Total fabric heat loss						(33) + (36) =	41.7491 (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	70.1540	69.9894	69.8279	69.0697	68.9279	68.2675	68.2675
Average = Sum(39)m / 12 =						68.1452	68.1452
	68.5219	68.9279	69.2148	69.5149	69.0690		
HLP	1.1497	1.1470	1.1443	1.1319	1.1296	1.1188	1.1188
HLP (average)						1.1168	1.1168
Days in month	31	28	31	30	31	30	31
						30	31

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	15.6662	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)

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
tau	60.4028	60.5449	60.6849	61.3510	61.4773	62.0720	62.0720	62.1834	61.8416	61.4773	61.2224	60.9582	
alpha	5.0269	5.0363	5.0457	5.0901	5.0985	5.1381	5.1381	5.1456	5.1228	5.0985	5.0815	5.0639	
util living area	0.9963	0.9891	0.9697	0.9136	0.7926	0.6094	0.4491	0.4948	0.7389	0.9441	0.9911	0.9973	(86)
MIT	19.8423	20.0546	20.3363	20.6525	20.8753	20.9748	20.9956	20.9929	20.9344	20.6281	20.1663	19.8025	(87)
Th 2	19.9605	19.9626	19.9648	19.9749	19.9767	19.9855	19.9855	19.9872	19.9821	19.9767	19.9729	19.9689	(88)
util rest of house	0.9950	0.9855	0.9598	0.8866	0.7355	0.5227	0.3479	0.3896	0.6558	0.9205	0.9876	0.9965	(89)
MIT 2	18.9142	19.1263	19.4033	19.7089	19.8986	19.9749	19.9845	19.9853	19.9496	19.6954	19.2466	18.8814	(90)
Living area fraction	19.2865	19.4987	19.7776	20.0874	20.2904	20.3760	20.3901	20.3895	20.3447	20.0696	19.6156	19.2509	(92)
MIT	19.2865	19.4987	19.7776	20.0874	20.2904	20.3760	20.3901	20.3895	20.3447	20.0696	19.6156	19.2509	(93)
Temperature adjustment												0.0000	
adjusted MIT	19.2865	19.4987	19.7776	20.0874	20.2904	20.3760	20.3901	20.3895	20.3447	20.0696	19.6156	19.2509	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9940	0.9835	0.9577	0.8899	0.7542	0.5570	0.3887	0.4320	0.6873	0.9230	0.9861	0.9956	(94)
Useful gains	418.4444	510.0771	574.5313	594.9188	533.1386	384.4761	257.4800	269.7261	400.3414	465.4763	419.7942	390.6340	(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	1051.3654	1021.7551	927.1483	772.7138	592.1183	394.3138	258.7425	271.8682	427.8990	652.7179	866.2636	1046.2622	(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	470.8932	343.8476	262.3470	128.0124	43.8808	0.0000	0.0000	0.0000	0.0000	139.3077	321.4580	487.7874	(98)
Space heating												2197.5342	(98)
Space heating per m2												36.0133	(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	641.7145	505.1795	517.9035	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9380	0.9705	0.9604	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	601.9246	490.2857	497.3978	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	201.4891	266.0455	228.4460	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												695.9806	(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	50.3723	66.5114	57.1115	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													173.9952 (107)
Space cooling per m2													2.8514 (108)
Energy for space heating													36.0133 (99)
Energy for space cooling													2.8514 (108)
Total													38.8648 (109)
Target Fabric Energy Efficiency (TFEE)													44.7 (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) =					Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0200
Infiltration rate					0.1510 (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) =	0.1284 (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	0.1380	0.1348	0.1348	0.1251	0.1284	0.1091	0.1059	0.1059	0.1091	0.1219	0.1219	0.1251 (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)
GF			61.0200	0.1400	8.5428	75.0000	4576.5000 (28a)
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)			115.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.8178		(33)
Party Wall 1			24.0800	0.0000	0.0000	70.0000	1685.6000 (32)
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) =	13705.1700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							224.6013 (35)
Thermal bridges (User defined value 0.063 * total exposed area)							7.2778 (36)
Total fabric heat loss						(33) + (36) =	40.0955 (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	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595 (39)
Average = Sum(39)m / 12 =												64.2595 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531 (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)

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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)	

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)

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	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441
alpha	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496
util living area	0.9678	0.9376	0.8745	0.7524	0.5806	0.3972	0.2938	0.3254	0.5276	0.7976	0.9387	0.9745 (86)
MIT	20.3665	20.5156	20.6968	20.8542	20.9322	20.9531	20.9556	20.9552	20.9438	20.8394	20.5733	20.3163 (87)
Th 2	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393 (88)
util rest of house	0.9594	0.9225	0.8472	0.7069	0.5186	0.3264	0.2178	0.2457	0.4521	0.7480	0.9212	0.9677 (89)
MIT 2	19.2247	19.4324	19.6760	19.8719	19.9561	19.9736	19.9749	19.9748	19.9673	19.8606	19.5168	19.1535 (90)
Living area fraction									fLA = Living area / (4) =			0.4012 (91)
MIT	19.6827	19.8670	20.0856	20.2660	20.3477	20.3666	20.3684	20.3681	20.3590	20.2533	19.9407	19.6200 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6827	19.8670	20.0856	20.2660	20.3477	20.3666	20.3684	20.3681	20.3590	20.2533	19.9407	19.6200 (93)

[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					3.0200
Number of sides sheltered					0.1510 (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) =	0.1284 (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	0.1636	0.1604	0.1572	0.1412	0.1380	0.1219	0.1219	0.1187	0.1284	0.1380	0.1444	0.1508 (22b)
Mechanical extract ventilation - centralised												0.1508 (22b)
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)
GF			61.0200	0.1400	8.5428	75.0000	4576.5000 (28a)
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)			115.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.8178		(33)
Party Wall 1			24.0800	0.0000	0.0000	70.0000	1685.6000 (32)
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) =	13705.1700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							224.6013 (35)
Thermal bridges (User defined value 0.063 * total exposed area)							7.2778 (36)
Total fabric heat loss						(33) + (36) =	40.0955 (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	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595 (39)
Average = Sum(39)m / 12 =												64.2595 (39)
HLP	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531 (40)
HLP (average)												1.0531 (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 1239.4515 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	289.4368	195.1776	132.0773	55.2834	15.5727	0.0000	0.0000	0.0000	0.0000	58.5347	181.3677	312.0015	(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)	289.4368	195.1776	132.0773	55.2834	15.5727	0.0000	0.0000	0.0000	0.0000	58.5347	181.3677	312.0015	(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												1239.4515	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:
 (MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.4160)
 mechanical ventilation fans (SFP = 0.4160) 74.3253 (230a)
 Total electricity for the above, kWh/year 74.3253 (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 3127.2329 (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)	1239.4515	5.5000	68.1698	(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)	74.3253	12.4509	9.2542	(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			240.4858	(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] = 0.9527 (257)
 SAP value 86.7100
 SAP rating (Section 12) 87 (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	1239.4515	0.5190	643.2753	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	0.5190	797.5921	(264)
Space and water heating			1440.8674	(265)
Pumps and fans	74.3253	0.5190	38.5748	(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			1369.7619	(272)
CO2 emissions per m2			22.4500	(273)
EI value			82.6874	
EI rating			83 (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					3.0200
Infiltration rate					0.1510 (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) =				0.1284 (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	0.1380	0.1348	0.1348	0.1251	0.1284	0.1091	0.1059	0.1059	0.1091	0.1219	0.1219	0.1251 (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)
GF			61.0200	0.1400	8.5428	75.0000	4576.5000 (28a)
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)				115.5200			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.8178		(33)
Party Wall 1				24.0800	0.0000	70.0000	1685.6000 (32)
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) =			13705.1700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							224.6013 (35)
Thermal bridges (User defined value 0.063 * total exposed area)							7.2778 (36)
Total fabric heat loss				(33) + (36) =			40.0955 (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	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595	64.2595 (39)
Average = Sum(39)m / 12 =												64.2595 (39)
HLP	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531	1.0531 (40)
HLP (average)												1.0531 (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)

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

Water storage loss:												
Store volume												
a) If manufacturer declared loss factor is known (kWh/day):	150.0000 (47)											
Temperature factor from Table 2b	1.1300 (48)											
Enter (49) or (54) in (55)	0.6000 (49)											
Total storage loss	0.6780 (55)											
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	(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	(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	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441	59.2441
alpha	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496	4.9496
util living area	0.9678	0.9376	0.8745	0.7524	0.5806	0.3972	0.2938	0.3254	0.5276	0.7976	0.9387	0.9745 (86)
MIT	20.3665	20.5156	20.6968	20.8542	20.9322	20.9531	20.9556	20.9552	20.9438	20.8394	20.5733	20.3163 (87)
Th 2	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393	20.0393 (88)
util rest of house	0.9594	0.9225	0.8472	0.7069	0.5186	0.3264	0.2178	0.2457	0.4521	0.7480	0.9212	0.9677 (89)
MIT 2	19.2247	19.4324	19.6760	19.8719	19.9561	19.9736	19.9749	19.9748	19.9673	19.8606	19.5168	19.1535 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.4012 (91)
MIT	19.6827	19.8670	20.0856	20.2660	20.3477	20.3666	20.3684	20.3681	20.3590	20.2533	19.9407	19.6200 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6827	19.8670	20.0856	20.2660	20.3477	20.3666	20.3684	20.3681	20.3590	20.2533	19.9407	19.6200 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9556	0.9195	0.8487	0.7181	0.5389	0.3507	0.2439	0.2731	0.4777	0.7598	0.9191	0.9641 (94)
Useful gains	575.9542	641.3988	663.7391	609.5299	466.8894	298.7624	197.0330	209.7601	358.3766	512.3376	549.6019	553.3982 (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	930.6519	903.9346	815.1675	666.1138	478.5852	299.8715	197.1716	210.0091	363.6471	575.3352	773.7262	939.4711 (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	263.8950	176.4241	112.6627	40.7404	8.7017	0.0000	0.0000	0.0000	0.0000	46.8702	161.3695	287.2383 (98)
Space heating												1097.9019 (98)
Space heating per m2												17.9925 (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 1097.9019 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	263.8950	176.4241	112.6627	40.7404	8.7017	0.0000	0.0000	0.0000	0.0000	46.8702	161.3695	287.2383	(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)	263.8950	176.4241	112.6627	40.7404	8.7017	0.0000	0.0000	0.0000	0.0000	46.8702	161.3695	287.2383	(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												1097.9019	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:
 (MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.4160)
 mechanical ventilation fans (SFP = 0.4160) 74.3253 (230a)
 Total electricity for the above, kWh/year 74.3253 (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 2985.6833 (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)	1097.9019	12.1400	133.2853	(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)	74.3253	34.3275	25.5140	(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			504.4692	(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	1097.9019	0.5190	569.8111	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	0.5190	797.5921	(264)
Space and water heating			1367.4032	(265)
Pumps and fans	74.3253	0.5190	38.5748	(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			1296.2976	(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	1097.9019	3.0700	3370.5589	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	3.0700	4717.9341	(264)
Space and water heating			8088.4930	(265)
Pumps and fans	74.3253	3.0700	228.1786	(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			7667.8878 (272)
Primary energy kWh/m ² /year			125.6619 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating:	B 87
Current environmental impact rating:	B 83

(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 87
Potential environmental impact rating:	B 83

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 £504	Potential £504	Saving £0
Electricity			
Space heating	£159	£159	£0
Water heating	£234	£234	£0
Lighting	£111	£111	£0
Total cost of fuels	£504	£504	£0
Total cost of uses	£504	£504	£0
Delivered energy	49 kWh/m ²	49 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.3 tonnes	1.3 tonnes	0.0 tonnes
CO2 emissions per m ²	21 kg/m ²	21 kg/m ²	0 kg/m ²
Primary energy	126 kWh/m ²	126 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	224.6 (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	40.10 (37)
Summer heat loss coefficient	233.41 (P2)

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

	Jun	Jul	Aug	
Solar gains	589	549	491	(P3)
Internal gains	373	359	366	
Total summer gains	962	908	856	(P5)

Summer gain/loss ratio	4.12	3.89	3.67	(P6)
Summer external temperature	14.70	16.40	16.30	
Thermal mass temperature increment (TMP = 224.6)	0.43	0.43	0.43	
Threshold temperature	19.25	20.72	20.40	(P7)
Likelihood of high internal temperature	Not significant	Slight	Not significant	

Assessment of likelihood of high internal temperature: Slight