

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	74278-03			Issued on Date	30/03/2023
Assessment Reference	001	Prop Type Ref	HT 2B3P (GF)		
Property	Flat 3, 32 Brookstone Close, MANCHESTER, M21 7AE				
SAP Rating	88 B	DER	22.10	TER	23.35
Environmental	86 B	% DER<TER	5.37		
CO ₂ Emissions (t/year)	1.07	DFEE	26.52	TFEE	34.13
General Requirements Compliance	Pass	% DFEE<TFEE	22.30		
Assessor Details	Mr. Paul Goddard, Anderson Goddard Limited, Tel: 01925 733 942, paul.goddard@andersongoddard.com			Assessor ID	B342-0001
Client					

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

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DWELLING AS BUILT

Ground-floor flat, total floor area 61 m²

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

1a TER and DER

Fuel for main heating: Electricity
 Fuel factor: 1.55 (electricity)
 Target Carbon Dioxide Emission Rate (TER) 23.35 kgCO₂/m²
 Dwelling Carbon Dioxide Emission Rate (DER) 22.10 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 34.1 kWh/m²/yr
 Dwelling Fabric Energy Efficiency (DFEE) 26.5 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.35 (max. 2.00)	1.35 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified ψ -value of 0.060

3 Air permeability

Air permeability at 50 pascals: 3.44 (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
 Floor U-value 0.12 W/m²K
 Air permeability 3.4 m³/m²h
 Photovoltaic array 488.00 kWh/Year

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.4400
Infiltration rate					0.1720 (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) =				0.1462 (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	0.1864	0.1828	0.1791	0.1608	0.1572	0.1389	0.1389	0.1352	0.1462	0.1572	0.1645	0.1718 (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)
GF			61.0200	0.1200	7.3224	75.0000	4576.5000 (28a)
Main	24.4100	7.6900	16.7200	0.1800	3.0096	110.0000	1839.2000 (29a)
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) =			20.1816	(33)
Party Wall 1			53.2100	0.0000	0.0000	70.0000	3724.7000 (32)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				13033.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							213.6000 (35)
Thermal bridges (User defined value 0.060 * total exposed area)							5.1258 (36)
Total fabric heat loss			(33) + (36) =				25.3074 (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	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713 (39)
Average = Sum(39)m / 12 =												49.4713 (39)
HLP	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107 (40)
HLP (average)												0.8107 (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	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 (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)

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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													1165.5619 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	260.8115	184.5602	133.1220	60.2023	17.3992	0.0000	0.0000	0.0000	0.0000	60.8882	170.4436	278.1349	(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)	260.8115	184.5602	133.1220	60.2023	17.3992	0.0000	0.0000	0.0000	0.0000	60.8882	170.4436	278.1349	(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												1165.5619	(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													3085.7951 (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	1165.5619	0.5190	604.9266	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating	1536.7864	0.5190	797.5921	(264)
Space and water heating			1402.5187	(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			1348.2557	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			22.1000	(273)

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

DER			22.1000	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			41.8852	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			41.8852	ZC8

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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)			7.6900	1.3258	10.1951		(27)					
GF			61.0200	0.1300	7.9326		(28a)					
Main	24.4100	7.6900	16.7200	0.1800	3.0096		(29a)					
Total net area of external elements Aum(A, m2)			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/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8682 (36)					
Total fabric heat loss							(33) + (36) = 27.0055 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.4050	28.2403	28.0789	27.3207	27.1788	26.5184	26.5184	26.3961	26.7728	27.1788	27.4658	27.7658 (38)
Average = Sum(39)m / 12 =	55.4105	55.2458	55.0844	54.3261	54.1843	53.5239	53.5239	53.4016	53.7783	54.1843	54.4713	54.7713 (39)
												54.3255 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9081	0.9054	0.9027	0.8903	0.8880	0.8772	0.8772	0.8751	0.8813	0.8880	0.8927	0.8976 (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)
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	76.4747	76.7027	76.9275	78.0011	78.2053	79.1702	79.1702	79.3515	78.7957	78.2053	77.7933	77.3672
alpha	6.0983	6.1135	6.1285	6.2001	6.2137	6.2780	6.2780	6.2901	6.2530	6.2137	6.1862	6.1578
util living area	0.9940	0.9863	0.9668	0.9106	0.7864	0.5918	0.4287	0.4608	0.6941	0.9228	0.9855	0.9954 (86)
MIT	20.2225	20.3679	20.5648	20.7867	20.9338	20.9906	20.9989	20.9983	20.9758	20.7990	20.4738	20.1957 (87)
Th 2	20.1606	20.1629	20.1652	20.1758	20.1777	20.1870	20.1870	20.1887	20.1834	20.1777	20.1737	20.1695 (88)
util rest of house	0.9921	0.9822	0.9570	0.8856	0.7362	0.5210	0.3502	0.3806	0.6233	0.8958	0.9804	0.9940 (89)
MIT 2	19.1297	19.3415	19.6237	19.9351	20.1163	20.1810	20.1866	20.1880	20.1659	19.9583	19.5042	19.0976 (90)
Living area fraction	19.5681	19.7533	20.0013	20.2768	20.4443	20.5058	20.5125	20.5131	20.4908	20.2956	19.8932	19.5381 (92)
Temperature adjustment	19.5681	19.7533	20.0013	20.2768	20.4443	20.5058	20.5125	20.5131	20.4908	20.2956	19.8932	19.5381 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9905	0.9798	0.9547	0.8889	0.7533	0.5492	0.3818	0.4129	0.6508	0.9001	0.9783	0.9926 (94)
Useful gains	440.9132	493.7958	522.1000	512.8373	443.4812	312.5491	209.1004	219.1435	333.8807	428.3612	428.1302	420.4206 (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	846.0142	820.5806	743.7081	618.0566	473.8037	316.1018	209.4099	219.6448	343.6853	525.3485	696.8617	840.0899 (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	301.3951	219.5994	164.8764	75.7579	22.5599	0.0000	0.0000	0.0000	0.0000	72.1586	193.4867	312.2339 (98)
Space heating												1362.0679 (98)
Space heating per m2										(98) / (4) =		22.3217 (99)

8c. Space cooling requirement

Not applicable

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

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Calculation Type: New Build (As Built)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													1456.7571 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	301.3951	219.5994	164.8764	75.7579	22.5599	0.0000	0.0000	0.0000	0.0000	72.1586	193.4867	312.2339	(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)	322.3477	234.8656	176.3384	81.0245	24.1282	0.0000	0.0000	0.0000	0.0000	77.1749	206.9376	333.9400	(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	86.1754	85.6755	84.7760	83.0928	81.0714	79.8000	79.8000	79.8000	79.8000	82.9026	85.2507	86.3266	(216)
Fuel for water heating, kWh/month	209.1889	185.5820	197.2708	180.8480	181.9598	165.6395	159.5177	174.4356	173.9380	187.9383	192.7302	203.9366	(219)
Water heating fuel used												2212.9854	(219)
Annual totals kWh/year													
Space heating fuel - main system												1456.7571	(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												4048.1467	(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	1456.7571	0.2160	314.6595 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2212.9854	0.2160	478.0048 (264)
Space and water heating			792.6644 (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			989.0562 (272)
Emissions per m2 for space and water heating			12.9902 (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) = (12.9902 * 1.55) + 2.5806 + 0.6379, rounded to 2 d.p.			23.3500 (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					3.4400
Number of sides sheltered					0.3086 (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) =				0.2623 (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	0.3344	0.3279	0.3213	0.2885	0.2820	0.2492	0.2492	0.2426	0.2623	0.2820	0.2951	0.3082 (22b)
Effective ac	0.5559	0.5537	0.5516	0.5416	0.5397	0.5310	0.5310	0.5294	0.5344	0.5397	0.5435	0.5475 (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)
GF			61.0200	0.1200	7.3224	75.0000	4576.5000 (28a)
Main	24.4100	7.6900	16.7200	0.1800	3.0096	110.0000	1839.2000 (29a)
Total net area of external elements Aum (m ²)			85.4300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	20.1816			(33)
Party Wall 1			53.2100	0.0000	0.0000	70.0000	3724.7000 (32)
Party Ceilings 1			60.0200			20.0000	1200.4000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	12433.6700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							203.7638 (35)
Thermal bridges (User defined value 0.060 * total exposed area)							5.1258 (36)
Total fabric heat loss						(33) + (36) =	25.3074 (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	26.8662	26.7612	26.6584	26.1753	26.0849	25.6641	25.6641	25.5862	25.8262	26.0849	26.2677	26.4589 (38)
Heat transfer coeff	52.1736	52.0687	51.9658	51.4827	51.3923	50.9716	50.9716	50.8936	51.1336	51.3923	51.5752	51.7663 (39)
Average = Sum(39)m / 12 =												51.4823 (39)
HLP	0.8550	0.8533	0.8516	0.8437	0.8422	0.8353	0.8353	0.8340	0.8380	0.8422	0.8452	0.8484 (40)
HLP (average)												0.8437 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

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

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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 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	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	66.1982	66.3316	66.4629	67.0866	67.2045	67.7593	67.7593	67.8631	67.5445	67.2045	66.9663	66.7190	
alpha	5.4132	5.4221	5.4309	5.4724	5.4803	5.5173	5.5173	5.5242	5.5030	5.4803	5.4644	5.4479	
util living area	0.9940	0.9854	0.9648	0.9096	0.7924	0.6095	0.4468	0.4846	0.7187	0.9304	0.9866	0.9955	(86)
MIT	20.0428	20.2199	20.4541	20.7145	20.8990	20.9810	20.9971	20.9955	20.9545	20.7146	20.3239	20.0039	(87)
Th 2	20.2059	20.2074	20.2088	20.2156	20.2169	20.2228	20.2228	20.2239	20.2205	20.2169	20.2143	20.2116	(88)
util rest of house	0.9924	0.9818	0.9561	0.8878	0.7480	0.5426	0.3694	0.4052	0.6541	0.9088	0.9826	0.9944	(89)
MIT 2	19.3273	19.5037	19.7339	19.9861	20.1476	20.2133	20.2219	20.2224	20.1949	19.9919	19.6136	19.2934	(90)
Living area fraction	19.6143	19.7910	20.0228	20.2783	20.4490	20.5213	20.5329	20.5325	fLA = Living area / (4) =	20.4996	20.2819	19.8986	0.4012 (91)
MIT	19.6143	19.7910	20.0228	20.2783	20.4490	20.5213	20.5329	20.5325	20.4996	20.2819	19.8986	19.5784	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6143	19.7910	20.0228	20.2783	20.4490	20.5213	20.5329	20.5325	20.4996	20.2819	19.8986	19.5784	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	372.5976	430.3755	464.5359	464.5507	409.2159	295.2872	199.6769	209.0545	310.7040	378.4680	364.0583	351.8553	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	799.0037	775.3561	702.7240	585.7862	449.6330	301.8168	200.4649	210.3194	327.2346	497.5733	660.0875	796.0859	(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	317.2461	231.8269	177.2119	87.2896	30.0703	0.0000	0.0000	0.0000	0.0000	88.6143	213.1410	330.5075	(98)
Space heating												1475.9077	(98)
Space heating per m2										(98) / (4) =		24.1873	(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	479.1326	377.1895	386.7916	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9530	0.9795	0.9736	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	456.6143	369.4674	376.5984	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	162.6350	213.9905	192.0761	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												568.7016	(104)
Cooled fraction												1.0000	(105)
												fC = cooled area / (4) =	

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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	40.6588	53.4976	48.0190	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												142.1754 (107)
Space cooling per m2												2.3300 (108)
Energy for space heating												24.1873 (99)
Energy for space cooling												2.3300 (108)
Total												26.5173 (109)
Dwelling Fabric Energy Efficiency (DFEE)												26.5 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 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)			7.6900	1.3258	10.1951		(27)					
GF			61.0200	0.1300	7.9326		(28a)					
Main	24.4100	7.6900	16.7200	0.1800	3.0096		(29a)					
Total net area of external elements Aum(A, m2)			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/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8682 (36)					
Total fabric heat loss						(33) + (36) =	27.0055 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 28.4050	Feb 28.2403	Mar 28.0789	Apr 27.3207	May 27.1788	Jun 26.5184	Jul 26.5184	Aug 26.3961	Sep 26.7728	Oct 27.1788	Nov 27.4658	Dec 27.7658 (38)
Heat transfer coeff	55.4105	55.2458	55.0844	54.3261	54.1843	53.5239	53.5239	53.4016	53.7783	54.1843	54.4713	54.7713 (39)
Average = Sum(39)m / 12 =												54.3255 (39)
HLP	Jan 0.9081	Feb 0.9054	Mar 0.9027	Apr 0.8903	May 0.8880	Jun 0.8772	Jul 0.8772	Aug 0.8751	Sep 0.8813	Oct 0.8880	Nov 0.8927	Dec 0.8976 (40)
HLP (average)												0.8903 (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 90.1397	Feb 86.8619	Mar 83.5841	Apr 80.3063	May 77.0284	Jun 73.7506	Jul 73.7506	Aug 77.0284	Sep 80.3063	Oct 83.5841	Nov 86.8619	Dec 90.1397 (44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)										Total = Sum(45)m =		1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m	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												

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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	0.6300	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)

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
tau	76.4747	76.7027	76.9275	78.0011	78.2053	79.1702	79.1702	79.3515	78.7957	78.2053	77.7933	77.3672	
alpha	6.0983	6.1135	6.1285	6.2001	6.2137	6.2780	6.2780	6.2901	6.2530	6.2137	6.1862	6.1578	
util living area	0.9977	0.9939	0.9829	0.9463	0.8481	0.6620	0.4862	0.5262	0.7740	0.9601	0.9943	0.9984	(86)
MIT	20.1053	20.2557	20.4641	20.7120	20.8974	20.9829	20.9978	20.9965	20.9560	20.7180	20.3629	20.0786	(87)
Th 2	20.1606	20.1629	20.1652	20.1758	20.1777	20.1870	20.1870	20.1887	20.1834	20.1777	20.1737	20.1695	(88)
util rest of house	0.9970	0.9919	0.9773	0.9287	0.8034	0.5867	0.3979	0.4359	0.7042	0.9434	0.9922	0.9979	(89)
MIT 2	19.3404	19.4917	19.6991	19.9457	20.1096	20.1792	20.1864	20.1877	20.1603	19.9568	19.6080	19.3212	(90)
Living area fraction	19.6473	19.7982	20.0060	20.2531	20.4257	20.5016	20.5119	20.5121	fLA = Living area / (4) =	20.2621	19.9108	19.6250	(91)
MIT	19.6473	19.7982	20.0060	20.2531	20.4257	20.5016	20.5119	20.5121	20.4795	20.2621	19.9108	19.6250	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6473	19.7982	20.0060	20.2531	20.4257	20.5016	20.5119	20.5121	20.4795	20.2621	19.9108	19.6250	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9964	0.9909	0.9761	0.9306	0.8179	0.6166	0.4334	0.4722	0.7309	0.9454	0.9913	0.9974	(94)
Useful gains	369.1768	426.0922	462.9460	471.1185	424.7417	309.2269	208.7453	218.5291	324.7453	383.0574	361.4804	348.6609	(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	850.3990	823.0632	743.9692	616.7717	472.7942	315.8766	209.3806	219.5952	343.0791	523.5363	697.8222	844.8492	(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	358.0293	266.7645	209.0813	104.8703	35.7511	0.0000	0.0000	0.0000	0.0000	104.5163	242.1661	369.1641	(98)
Space heating												1690.3430	(98)
Space heating per m2												27.7015	(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	503.1248	396.0770	405.8524	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9504	0.9803	0.9741	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	478.1622	388.2581	395.3605	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	132.2839	185.2293	164.5714	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												482.0846	(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	33.0710	46.3073	41.1428	0.0000	0.0000	0.0000	0.0000	(107)

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Space cooling	120.5211 (107)
Space cooling per m2	1.9751 (108)
Energy for space heating	27.7015 (99)
Energy for space cooling	1.9751 (108)
Total	29.6766 (109)
Target Fabric Energy Efficiency (TFEE)	34.1 (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					3.4400
Infiltration rate					0.1720 (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) =				0.1462 (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				0.1425	0.1462	0.1243	0.1206	0.1206	0.1243	0.1389	0.1389	0.1425 (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)			7.6900	1.2808	9.8496		(27)
GF			61.0200	0.1200	7.3224	75.0000	4576.5000 (28a)
Main	24.4100	7.6900	16.7200	0.1800	3.0096	110.0000	1839.2000 (29a)
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) =			20.1816	(33)
Party Wall 1			53.2100	0.0000	0.0000	70.0000	3724.7000 (32)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				13033.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							213.6000 (35)
Thermal bridges (User defined value 0.060 * total exposed area)							5.1258 (36)
Total fabric heat loss			(33) + (36) =				25.3074 (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	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713 (39)
Average = Sum(39)m / 12 =												49.4713 (39)
HLP	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107 (40)
HLP (average)												0.8107 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397	(44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)												Total = Sum(45)m = 1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193	120.6193 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	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	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)

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	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842
alpha	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789
util living area	0.9564	0.9257	0.8644	0.7474	0.5786	0.3967	0.2914	0.3162	0.5070	0.7669	0.9195	0.9652 (86)
MIT	20.5915	20.6889	20.8065	20.9057	20.9517	20.9619	20.9629	20.9628	20.9585	20.9056	20.7381	20.5518 (87)
Th 2	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440 (88)
util rest of house	0.9467	0.9108	0.8397	0.7090	0.5284	0.3406	0.2320	0.2551	0.4483	0.7233	0.9008	0.9573 (89)
MIT 2	19.7160	19.8501	20.0071	20.1303	20.1804	20.1893	20.1898	20.1898	20.1868	20.1328	19.9202	19.6603 (90)
Living area fraction									FLA = Living area / (4) =			0.4012 (91)
MIT	20.0672	20.1866	20.3278	20.4414	20.4898	20.4992	20.4999	20.4999	20.4964	20.4428	20.2484	20.0179 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0672	20.1866	20.3278	20.4414	20.4898	20.4992	20.4999	20.4999	20.4964	20.4428	20.2484	20.0179 (93)

8. Space heating requirement

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

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

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.4400
Infiltration rate					0.1720 (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) =				0.1462 (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	0.1864	0.1828	0.1791	0.1608	0.1572	0.1389	0.1389	0.1352	0.1462	0.1572	0.1645	0.1718 (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)			7.6900	1.2808	9.8496		(27)
GF			61.0200	0.1200	7.3224	75.0000	4576.5000 (28a)
Main	24.4100	7.6900	16.7200	0.1800	3.0096	110.0000	1839.2000 (29a)
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) =			20.1816	(33)
Party Wall 1			53.2100	0.0000	0.0000	70.0000	3724.7000 (32)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				13033.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							213.6000 (35)
Thermal bridges (User defined value 0.060 * total exposed area)							5.1258 (36)
Total fabric heat loss			(33) + (36) =				25.3074 (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	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713 (39)
Average = Sum(39)m / 12 =												49.4713 (39)
HLP	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107 (40)
HLP (average)												0.8107 (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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[illegible]

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	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)

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	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842
alpha	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789
util living area	0.9625	0.9346	0.8827	0.7856	0.6395	0.4697	0.3373	0.3616	0.5469	0.7954	0.9307	0.9700 (86)
MIT	20.5456	20.6511	20.7733	20.8817	20.9414	20.9599	20.9626	20.9624	20.9558	20.8882	20.7022	20.5076 (87)
Th 2	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440 (88)
util rest of house	0.9545	0.9217	0.8615	0.7518	0.5935	0.4155	0.2795	0.3025	0.4900	0.7563	0.9149	0.9634 (89)
MIT 2	19.6505	19.7973	19.9628	20.1014	20.1699	20.1878	20.1897	20.1896	20.1845	20.1122	19.8708	19.5969 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.4012 (91)
MIT	20.0096	20.1398	20.2879	20.4144	20.4794	20.4975	20.4998	20.4996	20.4939	20.4235	20.2044	19.9623 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0096	20.1398	20.2879	20.4144	20.4794	20.4975	20.4998	20.4996	20.4939	20.4235	20.2044	19.9623 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9517	0.9197	0.8628	0.7598	0.6081	0.4338	0.2991	0.3225	0.5091	0.7661	0.9140	0.9606 (94)
Useful gains	541.0046	578.6936	577.1935	526.3144	423.7618	290.5105	192.8146	202.6363	313.2067	447.3747	504.1390	521.5647 (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	777.1762	753.9356	682.1080	569.6325	434.3295	291.7589	192.9271	202.8146	316.3143	485.9837	648.2907	779.7815 (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	175.7117	117.7626	78.0564	31.1890	7.8624	0.0000	0.0000	0.0000	0.0000	28.7251	103.7892	192.1134 (98)
Space heating												735.2097 (98)
Space heating per m2												12.0487 (99)
										(98) / (4) =		

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													735.2097 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	175.7117	117.7626	78.0564	31.1890	7.8624	0.0000	0.0000	0.0000	0.0000	28.7251	103.7892	192.1134	(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)	175.7117	117.7626	78.0564	31.1890	7.8624	0.0000	0.0000	0.0000	0.0000	28.7251	103.7892	192.1134	(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												735.2097	(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													2655.4429 (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)	735.2097	5.5000	40.4365 (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			217.2904 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		0.8608 (257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	87.9918
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	735.2097	0.5190	381.5738 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	0.5190	797.5921 (264)
Space and water heating			1179.1660 (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			1124.9029 (272)
CO2 emissions per m2			18.4300 (273)
EI value			85.7822
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	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.4400
Infiltration rate					0.1720 (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) =				0.1462 (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	0.1572	0.1535	0.1535	0.1425	0.1462	0.1243	0.1206	0.1206	0.1243	0.1389	0.1389	0.1425 (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)			7.6900	1.2808	9.8496		(27)
GF			61.0200	0.1200	7.3224	75.0000	4576.5000 (28a)
Main	24.4100	7.6900	16.7200	0.1800	3.0096	110.0000	1839.2000 (29a)
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) =			20.1816	(33)
Party Wall 1			53.2100	0.0000	0.0000	70.0000	3724.7000 (32)
Party Ceilings 1			60.0200			30.0000	1800.6000 (32b)
Internal Wall 1			121.4300			9.0000	1092.8700 (32c)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =				13033.8700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							213.6000 (35)
Thermal bridges (User defined value 0.060 * total exposed area)							5.1258 (36)
Total fabric heat loss			(33) + (36) =				25.3074 (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	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713	49.4713 (39)
Average = Sum(39)m / 12 =												49.4713 (39)
HLP	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107	0.8107 (40)
HLP (average)												0.8107 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0103 (42)
Average daily hot water use (litres/day)												81.9452 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
90.1397	86.8619	83.5841	80.3063	77.0284	73.7506	73.7506	77.0284	80.3063	83.5841	86.8619	90.1397	(44)
Energy conte	133.6745	116.9126	120.6433	105.1798	100.9225	87.0884	80.7002	92.6047	93.7107	109.2108	119.2121	129.4566 (45)
Energy content (annual)												Total = Sum(45)m = 1289.3164 (45)
Distribution loss (46)m = 0.15 x (45)m	20.0512	17.5369	18.0965	15.7770	15.1384	13.0633	12.1050	13.8907	14.0566	16.3816	17.8818	19.4185 (46)

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

Water storage loss:												150.0000	(47)	
Store volume														
a) If manufacturer declared loss factor is known (kWh/day):												1.1300	(48)	
Temperature factor from Table 2b												0.6000	(49)	
Enter (49) or (54) in (55)												0.6780	(55)	
Total storage loss														
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180	20.3400	21.0180	20.3400	21.0180	(56)	
If cylinder contains dedicated solar storage														
	21.0180	18.9840	21.0180	20.3400	21.0180	20.3400	21.0180	21.0180	20.3400	21.0180	20.3400	21.0180	(57)	
Primary loss								0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	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, n _{li,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842	73.1842
alpha	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789	5.8789
util living area	0.9564	0.9257	0.8644	0.7474	0.5786	0.3967	0.2914	0.3162	0.5070	0.7669	0.9195	0.9652 (86)
MIT	20.5915	20.6889	20.8065	20.9057	20.9517	20.9619	20.9629	20.9628	20.9585	20.9056	20.7381	20.5518 (87)
Th 2	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440	20.2440 (88)
util rest of house	0.9467	0.9108	0.8397	0.7090	0.5284	0.3406	0.2320	0.2551	0.4483	0.7233	0.9008	0.9573 (89)
MIT 2	19.7160	19.8501	20.0071	20.1303	20.1804	20.1893	20.1898	20.1898	20.1868	20.1328	19.9202	19.6603 (90)
Living area fraction									f _{LiA} = Living area / (4) =			0.4012 (91)
MIT	20.0672	20.1866	20.3278	20.4414	20.4898	20.4992	20.4999	20.4999	20.4964	20.4428	20.2484	20.0179 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0672	20.1866	20.3278	20.4414	20.4898	20.4992	20.4999	20.4999	20.4964	20.4428	20.2484	20.0179 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9442	0.9095	0.8426	0.7194	0.5449	0.3596	0.2521	0.2758	0.4681	0.7353	0.9009	0.9545 (94)
Useful gains	526.5429	558.7421	553.9156	491.6505	370.2483	237.0494	158.2690	168.1336	284.9296	423.3176	487.6921	510.9735 (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	735.5022	711.7253	639.5557	521.4954	375.4776	237.4252	158.3050	168.1964	286.7550	452.3079	610.8897	742.9569 (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	155.4657	102.8047	63.7162	21.4883	3.8905	0.0000	0.0000	0.0000	0.0000	21.5688	88.7023	172.5956 (98)
Space heating												630.2322 (98)
Space heating per m2												10.3283 (99)
										(98) / (4) =		

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													630.2322 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	155.4657	102.8047	63.7162	21.4883	3.8905	0.0000	0.0000	0.0000	0.0000	21.5688	88.7023	172.5956	(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)	155.4657	102.8047	63.7162	21.4883	3.8905	0.0000	0.0000	0.0000	0.0000	21.5688	88.7023	172.5956	(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													630.2322 (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													2550.4655 (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)	630.2322	12.1400	76.5102 (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			460.4214 (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	630.2322	0.5190	327.0905 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	0.5190	797.5921 (264)
Space and water heating			1124.6827 (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			1070.4196 (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	630.2322	3.0700	1934.8130 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating	1536.7864	3.0700	4717.9341 (264)
Space and water heating			6652.7471 (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
 Primary energy kWh/m²/year

6331.7690 (272)
 103.7655 (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 Environmental
 (none) efficiency impact
 Total Savings £0 0.00 kg/m²

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	£460	£460	£0
Space heating	£104	£104	£0
Water heating	£234	£234	£0
Lighting	£122	£122	£0
Total cost of fuels	£460	£460	£0
Total cost of uses	£460	£460	£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	104 kWh/m ²	104 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	213.6 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	4.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	193.31 (P1)
Transmission heat loss coefficient	25.31 (P7)
Summer heat loss coefficient	218.62 (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	3.32	3.14	3.03	(P6)
Summer external temperature	14.70	16.40	16.30	
Thermal mass temperature increment (TMP = 213.6)	0.50	0.50	0.50	
Threshold temperature	18.52	20.05	19.84	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			