

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	74278-05			Issued on Date	30/03/2023
Assessment Reference	001	Prop Type Ref	HT 2B3P (Mid)		
Property	Flat 5, 32 Brookstone Close, MANCHESTER, M21 7AE				
SAP Rating	88 B	DER	23.10	TER	23.54
Environmental	85 B	% DER<TER	1.88		
CO ₂ Emissions (t/year)	1.11	DFEE	28.12	TFEE	35.25
General Requirements Compliance	Pass	% DFEE<TFEE	20.23		
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

Mid-floor flat, total floor area 61 m²

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

1a TER and DER

Fuel for main heating: Electricity
 Fuel factor: 1.55 (electricity)
 Target Carbon Dioxide Emission Rate (TER) 23.54 kgCO₂/m²
 Dwelling Carbon Dioxide Emission Rate (DER) 23.10 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 35.2 kWh/m²/yr
 Dwelling Fabric Energy Efficiency (DFEE) 28.1 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	(no floor)		
Roof	(no roof)		
Openings	1.35 (max. 2.00)	1.35 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified ψ -value of 0.100

3 Air permeability

Air permeability at 50 pascals: 2.73 (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)): Not significant OK

Based on:

Overshading: Average
 Windows facing North East: 7.69 m², No overhang
 Windows facing South East: 0.90 m², No overhang
 Air change rate: 4.00 ach
 Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
 Air permeability 2.7 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					2.7300
Infiltration rate					0.1365 (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) =				0.1160 (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	0.1479	0.1450	0.1421	0.1276	0.1247	0.1102	0.1102	0.1073	0.1160	0.1247	0.1305	0.1363 (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)			8.5900	1.2808	11.0024		(27)
Main	48.8200	8.5900	40.2300	0.1800	7.2414	110.0000	4425.3000 (29a)
Total net area of external elements Aum(A, m ²)			48.8200				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				18.2438		(33)
Party Wall 1			30.0000	0.0000	0.0000	45.0000	1350.0000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11109.5700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		182.0644 (35)
Thermal bridges (User defined value 0.100 * total exposed area)		4.8820 (36)
Total fabric heat loss	(33) + (36) =	23.1258 (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	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897 (39)
Average = Sum(39)m / 12 =												47.2897 (39)
HLP	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750 (40)
HLP (average)												0.7750 (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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Independent Energy Specialists, SAP, SBEM, EPC's, U-Value & Condensation Risk, 2D & 3D Thermal Modelling

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.7663	14.8917	12.1107	9.1686	6.8536	5.7861	6.2521	8.1267	10.9077	13.8498	16.1648	17.2323 (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	327.7733	325.8270	314.5257	296.4691	278.3511	260.8065	249.3762	254.7497	264.0105	282.2543	303.1484	318.6102 (73)

[Jan											Area		Solar flux		g		FF		Access		Gains	
											m2		Table 6a		Table 6b		Table 6c		factor		W	
													W/m2		or Table 6b		or Table 6c		Table 6d			
Northeast											7.6900		11.2829		0.6700		0.7000		0.7700		28.2004 (75)	
Southeast											0.9000		36.7938		0.6700		0.7000		0.7700		10.7628 (77)	
Solar gains	38.9631	75.7356	128.5053	200.9278	263.1209	277.9617	261.0168	212.0582	153.1811	90.4124	48.3747			32.2405 (83)								
Total gains	366.7364	401.5626	443.0310	497.3969	541.4720	538.7682	510.3930	466.8079	417.1916	372.6667	351.5231			350.8507 (84)								

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572
alpha	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505
util living area	0.9911	0.9843	0.9635	0.8952	0.7438	0.5502	0.4057	0.4618	0.7242	0.9337	0.9833	0.9929 (86)
MIT	20.2272	20.3306	20.5148	20.7413	20.8958	20.9487	20.9576	20.9560	20.9179	20.7123	20.4241	20.1932 (87)
Th 2	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751 (88)
util rest of house	0.9891	0.9809	0.9555	0.8736	0.7013	0.4920	0.3398	0.3910	0.6652	0.9150	0.9791	0.9913 (89)
MIT 2	19.2277	19.3774	19.6417	19.9554	20.1507	20.2073	20.2147	20.2137	20.1791	19.9224	19.5140	19.1782 (90)
Living area fraction									fLA = Living area / (4) =			0.4012 (91)
MIT	19.6287	19.7598	19.9920	20.2707	20.4496	20.5048	20.5127	20.5115	20.4755	20.2393	19.8791	19.5854 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6287	19.7598	19.9920	20.2707	20.4496	20.5048	20.5127	20.5115	20.4755	20.2393	19.8791	19.5854 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9869	0.9779	0.9518	0.8734	0.7120	0.5108	0.3615	0.4143	0.6823	0.9140	0.9762	0.9894 (94)
Useful gains	361.9432	392.6897	421.6925	434.4432	385.5078	275.1765	184.5138	193.3811	284.6452	340.6068	343.1563	347.1462 (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												
	724.8883	702.7145	638.0331	537.7180	413.7671	279.2344	185.0322	194.4314	301.4951	455.8402	604.3206	727.5702 (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												
	270.0312	208.3367	160.9574	74.3579	21.0250	0.0000	0.0000	0.0000	0.0000	85.7336	188.0383	283.0355 (98)
Space heating												1291.5156 (99)
Space heating per m2												21.1654 (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	1291.5156 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	270.0312	208.3367	160.9574	74.3579	21.0250	0.0000	0.0000	0.0000	0.0000	85.7336	188.0383	283.0355 (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)	270.0312	208.3367	160.9574	74.3579	21.0250	0.0000	0.0000	0.0000	0.0000	85.7336	188.0383	283.0355 (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												1291.5156 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.4480)												80.0426 (230a)
mechanical ventilation fans (SFP = 0.4480)												80.0426 (231)
Total electricity for the above, kWh/year												296.0977 (232)
Electricity for lighting (calculated in Appendix L)												
Energy saving/generation technologies (Appendices M,N and Q)												3204.4422 (238)
Total delivered energy for all uses												

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	1291.5156	0.5190	670.2966 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	0.5190	797.5921 (264)
Space and water heating			1467.8887 (265)
Pumps and fans	80.0426	0.5190	41.5421 (267)
Energy for lighting	296.0977	0.5190	153.6747 (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			1409.8335 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			23.1000 (273)

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

DER		23.1000 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		42.8852 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		42.8852 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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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)			8.5900	1.3258	11.3883			(27)				
Main	48.8200	8.5900	40.2300	0.1800	7.2414			(29a)				
Total net area of external elements Aum(A, m2)			48.8200					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			18.6297		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.0021 (36)				
Total fabric heat loss						(33) + (36) =		23.6318 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.4050	28.2403	28.0789	27.3207	27.1788	26.5184	26.5184	26.3961	26.7728	27.1788	27.4658	27.7658 (38)
Heat transfer coeff	52.0368	51.8721	51.7106	50.9524	50.8106	50.1502	50.1502	50.0279	50.4046	50.8106	51.0976	51.3976 (39)
Average = Sum(39)m / 12 =												50.9518 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8528	0.8501	0.8474	0.8350	0.8327	0.8219	0.8219	0.8199	0.8260	0.8327	0.8374	0.8423 (40)
HLP (average)												0.8350 (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)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												

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Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	180.2694	158.9983	167.2382	150.2716	147.5174	132.1803	127.2951	139.1996	138.8025	155.8057	164.3040	176.0515 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	180.2694	158.9983	167.2382	150.2716	147.5174	132.1803	127.2951	139.1996	138.8025	155.8057	164.3040	176.0515 (64)
	81.7227	72.5420	77.3898	71.0457	70.8327	65.0304	64.1088	68.0670	67.2323	73.5885	75.7115	80.3203 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.7663	14.8917	12.1107	9.1686	6.8536	5.7861	6.2521	8.1267	10.9077	13.8498	16.1648	17.2323	(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	358.2753	356.3291	345.0277	326.9711	308.8531	291.3086	279.8782	285.2518	294.5125	312.7563	333.6505	349.1123	(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					7.6900	11.2829	0.6300	0.7000	0.7700		26.5168 (75)	
Southeast					0.9000	36.7938	0.6300	0.7000	0.7700		10.1202 (77)	

Solar gains	36.6370	71.2141	120.8333	188.9321	247.4122	261.3669	245.4337	199.3980	144.0360	85.0147	45.4866	30.3157 (83)
Total gains	394.9123	427.5431	465.8611	515.9032	556.2653	552.6755	525.3119	484.6498	438.5485	397.7710	379.1371	379.4280 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.4328	81.6914	81.9464	83.1658	83.3980	84.4962	84.4962	84.7027	84.0698	83.3980	82.9296	82.4455	
alpha	6.4289	6.4461	6.4631	6.5444	6.5599	6.6331	6.6331	6.6468	6.6047	6.5599	6.5286	6.4964	
util living area	0.9966	0.9934	0.9820	0.9312	0.7876	0.5740	0.4193	0.4731	0.7502	0.9566	0.9922	0.9973	(86)
MIT	20.2263	20.3318	20.5238	20.7778	20.9438	20.9939	20.9993	20.9986	20.9693	20.7583	20.4548	20.2091	(87)
Th 2	20.2078	20.2101	20.2124	20.2231	20.2251	20.2344	20.2344	20.2362	20.2308	20.2251	20.2210	20.2168	(88)
util rest of house	0.9955	0.9914	0.9763	0.9107	0.7394	0.5083	0.3468	0.3955	0.6825	0.9391	0.9893	0.9965	(89)
MIT 2	19.1719	19.3271	19.6058	19.9669	20.1727	20.2305	20.2342	20.2356	20.2075	19.9487	19.5150	19.1538	(90)
Living area fraction	19.5949	19.7302	19.9741	20.2922	20.4821	20.5368	20.5411	20.5417	20.5131	20.2735	19.8920	19.5772	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5949	19.7302	19.9741	20.2922	20.4821	20.5368	20.5411	20.5417	20.5131	20.2735	19.8920	19.5772	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9944	0.9898	0.9741	0.9127	0.7561	0.5346	0.3759	0.4267	0.7084	0.9404	0.9878	0.9956	(94)
Ext temp.	392.7018	423.1811	453.8170	470.8820	420.5893	295.4415	197.4604	206.7808	310.6819	374.0508	374.5138	377.7433	(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	795.8984	769.2736	696.7536	580.4617	446.2215	297.7310	197.6488	207.1994	323.2513	491.5174	653.6420	790.3489	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	299.9783	232.5741	180.7449	78.8974	19.0704	0.0000	0.0000	0.0000	0.0000	87.3952	200.9723	306.9786	(98)
												1406.6111	(98)
												23.0516	(99)

8c. Space cooling requirement

Not applicable

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

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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													1504.3969 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	299.9783	232.5741	180.7449	78.8974	19.0704	0.0000	0.0000	0.0000	0.0000	87.3952	200.9723	306.9786	(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)	320.8324	248.7424	193.3100	84.3822	20.3961	0.0000	0.0000	0.0000	0.0000	93.4708	214.9437	328.3193	(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	86.1633	85.8271	85.0212	83.1860	80.8949	79.8000	79.8000	79.8000	79.8000	83.3409	85.3522	86.2833	(216)
Fuel for water heating, kWh/month	209.2184	185.2542	196.7018	180.6452	182.3569	165.6395	159.5177	174.4356	173.9380	186.9498	192.5012	204.0390	(219)
Water heating fuel used												2211.1972	(219)
Annual totals kWh/year													
Space heating fuel - main system												1504.3969	(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)												296.0977	(232)
Total delivered energy for all uses												4086.6918	(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	1504.3969	0.2160	324.9497 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2211.1972	0.2160	477.6186 (264)
Space and water heating			802.5683 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	296.0977	0.5190	153.6747 (268)
Total CO2, kg/m2/year			995.1680 (272)
Emissions per m2 for space and water heating			13.1525 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.5184 (272b)
Emissions per m2 for pumps and fans			0.6379 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.1525 * 1.55) + 2.5184 + 0.6379, rounded to 2 d.p.			23.5400 (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	0 * 40 =	0.0000 (6a)
Number of open flues	0	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					2.7300
Infiltration rate					0.2731 (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) =				0.2321 (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	0.2959	0.2901	0.2843	0.2553	0.2495	0.2205	0.2205	0.2147	0.2321	0.2495	0.2611	0.2727 (22b)
	0.5438	0.5421	0.5404	0.5326	0.5311	0.5243	0.5243	0.5230	0.5269	0.5311	0.5341	0.5372 (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)			8.5900	1.2808	11.0024		(27)
Main	48.8200	8.5900	40.2300	0.1800	7.2414	110.0000	4425.3000 (29a)
Total net area of external elements Aum(A, m ²)			48.8200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 18.2438		(33)
Party Wall 1			30.0000	0.0000	0.0000	45.0000	1350.0000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Party Ceilings 1			60.0200			20.0000	1200.4000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		10509.3700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							172.2283 (35)
Thermal bridges (User defined value 0.100 * total exposed area)							4.8820 (36)
Total fabric heat loss					(33) + (36) =		23.1258 (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	26.2802	26.1980	26.1174	25.7391	25.6683	25.3388	25.3388	25.2778	25.4657	25.6683	25.8115	25.9612 (38)
Heat transfer coeff	49.4059	49.3238	49.2432	48.8649	48.7941	48.4646	48.4646	48.4035	48.5915	48.7941	48.9373	49.0870 (39)
Average = Sum(39)m / 12 =												48.8645 (39)
HLP	0.8097	0.8083	0.8070	0.8008	0.7996	0.7942	0.7942	0.7932	0.7963	0.7996	0.8020	0.8044 (40)
HLP (average)												0.8008 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397 (44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)											Total = Sum(45)m =	1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	28.4058	24.8439	25.6367	22.3507	21.4460	18.5063	17.1488	19.6785	19.9135	23.2073	25.3326	27.5095 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.7663	14.8917	12.1107	9.1686	6.8536	5.7861	6.2521	8.1267	10.9077	13.8498	16.1648	17.2323	(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	283.6129	282.3498	272.4671	256.3391	239.4732	223.6918	213.7600	217.2135	225.7920	242.0397	260.6797	275.1301	(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					7.6900	11.2829	0.6700	0.7000			0.7700			28.2004 (75)
Southeast					0.9000	36.7938	0.6700	0.7000			0.7700			10.7628 (77)
Solar gains	38.9631	75.7356	128.5053	200.9278	263.1209	277.9617	261.0168	212.0582	153.1811	90.4124	48.3747	32.2405 (83)		
Total gains	322.5760	358.0854	400.9724	457.2669	502.5941	501.6535	474.7768	429.2717	378.9732	332.4521	309.0544	307.3706 (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	59.0874	59.1859	59.2827	59.7417	59.8283	60.2351	60.2351	60.3111	60.0778	59.8283	59.6533	59.4713	
alpha	4.9392	4.9457	4.9522	4.9828	4.9886	5.0157	5.0157	5.0207	5.0052	4.9886	4.9769	4.9648	
util living area	0.9941	0.9892	0.9740	0.9198	0.7878	0.5959	0.4446	0.5093	0.7786	0.9546	0.9891	0.9953	(86)
MIT	19.8783	20.0214	20.2801	20.6195	20.8710	20.9749	20.9952	20.9910	20.9103	20.5761	20.1654	19.8448	(87)
Th 2	20.2450	20.2461	20.2473	20.2526	20.2536	20.2583	20.2583	20.2592	20.2565	20.2536	20.2516	20.2495	(88)
util rest of house	0.9928	0.9868	0.9681	0.9021	0.7474	0.5343	0.3718	0.4314	0.7223	0.9409	0.9863	0.9943	(89)
MIT 2	19.2052	19.3484	19.6046	19.9356	20.1606	20.2445	20.2565	20.2556	20.1998	19.9008	19.4967	19.1756	(90)
Living area fraction									fLA = Living area / (4) =			0.4012	(91)
MIT	19.4752	19.6184	19.8756	20.2100	20.4456	20.5375	20.5529	20.5506	20.4848	20.1717	19.7650	19.4441	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4752	19.6184	19.8756	20.2100	20.4456	20.5375	20.5529	20.5506	20.4848	20.1717	19.7650	19.4441	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9911	0.9844	0.9647	0.9010	0.7584	0.5580	0.4010	0.4624	0.7407	0.9392	0.9840	0.9929	(94)
Ext temp.	319.7046	352.4963	386.8023	411.9882	381.1474	279.9300	190.3650	198.5162	280.6937	312.2354	304.1231	305.1743	(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	749.7472	725.9653	658.6583	552.6602	426.7342	287.7605	191.5752	200.9031	310.2472	467.0446	619.7894	748.2873	(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	319.9518	250.9712	202.2609	101.2839	33.9166	0.0000	0.0000	0.0000	0.0000	115.1781	227.2797	329.6761	(98)
Space heating												1580.5181	(98)
Space heating per m2												25.9016	(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	455.5669	358.6378	367.8669	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9465	0.9734	0.9595	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	431.1798	349.1065	352.9765	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	661.8713	629.0185	577.1625	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	166.0978	208.2546	166.7944	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												541.1468	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction	FC = cooled area / (4) =										1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.5245	52.0636	41.6986	0.0000	0.0000	0.0000 (107)
Space cooling											135.2867 (107)
Space cooling per m2											2.2171 (108)
Energy for space heating											25.9016 (99)
Energy for space cooling											2.2171 (108)
Total											28.1187 (109)
Dwelling Fabric Energy Efficiency (DFEE)											28.1 (109)

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

	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)

	main		secondary		other		total	m3 per hour
	heating		heating					
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans							2 * 10 =	20.0000 (7a)
Number of passive vents							0 * 10 =	0.0000 (7b)
Number of flueless gas fires							0 * 40 =	0.0000 (7c)
Air changes per hour								
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						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)

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)			8.5900	1.3258	11.3883			(27)				
Main	48.8200	8.5900	40.2300	0.1800	7.2414			(29a)				
Total net area of external elements Aum(A, m2)			48.8200					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	18.6297			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.0021 (36)				
Total fabric heat loss						(33) + (36) =	23.6318	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	28.4050	28.2403	28.0789	27.3207	27.1788	26.5184	26.5184	26.3961	26.7728	27.1788	27.4658	27.7658 (38)
Heat transfer coeff	52.0368	51.8721	51.7106	50.9524	50.8106	50.1502	50.1502	50.0279	50.4046	50.8106	51.0976	51.3976 (39)
Average = Sum(39)m / 12 =												50.9518 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8528	0.8501	0.8474	0.8350	0.8327	0.8219	0.8219	0.8199	0.8260	0.8327	0.8374	0.8423 (40)
HLP (average)												0.8350 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

Assumed occupancy												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397 (44)
Energy content (annual)	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum (45)m = 1289.3164 (45)											
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)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	28.4058	24.8439	25.6367	22.3507	21.4460	18.5063	17.1488	19.6785	19.9135	23.2073	25.3326	27.5095 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.7663	14.8917	12.1107	9.1686	6.8536	5.7861	6.2521	8.1267	10.9077	13.8498	16.1648	17.2323	(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	283.6129	282.3498	272.4671	256.3391	239.4732	223.6918	213.7600	217.2135	225.7920	242.0397	260.6797	275.1301	(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				7.6900	11.2829	0.6300		0.7000		0.7700		26.5168 (75)	
Southeast				0.9000	36.7938	0.6300		0.7000		0.7700		10.1202 (77)	
Solar gains	36.6370	71.2141	120.8333	188.9321	247.4122	261.3669	245.4337	199.3980	144.0360	85.0147	45.4866	30.3157 (83)	
Total gains	320.2498	353.5639	393.3004	445.2712	486.8854	485.0587	459.1937	416.6115	369.8280	327.0543	306.1664	305.4458 (84)	

7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
tau	81.4328	81.6914	81.9464	83.1658	83.3980	84.4962	84.4962	84.7027	84.0698	83.3980	82.9296	82.4455	
alpha	6.4289	6.4461	6.4631	6.5444	6.5599	6.6331	6.6331	6.6468	6.6047	6.5599	6.5286	6.4964	
util living area	0.9990	0.9977	0.9926	0.9639	0.8544	0.6466	0.4786	0.5475	0.8404	0.9832	0.9977	0.9992	(86)
MIT	20.1065	20.2147	20.4146	20.6941	20.9076	20.9880	20.9985	20.9967	20.9395	20.6621	20.3393	20.0898	(87)
Th 2	20.2078	20.2101	20.2124	20.2231	20.2251	20.2344	20.2344	20.2362	20.2308	20.2251	20.2210	20.2168	(88)
util rest of house	0.9986	0.9970	0.9900	0.9512	0.8120	0.5757	0.3964	0.4592	0.7793	0.9752	0.9967	0.9990	(89)
MIT 2	19.3812	19.4911	19.6916	19.9726	20.1633	20.2290	20.2340	20.2352	20.1968	19.9472	19.6249	19.3721	(90)
Living area fraction													0.4012 (91)
MIT	19.6722	19.7814	19.9817	20.2621	20.4619	20.5335	20.5407	20.5407	20.4947	20.2340	19.9115	19.6600	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6722	19.7814	19.9817	20.2621	20.4619	20.5335	20.5407	20.5407	20.4947	20.2340	19.9115	19.6600	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9983	0.9965	0.9891	0.9519	0.8259	0.6040	0.4295	0.4948	0.8019	0.9753	0.9963	0.9988	(94)
Useful gains	319.7152	352.3112	389.0007	423.8698	402.1029	292.9552	197.2086	206.1432	296.5734	318.9672	305.0213	305.0681	(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	799.9197	771.9274	697.1455	578.9254	445.1977	297.5652	197.6288	207.1496	322.3233	489.5082	654.6369	794.6067	(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	357.2722	281.9820	229.2597	111.6401	32.0626	0.0000	0.0000	0.0000	0.0000	126.8825	251.7232	364.2167	(98)
Space heating												1755.0390	(98)
Space heating per m2												28.7617	(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	471.4119	371.1115	380.2121	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9623	0.9853	0.9747	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	453.6382	365.6455	370.5989	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	642.4748	610.8045	562.3649	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	135.9623	182.3983	142.6739	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												461.0346	(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)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.9906	45.5996	35.6685	0.0000	0.0000	0.0000	0.0000	(107)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	115.2586 (107)
Space cooling per m2	1.8889 (108)
Energy for space heating	28.7617 (99)
Energy for space cooling	1.8889 (108)
Total	30.6506 (109)
Target Fabric Energy Efficiency (TFEE)	35.2 (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					2.7300
Infiltration rate					0.1365 (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) =				0.1160 (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	0.1247	0.1218	0.1218	0.1131	0.1160	0.0986	0.0957	0.0957	0.0986	0.1102	0.1102	0.1131 (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)			8.5900	1.2808	11.0024		(27)
Main	48.8200	8.5900	40.2300	0.1800	7.2414	110.0000	4425.3000 (29a)
Total net area of external elements Aum(A, m ²)			48.8200				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				18.2438		(33)
Party Wall 1			30.0000	0.0000	0.0000	45.0000	1350.0000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11109.5700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		182.0644 (35)
Thermal bridges (User defined value 0.100 * total exposed area)		4.8820 (36)
Total fabric heat loss	(33) + (36) =	23.1258 (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	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897 (39)
Average = Sum(39)m / 12 =												47.2897 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750 (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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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	41.9157	37.2291	30.2768	22.9215	17.1341	14.4653	15.6303	20.3168	27.2692	34.6245	40.4119	43.0807 (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	475.4927	471.6316	453.8983	426.6161	398.9509	374.0957	359.5501	366.8386	382.5313	410.0006	440.4419	463.2144 (73)

[Jan					Area	Solar flux		g		FF		Access		Gains
					m2	Table 6a		Table 6b		Table 6c		factor		W
						W/m2		or Table 6b		or Table 6c		Table 6d		
Northeast					7.6900	9.9768		0.6700		0.7000		0.7700		24.9358 (75)
Southeast					0.9000	32.4665		0.6700		0.7000		0.7700		9.4970 (77)
Solar gains	34.4328	68.6775	121.7891	194.2639	248.1240	268.3232	245.9063	197.2499	149.1821	86.2613	43.9370	29.1381 (83)		
Total gains	509.9255	540.3090	575.6874	620.8801	647.0749	642.4190	605.4565	564.0885	531.7134	496.2619	484.3789	492.3525 (84)		

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572
alpha	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505
util living area	0.9549	0.9356	0.8852	0.7643	0.5768	0.3886	0.2887	0.3264	0.5489	0.8076	0.9260	0.9625 (86)
MIT	20.5124	20.5930	20.7301	20.8728	20.9425	20.9577	20.9591	20.9588	20.9490	20.8599	20.6658	20.4737 (87)
Th 2	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751 (88)
util rest of house	0.9462	0.9236	0.8651	0.7296	0.5297	0.3361	0.2323	0.2660	0.4899	0.7701	0.9104	0.9551 (89)
MIT 2	19.6360	19.7489	19.9368	20.1209	20.2005	20.2145	20.2155	20.2153	20.2077	20.1092	19.8527	19.5814 (90)
Living area fraction	19.9876	20.0876	20.2551	20.4226	20.4982	20.5127	20.5138	20.5136	fLA = Living area / (4) =	20.5051	20.4104	0.4012 (91)
MIT	19.9876	20.0876	20.2551	20.4226	20.4982	20.5127	20.5138	20.5136	20.5051	20.4104	20.1789	19.9394 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9876	20.0876	20.2551	20.4226	20.4982	20.5127	20.5138	20.5136	20.5051	20.4104	20.1789	19.9394 (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					2.7300
Number of sides sheltered					0.1365 (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) = 0.1160 (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	0.1479	0.1450	0.1421	0.1276	0.1247	0.1102	0.1102	0.1073	0.1160	0.1247	0.1305	0.1363 (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)			8.5900	1.2808	11.0024		(27)
Main	48.8200	8.5900	40.2300	0.1800	7.2414	110.0000	4425.3000 (29a)
Total net area of external elements Aum(A, m ²)			48.8200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.2438		(33)
Party Wall 1			30.0000	0.0000	0.0000	45.0000	1350.0000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11109.5700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		182.0644 (35)
Thermal bridges (User defined value 0.100 * total exposed area)		4.8820 (36)
Total fabric heat loss	(33) + (36) =	23.1258 (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 =	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750 (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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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	833.0537	(211)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Space heating requirement	185.2501 137.9880 99.0634 40.4379 10.0253 0.0000 0.0000 0.0000 0.0000 43.4202 118.7898 198.0791	(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)	185.2501 137.9880 99.0634 40.4379 10.0253 0.0000 0.0000 0.0000 0.0000 43.4202 118.7898 198.0791	(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		833.0537 (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)		296.0977 (232)
Energy saving/generation technologies (Appendices M, N and Q)		
Total delivered energy for all uses		2745.9804 (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)	833.0537	5.5000	45.8180 (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)	296.0977	14.3110	42.3745 (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			221.6262 (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] = 0.8780 (257)
SAP value	87.7522
SAP rating (Section 12)	88 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	833.0537	0.5190	432.3549 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	0.5190	797.5921 (264)
Space and water heating			1229.9470 (265)
Pumps and fans	80.0426	0.5190	41.5421 (267)
Energy for lighting	296.0977	0.5190	153.6747 (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			1171.8918 (272)
CO2 emissions per m2			19.2100 (273)
EI value			85.1883
EI rating			85 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.0200 (1b)	x 2.4000 (2b)	= 146.4480 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 146.4480 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.7300
Infiltration rate					0.1365 (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) =				0.1160 (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	0.1247	0.1218	0.1218	0.1131	0.1160	0.0986	0.0957	0.0957	0.0986	0.1102	0.1102	0.1131 (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)			8.5900	1.2808	11.0024		(27)
Main	48.8200	8.5900	40.2300	0.1800	7.2414	110.0000	4425.3000 (29a)
Total net area of external elements Aum(A, m ²)			48.8200				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =				18.2438		(33)
Party Wall 1			30.0000	0.0000	0.0000	45.0000	1350.0000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11109.5700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		182.0644 (35)
Thermal bridges (User defined value 0.100 * total exposed area)		4.8820 (36)
Total fabric heat loss	(33) + (36) =	23.1258 (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 =	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897	47.2897 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750	0.7750 (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	21.0180	20.3400	21.0180	20.3400	21.0180	(56)
If cylinder contains dedicated solar storage													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180	20.3400	21.0180	20.3400	21.0180	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													
	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum (63)m =					0.0000 (63)
Output from w/h	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(64)
								Total per year (kWh/year) = Sum (64)m =					1536.7864 (64)
Heat gains from water heating, kWh/month													
	61.2612	54.0606	56.9283	51.2443	50.3711	45.2289	43.6472	47.6055	47.4308	53.1270	55.9100	59.8587	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	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	41.9157	37.2291	30.2768	22.9215	17.1341	14.4653	15.6303	20.3168	27.2692	34.6245	40.4119	43.0807 (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	475.4927	471.6316	453.8983	426.6161	398.9509	374.0957	359.5501	366.8386	382.5313	410.0006	440.4419	463.2144 (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											7.6900	9.9768	0.6700	0.7000	0.7700	24.9358 (75)
Southeast											0.9000	32.4665	0.6700	0.7000	0.7700	9.4970 (77)
Solar gains	34.4328	68.6775	121.7891	194.2639	248.1240	268.3232	245.9063	197.2499	149.1821	86.2613	43.9370	29.1381 (83)				
Total gains	509.9255	540.3090	575.6874	620.8801	647.0749	642.4190	605.4565	564.0885	531.7134	496.2619	484.3789	492.3525 (84)				

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572	65.2572
alpha	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505	5.3505
util living area	0.9549	0.9356	0.8852	0.7643	0.5768	0.3886	0.2887	0.3264	0.5489	0.8076	0.9260	0.9625 (86)
MIT	20.5124	20.5930	20.7301	20.8728	20.9425	20.9577	20.9591	20.9588	20.9490	20.8599	20.6658	20.4737 (87)
Th 2	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751	20.2751 (88)
util rest of house	0.9462	0.9236	0.8651	0.7296	0.5297	0.3361	0.2323	0.2660	0.4899	0.7701	0.9104	0.9551 (89)
MIT 2	19.6360	19.7489	19.9368	20.1209	20.2005	20.2145	20.2155	20.2153	20.2077	20.1092	19.8527	19.5814 (90)
Living area fraction									fLA = Living area / (4) =			0.4012 (91)
MIT	19.9876	20.0876	20.2551	20.4226	20.4982	20.5127	20.5138	20.5136	20.5051	20.4104	20.1789	19.9394 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9876	20.0876	20.2551	20.4226	20.4982	20.5127	20.5138	20.5136	20.5051	20.4104	20.1789	19.9394 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9422	0.9201	0.8645	0.7369	0.5444	0.3534	0.2509	0.2859	0.5089	0.7775	0.9081	0.9512 (94)
Useful gains	480.4754	497.1423	497.7059	457.5543	352.2830	227.0182	151.9099	161.2866	270.5968	385.8405	439.8551	468.3097 (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	699.2992	675.6539	607.9119	497.6084	359.3154	227.5890	151.9798	161.4293	274.5195	430.8271	580.6657	706.4789 (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	162.8049	119.9598	81.9933	28.8389	5.2321	0.0000	0.0000	0.0000	0.0000	33.4701	101.3836	177.1979 (98)
Space heating												710.8806 (98)
Space heating per m2												11.6500 (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													710.8806 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	162.8049	119.9598	81.9933	28.8389	5.2321	0.0000	0.0000	0.0000	0.0000	33.4701	101.3836	177.1979	(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)	162.8049	119.9598	81.9933	28.8389	5.2321	0.0000	0.0000	0.0000	0.0000	33.4701	101.3836	177.1979	(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												710.8806	(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)													296.0977 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													2623.8072 (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)	710.8806	12.1400	86.3009 (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)	296.0977	40.2650	119.2237 (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			467.2701 (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	710.8806	0.5190	368.9470 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	0.5190	797.5921 (264)
Space and water heating			1166.5391 (265)
Pumps and fans	80.0426	0.5190	41.5421 (267)
Energy for lighting	296.0977	0.5190	153.6747 (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			1108.4839 (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	710.8806	3.0700	2182.4033 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	3.0700	4717.9341 (264)
Space and water heating			6900.3374 (265)
Pumps and fans	80.0426	3.0700	245.7308 (267)
Energy for lighting	296.0977	3.0700	909.0198 (268)
Energy saving/generation technologies			

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PV Unit (0.90*43.39 + 0.10*12.14) -488.0000 3.0700 -1498.1600 (269)
 Primary energy kWh/year 6556.9281 (272)
 Primary energy kWh/m2/year 107.4554 (273)

SAP 2012 EPC IMPROVEMENTS

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

(For testing purposes):

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

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

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
	Total Savings £0		0.00 kg/m²

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

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

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

	Current	Potential	Saving
Electricity	£467	£467	£0
Space heating	£114	£114	£0
Water heating	£234	£234	£0
Lighting	£119	£119	£0
Total cost of fuels	£467	£467	£0
Total cost of uses	£467	£467	£0
Delivered energy	43 kWh/m²	43 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	18 kg/m²	18 kg/m²	0 kg/m²
Primary energy	107 kWh/m²	107 kWh/m²	0 kWh/m²

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	North East
Overshading	Average or unknown
Thermal mass parameter	182.1 (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	23.13 (37)
Summer heat loss coefficient	216.44 (P2)

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

[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	7.6900	89.6552	0.6700	0.7000	0.9000	261.9145
South East	0.9000	112.1012	0.6700	0.7000	0.9000	38.3275
total:						300.2420

	Jun	Jul	Aug	
Solar gains	330	300	240	(P3)
Internal gains	374	360	367	
Total summer gains	704	660	607	(P5)
Summer gain/loss ratio	3.25	3.05	2.80	(P6)
Summer external temperature	14.70	16.40	16.30	
Thermal mass temperature increment (TMP = 182.1)	0.73	0.73	0.73	
Threshold temperature	18.68	20.17	19.83	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			