

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	74278-11				Issued on Date	30/03/2023
Assessment Reference	001	Prop Type Ref	HT 2B3P (Top)			
Property	Flat 11, 32 Brookstone Close, MANCHESTER, M21 7AE					
SAP Rating	88 B	DER	21.90	TER	23.38	
Environmental	86 B	% DER<TER	6.32			
CO ₂ Emissions (t/year)	1.08	DFEE	25.53	TFEE	34.21	
General Requirements Compliance	Pass	% DFEE<TFEE	25.38			
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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Calculation Type: New Build (As Built)

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

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DWELLING AS BUILT

Top-floor flat, total floor area 61 m²

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

1a TER and DER

Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 23.38 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 21.90 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)34.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)25.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.35 (max. 2.00)	1.35 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.041

3 Air permeability

Air permeability at 50 pascals: 2.81 (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 South West: 7.69 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 2.8 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					2.8100
Infiltration rate					0.1405 (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) =		0.1194 (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	0.1523	0.1493	0.1463	0.1314	0.1284	0.1135	0.1135	0.1105	0.1194	0.1284	0.1344	0.1403 (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)			7.6900	1.2808	9.8496		(27)
Main	24.4100	7.6900	16.7200	0.1800	3.0096	110.0000	1839.2000 (29a)
PIJ	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800 (30)
Total net area of external elements Aum(A, m ²)			85.4300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.7918		(33)
Party Wall 1			53.2100	0.0000	0.0000	70.0000	3724.7000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9646.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		158.0916 (35)
Thermal bridges (User defined value 0.041 * total exposed area)		3.5026 (36)
Total fabric heat loss	(33) + (36) =	24.2945 (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 =	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397 (44)
Energy content (annual)	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)

Anderson Goddard Ltd
eco-survey.com

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

Water storage loss:												
Store volume												
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	(59)
Total heat required for water heating calculated for each month												
154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum(63)m =										0.0000	(63)
Output from w/h												
154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746	(64)
	Total per year (kWh/year) = Sum(64)m =										1536.7864	(64)
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	17.1800	15.2591	12.4096	9.3948	7.0227	5.9289	6.4064	8.3273	11.1768	14.1916	16.5636	17.6575 (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	328.1870	326.1945	314.8245	296.6953	278.5202	260.9493	249.5305	254.9503	264.2797	282.5961	303.5473	319.0354 (73)

[Jan				Area	Solar flux		g		FF	Access		Gains
				m2	Table 6a	Specific data	Specific data	Specific data	Table 6c	factor	W	
					W/m2	or Table 6b	or Table 6b	or Table 6b	or Table 6c	Table 6d		
-----				7.6900	36.7938	0.6700	0.7000	0.7700	91.9618	(79)		

Solar gains	91.9618	156.6450	214.3285	265.5634	297.4531	295.3021	284.7027	260.9115	232.0724	173.1261	110.1490	78.7001 (83)
Total gains	420.1488	482.8394	529.1530	562.2587	575.9733	556.2514	534.2332	515.8618	496.3521	455.7221	413.6963	397.7356 (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	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980
alpha	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865
util living area	0.9772	0.9570	0.9184	0.8410	0.7108	0.5410	0.3959	0.4273	0.6350	0.8629	0.9581	0.9819 (86)
MIT	20.1921	20.3460	20.5398	20.7369	20.8749	20.9361	20.9504	20.9489	20.9171	20.7422	20.4242	20.1446 (87)
Th 2	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584 (88)
util rest of house	0.9730	0.9495	0.9045	0.8153	0.6689	0.4837	0.3306	0.3605	0.5779	0.8349	0.9494	0.9785 (89)
MIT 2	19.1707	19.3910	19.6643	19.9331	20.1082	20.1762	20.1887	20.1877	20.1581	19.9457	19.5056	19.1023 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.4012 (91)
MIT	19.5805	19.7741	20.0155	20.2556	20.4158	20.4811	20.4943	20.4931	20.4626	20.2653	19.8741	19.5204 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5805	19.7741	20.0155	20.2556	20.4158	20.4811	20.4943	20.4931	20.4626	20.2653	19.8741	19.5204 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9684	0.9437	0.8994	0.8152	0.6781	0.5012	0.3515	0.3818	0.5941	0.8352	0.9442	0.9743 (94)
Useful gains	406.8512	455.6772	475.9145	458.3260	390.5874	278.7997	187.7787	196.9557	294.8851	380.6317	390.6038	387.5318 (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	740.4674	720.7752	654.9405	550.2737	422.3518	284.9878	188.7113	198.3460	308.3226	468.3628	619.0111	742.4028 (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	248.2105	178.1459	133.1953	66.2023	23.6328	0.0000	0.0000	0.0000	0.0000	65.2719	164.4532	264.0240 (98)
Space heating												1143.1359 (98)
Space heating per m2												18.7338 (99)
										(98) / (4) =		

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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													1143.1359 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	248.2105	178.1459	133.1953	66.2023	23.6328	0.0000	0.0000	0.0000	0.0000	65.2719	164.4532	264.0240	(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)	248.2105	178.1459	133.1953	66.2023	23.6328	0.0000	0.0000	0.0000	0.0000	65.2719	164.4532	264.0240	(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													1143.1359 (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)													303.4043 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													3063.3692 (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	1143.1359	0.5190	593.2876	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	0.5190	797.5921	(264)
Space and water heating			1390.8797	(265)
Pumps and fans	80.0426	0.5190	41.5421	(267)
Energy for lighting	303.4043	0.5190	157.4668	(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			1336.6166	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			21.9000	(273)

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

DER			21.9000	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			41.6852	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			41.6852	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	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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)			7.6900	1.3258	10.1951		(27)
Main	24.4100	7.6900	16.7200	0.1800	3.0096		(29a)
PIJ	61.0200		61.0200	0.1300	7.9326		(30)
Total net area of external elements Aum(A, m ²)			85.4300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.1373		(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)							5.9414 (36)
Total fabric heat loss						(33) + (36) =	27.0787 (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	55.4837	55.3190	55.1576	54.3993	54.2575	53.5971	53.5971
Average = Sum(39)m / 12 =						53.4748	53.8515
							54.2575
							54.5445
							54.8445 (39)
							54.3987 (39)
HLP	0.9093	0.9066	0.9039	0.8915	0.8892	0.8784	0.8784
HLP (average)						0.8763	0.8825
Days in month	31	28	31	30	31	30	31
							0.8892
							0.8939
							0.8988 (40)
							0.8915 (40)
							31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397 (44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)										Total = Sum(45)m =		1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)

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

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.1800	15.2591	12.4096	9.3948	7.0227	5.9289	6.4064	8.3273	11.1768	14.1916	16.5636	17.6575 (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	358.6891	356.6965	345.3266	327.1974	309.0222	291.4514	280.0325	285.4523	294.7817	313.0981	334.0493	349.5375 (73)

6. Solar gains

[Jan]													
	Area				Solar flux		g		FF		Access		Gains
	m2				Table 6a		Specific data		Specific data		factor		W
					W/m2		or Table 6b		or Table 6c		Table 6d		
Southwest	7.6900				36.7938		0.6300		0.7000		0.7700		86.4715 (79)
Solar gains	86.4715	147.2930	201.5327	249.7088	279.6947	277.6721	267.7055	245.3347	218.2173	162.7902	103.5730	74.0016 (83)	
Total gains	445.1606	503.9896	546.8593	576.9062	588.7169	569.1235	547.7380	530.7871	512.9990	475.8883	437.6223	423.5391 (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	76.3738	76.6012	76.8254	77.8962	78.0998	79.0621	79.0621	79.2429	78.6886	78.0998	77.6889	77.2639
alpha	6.0916	6.1067	6.1217	6.1931	6.2067	6.2708	6.2708	6.2829	6.2459	6.2067	6.1793	6.1509
util living area	0.9940	0.9863	0.9669	0.9109	0.7870	0.5925	0.4293	0.4614	0.6948	0.9230	0.9856	0.9954 (86)
MIT	20.2208	20.3662	20.5633	20.7856	20.9333	20.9905	20.9989	20.9983	20.9755	20.7980	20.4723	20.1939 (87)
Th 2	20.1596	20.1619	20.1642	20.1747	20.1767	20.1859	20.1859	20.1876	20.1824	20.1767	20.1727	20.1685 (88)
util rest of house	0.9922	0.9823	0.9571	0.8859	0.7368	0.5216	0.3506	0.3810	0.6239	0.8961	0.9805	0.9940 (89)
MIT 2	19.1263	19.3382	19.6207	19.9328	20.1148	20.1799	20.1855	20.1870	20.1647	19.9562	19.5013	19.0942 (90)
Living area fraction	19.5654	19.7506	19.9989	20.2750	20.4432	20.5051	20.5118	20.5124	20.4900	20.2939	19.8908	19.5354 (92)
Temperature adjustment	19.5654	19.7506	19.9989	20.2750	20.4432	20.5051	20.5118	20.5124	20.4900	20.2939	19.8908	19.5354 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9905	0.9798	0.9548	0.8893	0.7539	0.5498	0.3822	0.4134	0.6515	0.9004	0.9784	0.9926 (94)
Useful gains	440.9192	493.8165	522.1625	513.0155	443.8163	312.9013	209.3487	219.4036	334.2064	428.4932	428.1506	420.4245 (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	846.9802	821.5209	744.5650	618.7899	474.3830	316.4966	209.6629	219.9122	344.1094	525.9672	697.6692	841.0617 (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	302.1094	220.2173	165.4674	76.1576	22.7416	0.0000	0.0000	0.0000	0.0000	72.5206	194.0534	312.9541 (98)
Space heating												1366.2215 (98)
Space heating per m2										(98) / (4) =		22.3897 (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													1461.1994 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	302.1094	220.2173	165.4674	76.1576	22.7416	0.0000	0.0000	0.0000	0.0000	72.5206	194.0534	312.9541	(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)	323.1116	235.5266	176.9705	81.4520	24.3226	0.0000	0.0000	0.0000	0.0000	77.5622	207.5438	334.7102	(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	86.1815	85.6829	84.7855	83.1048	81.0805	79.8000	79.8000	79.8000	79.8000	82.9136	85.2586	86.3324	(217)
Fuel for water heating, kWh/month	209.1741	185.5659	197.2486	180.8219	181.9395	165.6395	159.5177	174.4356	173.9380	187.9132	192.7126	203.9228	(219)
Water heating fuel used												2212.8294	(219)
Annual totals kWh/year													
Space heating fuel - main system												1461.1994	(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)												303.4043	(232)
Total delivered energy for all uses												4052.4331	(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	1461.1994	0.2160	315.6191 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2212.8294	0.2160	477.9711 (264)
Space and water heating			793.5902 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	303.4043	0.5190	157.4668 (268)
Total CO2, kg/m2/year			989.9820 (272)
Emissions per m2 for space and water heating			13.0054 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.5806 (272b)
Emissions per m2 for pumps and fans			0.6379 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.0054 * 1.55) + 2.5806 + 0.6379, rounded to 2 d.p.			23.3800 (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) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1366 (8)
Measured/design AP50					Yes
Infiltration rate					2.8100
Number of sides sheltered					0.2771 (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) =				0.2355 (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	0.3003	0.2944	0.2885	0.2591	0.2532	0.2237	0.2237	0.2178	0.2355	0.2532	0.2649	0.2767 (22b)
	0.5451	0.5433	0.5416	0.5336	0.5320	0.5250	0.5250	0.5237	0.5277	0.5320	0.5351	0.5383 (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)			7.6900	1.2808	9.8496		(27)
Main	24.4100	7.6900	16.7200	0.1800	3.0096	110.0000	1839.2000 (29a)
PIJ	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800 (30)
Total net area of external elements Aum(A, m ²)			85.4300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	20.7918			(33)
Party Wall 1			53.2100	0.0000	0.0000	70.0000	3724.7000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 9646.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							158.0916 (35)
Thermal bridges (User defined value 0.041 * total exposed area)							3.5026 (36)
Total fabric heat loss							(33) + (36) = 24.2945 (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	26.3426	26.2580	26.1751	25.7856	25.7127	25.3735	25.3735	25.3106	25.5041	25.7127	25.8601	26.0143 (38)
Heat transfer coeff	50.6371	50.5525	50.4695	50.0800	50.0072	49.6679	49.6679	49.6051	49.7986	50.0072	50.1546	50.3087 (39)
Average = Sum(39)m / 12 =												50.0797 (39)
HLP	0.8298	0.8285	0.8271	0.8207	0.8195	0.8140	0.8140	0.8129	0.8161	0.8195	0.8219	0.8245 (40)
HLP (average)												0.8207 (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												
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	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	17.1800	15.2591	12.4096	9.3948	7.0227	5.9289	6.4064	8.3273	11.1768	14.1916	16.5636	17.6575	(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	284.0266	282.7172	272.7659	256.5654	239.6424	223.8346	213.9143	217.4140	226.0612	242.3814	261.0786	275.5553	(73)

6. Solar gains

[Jan]					Area	Solar flux		g	FF			Access	Gains
					m2	Table 6a		Specific data	Specific data			factor	W
						W/m2		or Table 6b	or Table 6c			Table 6d	
Southwest					7.6900	36.7938		0.6700	0.7000			0.7700	91.9618 (79)
Solar gains	91.9618	156.6450	214.3285	265.5634	297.4531	295.3021	284.7027	260.9115	232.0724	173.1261	110.1490	78.7001	(83)
Total gains	375.9884	439.3622	487.0944	522.1287	537.0955	519.1367	498.6170	478.3256	458.1336	415.5075	371.2277	354.2555	(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	52.9188	53.0074	53.0945	53.5074	53.5854	53.9514	53.9514	54.0197	53.8098	53.5854	53.4279	53.2642	
alpha	4.5279	4.5338	4.5396	4.5672	4.5724	4.5968	4.5968	4.6013	4.5873	4.5724	4.5619	4.5509	
util living area	0.9857	0.9709	0.9411	0.8756	0.7569	0.5857	0.4327	0.4686	0.6874	0.8991	0.9728	0.9888	(86)
MIT	19.8770	20.0840	20.3532	20.6474	20.8613	20.9672	20.9934	20.9904	20.9319	20.6527	20.2039	19.8283	(87)
Th 2	20.2275	20.2287	20.2299	20.2354	20.2364	20.2412	20.2412	20.2421	20.2394	20.2364	20.2344	20.2322	(88)
util rest of house	0.9829	0.9654	0.9301	0.8529	0.7158	0.5247	0.3605	0.3950	0.6286	0.8756	0.9667	0.9866	(89)
MIT 2	19.1946	19.3993	19.6624	19.9454	20.1358	20.2227	20.2387	20.2382	20.1973	19.9565	19.5239	19.1501	(90)
Living area fraction	19.4683	19.6740	19.9395	20.2270	20.4268	20.5214	20.5414	20.5400	20.4920	20.2358	19.7967	19.4222	(91)
MIT	19.4683	19.6740	19.9395	20.2270	20.4268	20.5214	20.5414	20.5400	20.4920	20.2358	19.7967	19.4222	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4683	19.6740	19.9395	20.2270	20.4268	20.5214	20.5414	20.5400	20.4920	20.2358	19.7967	19.4222	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9795	0.9608	0.9254	0.8526	0.7265	0.5477	0.3894	0.4243	0.6489	0.8755	0.9626	0.9837	(94)
Ext temp.	368.2811	422.1261	450.7486	445.1796	390.2141	284.3406	194.1367	202.9473	297.2805	363.7967	357.3331	348.4744	(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	768.0806	746.8625	678.2869	567.2585	436.4041	294.1018	195.7625	205.3634	318.3108	481.8577	636.7977	765.8078	(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	297.4508	218.2229	169.2885	87.8968	34.3654	0.0000	0.0000	0.0000	0.0000	87.8374	201.2145	310.4960	(98)
Space heating per m2												1406.7723	(98)
										(98) / (4) =		23.0543	(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	466.8784	367.5426	376.9987	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9374	0.9683	0.9610	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	437.6345	355.8823	362.2784	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	682.4962	657.0891	634.7652	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	176.3004	224.0978	202.7302	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												603.1285	(104)
Cooled fraction												1.0000	(105)
												fc = cooled area / (4) =	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	44.0751	56.0245	50.6826	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												150.7821 (107)
Space cooling per m2												2.4710 (108)
Energy for space heating												23.0543 (99)
Energy for space cooling												2.4710 (108)
Total												25.5253 (109)
Dwelling Fabric Energy Efficiency (DFEE)												25.5 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1366 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3866 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3286 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4189	0.4107	0.4025	0.3614	0.3532	0.3122	0.3122	0.3039	0.3286	0.3532	0.3697	0.3861 (22b)
Effective ac	0.5878	0.5843	0.5810	0.5653	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5683	0.5745 (25)

3. Heat losses and heat loss parameter

Element	Gross 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)			7.6900	1.3258	10.1951		(27)
Main	24.4100	7.6900	16.7200	0.1800	3.0096		(29a)
PIJ	61.0200		61.0200	0.1300	7.9326		(30)
Total net area of external elements Aum(A, m ²)			85.4300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.1373		(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)							5.9414 (36)
Total fabric heat loss						(33) + (36) =	27.0787 (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	55.4837	55.3190	55.1576	54.3993	54.2575	53.5971	53.5971
Average = Sum(39)m / 12 =						53.4748	53.8515
							54.2575
							54.5445
							54.8445 (39)
							54.3987 (39)
HLP	0.9093	0.9066	0.9039	0.8915	0.8892	0.8784	0.8784
HLP (average)						0.8763	0.8825
Days in month	31	28	31	30	31	30	31
							0.8892
							0.8939
							0.8988 (40)
							0.8915 (40)

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	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	17.1800	15.2591	12.4096	9.3948	7.0227	5.9289	6.4064	8.3273	11.1768	14.1916	16.5636	17.6575	(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	284.0266	282.7172	272.7659	256.5654	239.6424	223.8346	213.9143	217.4140	226.0612	242.3814	261.0786	275.5553	(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			

Southwest				7.6900	36.7938	0.6300	0.7000	0.7700	86.4715 (79)			

Solar gains	86.4715	147.2930	201.5327	249.7088	279.6947	277.6721	267.7055	245.3347	218.2173	162.7902	103.5730	74.0016 (83)
Total gains	370.4981	430.0103	474.2987	506.2742	519.3371	501.5067	481.6198	462.7488	444.2785	405.1716	364.6516	349.5570 (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	76.3738	76.6012	76.8254	77.8962	78.0998	79.0621	79.0621	79.2429	78.6886	78.0998	77.6889	77.2639	
alpha	6.0916	6.1067	6.1217	6.1931	6.2067	6.2708	6.2708	6.2829	6.2459	6.2067	6.1793	6.1509	
util living area	0.9977	0.9939	0.9830	0.9465	0.8485	0.6627	0.4868	0.5268	0.7746	0.9603	0.9943	0.9984	(86)
MIT	20.1035	20.2539	20.4625	20.7108	20.8967	20.9827	20.9978	20.9964	20.9556	20.7169	20.3614	20.0768	(87)
Th 2	20.1596	20.1619	20.1642	20.1747	20.1767	20.1859	20.1859	20.1876	20.1824	20.1767	20.1727	20.1685	(88)
util rest of house	0.9970	0.9920	0.9774	0.9289	0.8039	0.5873	0.3983	0.4363	0.7048	0.9436	0.9922	0.9979	(89)
MIT 2	19.3378	19.4892	19.6967	19.9437	20.1081	20.1781	20.1853	20.1866	20.1591	19.9549	19.6057	19.3186	(90)
Living area fraction	19.6450	19.7960	20.0039	20.2514	20.4245	20.5009	20.5113	20.5115	20.4786	20.2606	19.9088	19.6228	(91)
MIT	19.6450	19.7960	20.0039	20.2514	20.4245	20.5009	20.5113	20.5115	20.4786	20.2606	19.9088	19.6228	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6450	19.7960	20.0039	20.2514	20.4245	20.5009	20.5113	20.5115	20.4786	20.2606	19.9088	19.6228	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9964	0.9909	0.9761	0.9308	0.8183	0.6172	0.4339	0.4728	0.7315	0.9456	0.9913	0.9974	(94)
Useful gains	369.1777	426.0982	462.9720	471.2187	424.9887	309.5480	208.9890	218.7817	325.0085	383.1185	361.4853	348.6613	(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	851.3966	824.0306	744.8446	617.5100	473.3697	316.2693	209.6332	219.8620	343.4989	524.1583	698.6510	845.8533	(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	358.7709	267.4106	209.7132	105.3298	35.9954	0.0000	0.0000	0.0000	0.0000	104.9335	242.7593	369.9109	(98)
Space heating												1694.8237	(98)
Space heating per m2												27.7749	(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	503.8129	396.6187	406.4087	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9500	0.9801	0.9739	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	478.6131	388.7089	395.8006	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	661.8898	637.2222	616.5586	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	131.9592	184.8939	164.2439	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												481.0970	(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	32.9898	46.2235	41.0610	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	120.2743 (107)
Space cooling per m2	1.9711 (108)
Energy for space heating	27.7749 (99)
Energy for space cooling	1.9711 (108)
Total	29.7460 (109)
Target Fabric Energy Efficiency (TFEE)	34.2 (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	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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					2.8100
Infiltration rate					0.1405 (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) =				0.1194 (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	0.1284	0.1254	0.1254	0.1164	0.1194	0.1015	0.0985	0.0985	0.1015	0.1135	0.1135	0.1164 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.35)			7.6900	1.2808	9.8496			(27)
Main	24.4100	7.6900	16.7200	0.1800	3.0096	110.0000	1839.2000	(29a)
PIJ	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800	(30)
Total net area of external elements Aum(A, m2)			85.4300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.7918			(33)
Party Wall 1			53.2100	0.0000	0.0000	70.0000	3724.7000	(32)
Party Floor 1			61.0200			40.0000	2440.8000	(32d)
Internal Wall 1			121.4300			9.0000	1092.8700	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			9646.7500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							158.0916	(35)
Thermal bridges (User defined value 0.041 * total exposed area)							3.5026	(36)
Total fabric heat loss						(33) + (36) =	24.2945	(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	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584 (39)
Average = Sum(39)m / 12 =												48.4584 (39)
HLP	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941 (40)
HLP (average)												0.7941 (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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Water storage loss:													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.1300 (48)	
Temperature factor from Table 2b												0.6000 (49)	
Enter (49) or (54) in (55)												0.6780 (55)	
Total storage loss													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180 (56)	
If cylinder contains dedicated solar storage													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	20.3400	21.0180	20.3400	21.0180 (57)		
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)		
Total heat required for water heating calculated for each month													
	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746 (62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)		
												Solar input (sum of months) = Sum(63)m =	0.0000 (63)
Output from w/h													
	154.6925	135.8966	141.6613	125.5198	121.9405	107.4284	101.7182	113.6227	114.0507	130.2288	139.5521	150.4746 (64)	
												Total per year (kWh/year) = Sum(64)m =	1536.7864 (64)
													1537 (64)
RHI water heating demand													
Heat gains from water heating, kWh/month													
	61.2612	54.0606	56.9283	51.2443	50.3711	45.2289	43.6472	47.6055	47.4308	53.1270	55.9100	59.8587 (65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	42.9500	38.1478	31.0239	23.4871	17.5569	14.8222	16.0160	20.8182	27.9421	35.4789	41.4091	44.1437 (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	476.5270	472.5502	454.6454	427.1818	399.3737	374.4527	359.9358	367.3399	383.2042	410.8550	441.4391	464.2775 (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	
Southwest					7.6900	32.4665	0.6700	0.7000	0.7700		81.1462 (79)	
Solar gains	81.1462	141.7883	202.7120	256.2691	280.0662	284.6815	267.8375	242.2640	225.5545	164.8574	99.8836	71.0264 (83)
Total gains	557.6732	614.3386	657.3575	683.4508	679.4400	659.1342	627.7734	609.6039	608.7587	575.7124	541.3227	535.3038 (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	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980
alpha	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865
util living area	0.9264	0.8898	0.8252	0.7137	0.5582	0.3868	0.2850	0.3091	0.4914	0.7318	0.8828	0.9379 (86)
MIT	20.4780	20.5910	20.7310	20.8580	20.9284	20.9501	20.9530	20.9527	20.9420	20.8606	20.6540	20.4317 (87)
Th 2	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584 (88)
util rest of house	0.9146	0.8736	0.8014	0.6789	0.5123	0.3338	0.2282	0.2508	0.4370	0.6922	0.8630	0.9277 (89)
MIT 2	19.5761	19.7320	19.9212	20.0845	20.1669	20.1882	20.1903	20.1901	20.1813	20.0911	19.8222	19.5114 (90)
Living area fraction	19.9379	20.0766	20.2461	20.3948	20.4724	20.4938	20.4963	20.4961	20.4865	20.3998	20.1559	0.4012 (91)
MIT	19.9379	20.0766	20.2461	20.3948	20.4724	20.4938	20.4963	20.4961	20.4865	20.3998	20.1559	19.8806 (92)
Temperature adjustment	19.9379	20.0766	20.2461	20.3948	20.4724	20.4938	20.4963	20.4961	20.4865	20.3998	20.1559	0.0000
adjusted MIT	19.9379	20.0766	20.2461	20.3948	20.4724	20.4938	20.4963	20.4961	20.4865	20.3998	20.1559	19.8806 (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) =				0.0000 / (5) =	0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.8100
Infiltration rate					0.1405 (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) =		0.1194 (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	0.1523	0.1493	0.1463	0.1314	0.1284	0.1135	0.1135	0.1105	0.1194	0.1284	0.1344	0.1403 (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)			7.6900	1.2808	9.8496		(27)
Main	24.4100	7.6900	16.7200	0.1800	3.0096	110.0000	1839.2000 (29a)
PIJ	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800 (30)
Total net area of external elements Aum(A, m ²)			85.4300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	20.7918			(33)
Party Wall 1			53.2100	0.0000	0.0000	70.0000	3724.7000 (32)
Party Floor 1			61.0200			40.0000	2440.8000 (32d)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9646.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							158.0916 (35)
Thermal bridges (User defined value 0.041 * total exposed area)							3.5026 (36)
Total fabric heat loss						(33) + (36) =	24.2945 (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	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584 (39)
Average = Sum(39)m / 12 =												48.4584 (39)
HLP	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941 (40)
HLP (average)												0.7941 (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)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.1300 (48)
Temperature factor from Table 2b													0.6000 (49)
Enter (49) or (54) in (55)													0.6780 (55)
Total storage loss													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180	20.3400	21.0180	20.3400	21.0180	(56)
If cylinder contains dedicated solar storage													
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180	20.3400	21.0180	20.3400	21.0180	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	42.9500	38.1478	31.0239	23.4871	17.5569	14.8222	16.0160	20.8182	27.9421	35.4789	41.4091	44.1437 (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	476.5270	472.5502	454.6454	427.1818	399.3737	374.4527	359.9358	367.3399	383.2042	410.8550	441.4391	464.2775 (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
Southwest					7.6900	36.7938	0.6700	0.7000			0.7700			91.9618 (79)
Solar gains	91.9618	156.6450	214.3285	265.5634	297.4531	295.3021	284.7027	260.9115	232.0724	173.1261	110.1490	78.7001	(83)	
Total gains	568.4888	629.1952	668.9739	692.7451	696.8268	669.7548	644.6385	628.2515	615.2766	583.9811	551.5882	542.9776	(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, n _{li,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980
alpha	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865
util living area												
	0.9343	0.8999	0.8438	0.7493	0.6144	0.4562	0.3295	0.3530	0.5287	0.7585	0.8954	0.9446 (86)
MIT	20.4225	20.5450	20.6897	20.8252	20.9107	20.9450	20.9522	20.9516	20.9364	20.8372	20.6105	20.3783 (87)
Th 2	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584 (88)
util rest of house												
	0.9242	0.8856	0.8227	0.7184	0.5728	0.4057	0.2745	0.2969	0.4765	0.7227	0.8782	0.9357 (89)
MIT 2	19.4970	19.6674	19.8652	20.0430	20.1471	20.1837	20.1898	20.1894	20.1759	20.0619	19.7618	19.4350 (90)
Living area fraction												
MIT	19.8683	20.0194	20.1960	20.3568	20.4534	20.4891	20.4956	20.4951	20.4810	20.3729	20.1023	19.8134 (91)
Temperature adjustment												
adjusted MIT	19.8683	20.0194	20.1960	20.3568	20.4534	20.4891	20.4956	20.4951	20.4810	20.3729	20.1023	19.8134 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9182	0.8806	0.8209	0.7227	0.5840	0.4216	0.2922	0.3149	0.4924	0.7285	0.8742	0.9297 (94)
Useful gains	521.9853	554.0429	549.1333	500.6177	406.9442	282.3473	188.3535	197.8308	302.9709	425.4197	482.1817	504.8098 (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	754.4126	732.6638	663.6846	555.1786	424.1758	285.3764	188.7764	198.4443	309.2137	473.5807	630.0707	756.6003 (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	172.9259	120.0333	85.2262	39.2838	12.8203	0.0000	0.0000	0.0000	0.0000	35.8318	106.4801	187.3321 (98)
Space heating												759.9335 (98)
Space heating per m2												12.4538 (99)
										(98) / (4) =		

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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													759.9335 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	172.9259	120.0333	85.2262	39.2838	12.8203	0.0000	0.0000	0.0000	0.0000	35.8318	106.4801	187.3321	(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)	172.9259	120.0333	85.2262	39.2838	12.8203	0.0000	0.0000	0.0000	0.0000	35.8318	106.4801	187.3321	(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												759.9335	(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)													303.4043 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													2680.1667 (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)	759.9335	5.5000	41.7963 (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)	303.4043	14.3110	43.4202 (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			218.6502 (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] =	0.8662 (257)
SAP value		87.9167
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	759.9335	0.5190	394.4055 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	0.5190	797.5921 (264)
Space and water heating			1191.9976 (265)
Pumps and fans	80.0426	0.5190	41.5421 (267)
Energy for lighting	303.4043	0.5190	157.4668 (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			1137.7345 (272)
CO2 emissions per m2			18.6500 (273)
EI value			85.6200
EI rating			86 (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	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					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					2.8100
Infiltration rate					0.1405 (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) =				0.1194 (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	0.1284	0.1254	0.1254	0.1164	0.1194	0.1015	0.0985	0.0985	0.1015	0.1135	0.1135	0.1164 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.35)			7.6900	1.2808	9.8496			(27)
Main	24.4100	7.6900	16.7200	0.1800	3.0096	110.0000	1839.2000	(29a)
PIJ	61.0200		61.0200	0.1300	7.9326	9.0000	549.1800	(30)
Total net area of external elements Aum(A, m2)			85.4300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.7918			(33)
Party Wall 1			53.2100	0.0000	0.0000	70.0000	3724.7000	(32)
Party Floor 1			61.0200			40.0000	2440.8000	(32d)
Internal Wall 1			121.4300			9.0000	1092.8700	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			9646.7500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							158.0916	(35)
Thermal bridges (User defined value 0.041 * total exposed area)							3.5026	(36)
Total fabric heat loss						(33) + (36) =	24.2945	(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 =	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584	48.4584 (39)
HLP	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941	0.7941 (40)
HLP (average)												0.7941 (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

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	(64)
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	(65)
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	42.9500	38.1478	31.0239	23.4871	17.5569	14.8222	16.0160	20.8182	27.9421	35.4789	41.4091	44.1437 (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	476.5270	472.5502	454.6454	427.1818	399.3737	374.4527	359.9358	367.3399	383.2042	410.8550	441.4391	464.2775 (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	
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Southwest				7.6900	32.4665		0.6700		0.7000		0.7700	81.1462 (79)
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Solar gains	81.1462	141.7883	202.7120	256.2691	280.0662	284.6815	267.8375	242.2640	225.5545	164.8574	99.8836	71.0264 (83)
Total gains	557.6732	614.3386	657.3575	683.4508	679.4400	659.1342	627.7734	609.6039	608.7587	575.7124	541.3227	535.3038 (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	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980	55.2980
alpha	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865	4.6865
util living area												
	0.9264	0.8898	0.8252	0.7137	0.5582	0.3868	0.2850	0.3091	0.4914	0.7318	0.8828	0.9379 (86)
MIT	20.4780	20.5910	20.7310	20.8580	20.9284	20.9501	20.9530	20.9527	20.9420	20.8606	20.6540	20.4317 (87)
Th 2	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584	20.2584 (88)
util rest of house												
	0.9146	0.8736	0.8014	0.6789	0.5123	0.3338	0.2282	0.2508	0.4370	0.6922	0.8630	0.9277 (89)
MIT 2	19.5761	19.7320	19.9212	20.0845	20.1669	20.1882	20.1903	20.1901	20.1813	20.0911	19.8222	19.5114 (90)
Living area fraction												
										f _{liA} = Living area / (4) =		0.4012 (91)
MIT	19.9379	20.0766	20.2461	20.3948	20.4724	20.4938	20.4963	20.4961	20.4865	20.3998	20.1559	19.8806 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9379	20.0766	20.2461	20.3948	20.4724	20.4938	20.4963	20.4961	20.4865	20.3998	20.1559	19.8806 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9089	0.8693	0.8010	0.6855	0.5258	0.3507	0.2465	0.2695	0.4540	0.7001	0.8601	0.9219 (94)
Useful gains	506.8942	534.0391	526.5239	468.5369	357.2484	231.1643	154.7221	164.3073	276.3570	403.0613	465.5674	493.4807 (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												
	714.1749	691.8199	622.4998	508.5602	366.9466	232.3015	154.8876	164.5672	280.4050	440.9613	593.9008	721.0886 (97)
Month fracti	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												
	154.2168	106.0287	71.4061	28.8168	7.2155	0.0000	0.0000	0.0000	0.0000	28.1976	92.4000	169.3403 (98)
Space heating												
Space heating per m2												657.6217 (98)
										(98) / (4) =		10.7772 (99)

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

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													657.6217 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	154.2168	106.0287	71.4061	28.8168	7.2155	0.0000	0.0000	0.0000	0.0000	28.1976	92.4000	169.3403	(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)	154.2168	106.0287	71.4061	28.8168	7.2155	0.0000	0.0000	0.0000	0.0000	28.1976	92.4000	169.3403	(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													657.6217 (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)													303.4043 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
Total delivered energy for all uses													2577.8549 (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)	657.6217	12.1400	79.8353 (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)	303.4043	40.2650	122.1657 (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			463.7464 (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	657.6217	0.5190	341.3057 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	0.5190	797.5921 (264)
Space and water heating			1138.8978 (265)
Pumps and fans	80.0426	0.5190	41.5421 (267)
Energy for lighting	303.4043	0.5190	157.4668 (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			1084.6347 (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	657.6217	3.0700	2018.8986 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	3.0700	4717.9341 (264)
Space and water heating			6736.8327 (265)
Pumps and fans	80.0426	3.0700	245.7308 (267)
Energy for lighting	303.4043	3.0700	931.4511 (268)
Energy saving/generation technologies			
PV Unit (0.90*43.39 + 0.10*12.14)	-488.0000	3.0700	-1498.1600 (269)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

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

Primary energy kWh/year 6415.8546 (272)
 Primary energy kWh/m²/year 105.1435 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 88
 Current environmental impact rating: B 86

(For testing purposes):

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

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

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

Potential energy efficiency rating: B 88
 Potential environmental impact rating: B 86

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	£464	£464	£0
Space heating	£107	£107	£0
Water heating	£234	£234	£0
Lighting	£122	£122	£0
Total cost of fuels	£464	£464	£0
Total cost of uses	£463	£463	£0
Delivered energy	42 kWh/m ²	42 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m ²	18 kg/m ²	18 kg/m ²	0 kg/m ²
Primary energy	105 kWh/m ²	105 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	MidTerrace 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	158.1 (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	24.29 (P7)
Summer heat loss coefficient	217.61 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type	
Orientation				
South West	0.000	1.000	None	
Solar shading				
Orientation	Z blinds	Solar access	Z overhangs	Z summer
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
South West	7.6900	112.1012	0.6700	0.7000
total:				327.4873

Solar gains	Jun	Jul	Aug	
Internal gains	350	327	295	(P3)
Total summer gains	374	360	367	
	725	687	663	(P5)
Summer gain/loss ratio	3.33	3.16	3.04	(P6)
Summer external temperature	14.70	16.40	16.30	
Thermal mass temperature increment (TMP = 158.1)	0.89	0.89	0.89	
Threshold temperature	18.92	20.45	20.24	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			