



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 53

Contact: Tobias Whiting
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toby@abacusenergyuk.com

Report Issue Date: 08/02/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

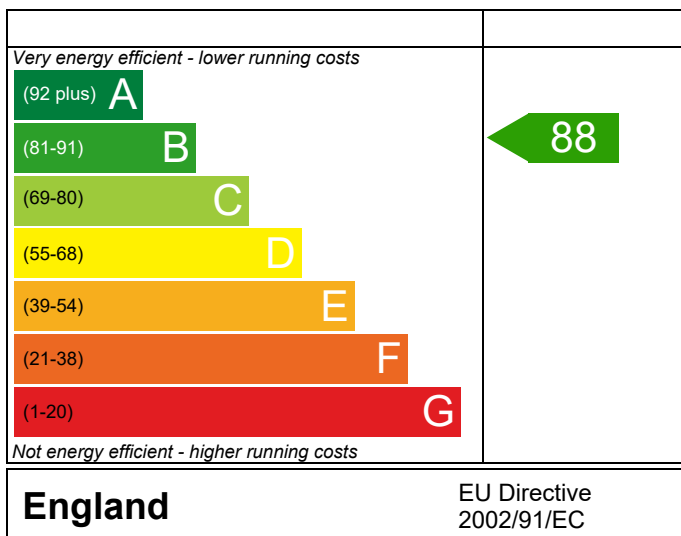
Plot 53

Dwelling type: House, Semi-Detached
Date of assessment: 08/02/2024
Produced by: Abacus Energy (UK) Ltd
Total floor area: 86 m²
DRRN: 8002-4298-4013

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

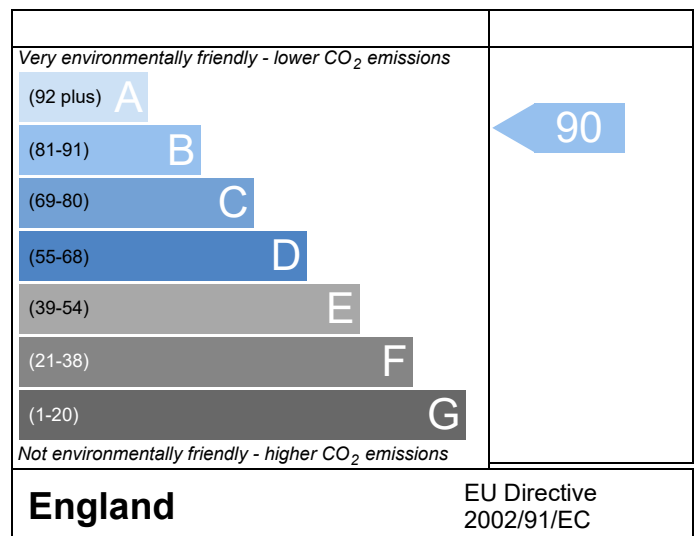
The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

This report has been produced by an accredited Elmhurst member whose work is subject to quality assurance audits. The data used to produce the report has been verified by the Elmhurst members' portal.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 53				Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref		Block H		
Property	Plot 53					
SAP Rating	88 B	DER	13.31	TER	18.16	
Environmental	90 B	% DER<TER	26.72			
CO ₂ Emissions (t/year)	0.81	DFEE	43.68	TFEE	51.92	
General Requirements Compliance	Pass	% DFEE<TFEE	15.88			
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.16	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.31	kgCO ₂ /m ²	Pass
	-4.85 (-26.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.92	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.68	kWh/m ² /yr	
	-8.2 (-15.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

7.00 m², No overhang

Windows facing South East

1.44 m², No overhang

Windows facing South West

3.86 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Floor U-value

0.12

W/m²K

Door U-value

1.10

W/m²K

Photovoltaic array

0.82

kW

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RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating	£4,000 - £6,000	£66	B 89	A 92	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£66	B 89	A 92	

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

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Assessment Reference	Rev B	Prop Type Ref	Block H			
Property	Plot 53					
SAP Rating	88 B	DER	13.31	TER	18.16	
Environmental	90 B	% DER<TER	26.72			
CO ₂ Emissions (t/year)	0.81	DFEE	43.68	TFEE	51.92	
General Requirements Compliance	Pass	% DFEE<TFEE	15.88			
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Client	Foreman Homes, FORE					

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.043	10.45	0.45	Catnic Thermally Broken
External wall	E3 Sill	Independently assessed	0.021	7.84	0.16	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	26.40	0.42	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	19.05	3.05	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.48	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	12.01	0.72	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	0.240	2.55	0.61	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	9.46	0.42	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	12.30	0.48	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	2.30	-0.21	Knauf P24
External wall	E18 Party wall between dwellings	Independently assessed	0.036	10.00	0.36	Knauf P25 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	9.46	1.51	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	9.46	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	9.46	0.33	Knauf P29 Halved

Total: **8.31** W/mK:
Y-Value: **0.046** W/m²K:

FULL SAP CALCULATION PRINTOUT

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Semi-Detached House, total floor area 86 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:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.16 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.31 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (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	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.19 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 835 VUW 356/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading:
Average
Windows facing North East: 7.00 m², No overhang
Windows facing South East: 1.44 m², No overhang
Windows facing South West: 3.86 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Photovoltaic array 0.82 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	43.7100 (1b)	x 2.3900 (2b)	= 104.4669 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 214.8438 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1862 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4362 (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) =	0.3708 (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	0.4727	0.4634	0.4542	0.4078	0.3986	0.3522	0.3522	0.3429	0.3708	0.3986	0.4171	0.4356 (22b)
Effective ac	0.6117	0.6074	0.6031	0.5832	0.5794	0.5620	0.5620	0.5588	0.5687	0.5794	0.5870	0.5949 (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
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.3000	1.1450	14.0840		(27)
Ground Floor			43.7100	0.1200	5.2452	90.0000	3933.9000 (28a)
Brick and Block	93.7600	14.4500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	43.7100		43.7100	0.1000	4.3710	9.1000	397.7610 (30)
Total net area of external elements Aum(A, m ²)			181.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.0996		(33)
Party Wall 1			45.5200	0.0000	0.0000	110.0000	5007.2000 (32)
Ground Floor Stud			73.7000			9.0000	663.3000 (32c)
First Floor Stud			98.1700			9.0000	883.5300 (32c)
Internal Floor 1			42.2900			18.0000	761.2200 (32d)
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15756.5992 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 183.2163 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3083 (36)
Total fabric heat loss (33) + (36) = 53.4079 (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	43.3706	43.0630	42.7615	41.3453	41.0804	39.8469	39.8469	39.6185	40.3220	41.0804	41.6164	42.1768 (38)
Heat transfer coeff	96.7785	96.4709	96.1694	94.7532	94.4883	93.2548	93.2548	93.0264	93.7299	94.4883	95.0243	95.5847 (39)
Average = Sum(39)m / 12 =												94.7520 (39)
HLP	1.1253	1.1218	1.1182	1.1018	1.0987	1.0844	1.0844	1.0817	1.0899	1.0987	1.1049	1.1114 (40)
HLP (average)												1.1018 (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												2.5669 (42)
Average daily hot water use (litres/day)												95.1643 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.6808	100.8742	97.0676	93.2610	89.4545	85.6479	85.6479	89.4545	93.2610	97.0676	100.8742	104.6808 (44)
Energy conte	155.2385	135.7726	140.1052	122.1471	117.2030	101.1373	93.7186	107.5434	108.8279	126.8284	138.4431	150.3402 (45)
Energy content (annual)										Total = Sum(45)m =		1497.3054 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.2858	20.3659	21.0158	18.3221	17.5805	15.1706	14.0578	16.1315	16.3242	19.0243	20.7665	22.5510 (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)
Combi loss	0.6707	0.6073	0.6120	0.5126	0.4718	0.3898	0.3612	0.4329	0.4567	0.5540	0.6193	0.6496 (61)
Total heat required for water heating calculated for each month	155.9093	136.3799	140.7172	122.6597	117.6748	101.5271	94.0798	107.9764	109.2846	127.3824	139.0624	150.9898 (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	155.9093	136.3799	140.7172	122.6597	117.6748	101.5271	94.0798	107.9764	109.2846	127.3824	139.0624	150.9898 (64)
Heat gains from water heating, kWh/month	51.7845	45.2962	46.7380	40.7421	39.0880	33.7256	31.2517	35.8664	36.2994	42.3089	46.1871	50.1505 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1503.6433 (64)												

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	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0412	19.5768	15.9209	12.0532	9.0099	7.6065	8.2191	10.6835	14.3394	18.2072	21.2504	22.6538 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346 (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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768 (71)
Water heating gains (Table 5)	69.6028	67.4051	62.8198	56.5862	52.5376	46.8411	42.0050	48.2076	50.4159	56.8668	64.1488	67.4066 (72)
Total internal gains	387.6712	385.4116	371.1163	348.1262	324.7647	302.3737	287.9348	294.1992	306.1176	329.3250	355.9199	375.8722 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast			7.0000		11.2829		0.6300		0.7000		0.7700		24.1375 (75)
Southeast			1.4400		36.7938		0.6300		0.7000		0.7700		16.1923 (77)
Southwest			3.8600		36.7938		0.6300		0.7000		0.7700		43.4044 (79)
Solar gains	83.7343	150.6479	227.4190	317.4784	388.1832	399.7073	379.3965	324.4565	258.2614	172.2400	101.7544	70.7143	(83)
Total gains	471.4055	536.0595	598.5353	665.6046	712.9478	702.0810	667.3312	618.6557	564.3790	501.5650	457.6743	446.5865	(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	45.2253	45.3695	45.5117	46.1919	46.3214	46.9341	46.9341	47.0494	46.6962	46.3214	46.0602	45.7901
alpha	4.0150	4.0246	4.0341	4.0795	4.0881	4.1289	4.1289	4.1366	4.1131	4.0881	4.0707	4.0527
util living area	0.9950	0.9909	0.9809	0.9513	0.8774	0.7348	0.5802	0.6371	0.8550	0.9676	0.9912	0.9960 (86)
MIT	19.4027	19.5759	19.8740	20.2813	20.6453	20.8862	20.9675	20.9524	20.7695	20.3032	19.7868	19.3782 (87)
Th 2	19.9802	19.9831	19.9860	19.9994	20.0019	20.0136	20.0136	20.0158	20.0091	20.0019	19.9968	19.9915 (88)
util rest of house	0.9937	0.9886	0.9757	0.9370	0.8399	0.6556	0.4650	0.5228	0.7968	0.9555	0.9886	0.9949 (89)
MIT 2	18.5195	18.6939	18.9917	19.4002	19.7418	19.9510	20.0024	19.9977	19.8629	19.4287	18.9153	18.5037 (90)
Living area fraction									fLA = Living area / (4) =			0.2112 (91)
MIT	18.7060	18.8802	19.1780	19.5862	19.9326	20.1485	20.2062	20.1993	20.0543	19.6134	19.0993	18.6884 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7060	18.8802	19.1780	19.5862	19.9326	20.1485	20.2062	20.1993	20.0543	19.6134	19.0993	18.6884 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9915	0.9852	0.9703	0.9298	0.8368	0.6675	0.4887	0.5457	0.7999	0.9494	0.9853	0.9931 (94)
Useful gains	467.3757	528.1021	580.7685	618.8676	596.6137	468.6244	326.1412	337.5879	451.4441	476.1762	450.9413	443.4936 (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	1394.1936	1348.6776	1219.2353	1012.5563	777.8818	517.4234	336.2919	353.4324	558.0972	851.6583	1140.2287	1384.8664 (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	689.5525	551.4268	475.0193	283.4559	134.8634	0.0000	0.0000	0.0000	0.0000	279.3587	496.2869	700.3814 (98)
Space heating												3610.3448 (98)
Space heating per m2										(98) / (4) =		41.9808 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4002.5996 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	689.5525	551.4268	475.0193	283.4559	134.8634	0.0000	0.0000	0.0000	0.0000	279.3587	496.2869	700.3814	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	764.4706	611.3379	526.6290	314.2526	149.5160	0.0000	0.0000	0.0000	0.0000	309.7103	550.2072	776.4760	(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	155.9093	136.3799	140.7172	122.6597	117.6748	101.5271	94.0798	107.9764	109.2846	127.3824	139.0624	150.9898	(64)
Efficiency of water heater (217)m	87.2924	87.0812	86.6242	85.5337	83.1975	76.4000	76.4000	76.4000	76.4000	85.3707	86.7696	76.4000	(216)
Fuel for water heating, kWh/month	178.6059	156.6125	162.4456	143.4052	141.4403	132.8889	123.1411	141.3303	143.0426	149.2109	160.2663	172.7568	(219)
Water heating fuel used												1805.1464	(219)
Annual totals kWh/year													
Space heating fuel - main system												4002.5996	(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)												389.2545	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 0.82 * 1029 * 1.00) =										-675.1465		-675.1465	(233)
Total delivered energy for all uses												5596.8540	(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	4002.5996	0.2160	864.5615 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1805.1464	0.2160	389.9116 (264)
Space and water heating			1254.4731 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	389.2545	0.5190	202.0231 (268)
Energy saving/generation technologies			
PV Unit	-675.1465	0.5190	-350.4010 (269)
Total CO2, kg/year			1145.0202 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.3100 (273)

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

DER			13.3100 ZC1
Total Floor Area		TFA	86.0000
Assumed number of occupants		N	2.5669
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			15.9530 ZC2
CO2 emissions from cooking, equation (L16)			2.1001 ZC3
Total CO2 emissions			31.3631 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			31.3631 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.7100 (1b)	x 2.3900 (2b)	= 104.4669 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 214.8438 (5)

2. Ventilation rate

	main heating	+	secondary heating	+	other	=	total	m3 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							3 * 10 =	30.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						30.0000 / (5) =	0.1396 (8)				
Pressure test							Yes					
Measured/design AP50							5.0000					
Infiltration rate							0.3896	(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) =	0.3312 (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	0.4223	0.4140	0.4057	0.3643	0.3560	0.3146	0.3146	0.3064	0.3312	0.3560	0.3726	0.3891 (22b)
Effective ac	0.5892	0.5857	0.5823	0.5664	0.5634	0.5495	0.5495	0.5469	0.5548	0.5634	0.5694	0.5757 (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 Opaque door			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			12.3000	1.3258	16.3068		(27)					
Ground Floor			43.7100	0.1300	5.6823		(28a)					
Brick and Block	93.7600	14.4500	79.3100	0.1800	14.2758		(29a)					
Pitched Roof	43.7100		43.7100	0.1300	5.6823		(30)					
Total net area of external elements Aum(A, m2)			181.1800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.0972		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5747 (36)					
Total fabric heat loss						(33) + (36) =	54.6719 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.7702	Feb 41.5247	Mar 41.2842	Apr 40.1541	May 39.9427	Jun 38.9584	Jul 38.9584	Aug 38.7762	Sep 39.3376	Oct 39.9427	Nov 40.3704	Dec 40.8176 (38)
Heat transfer coeff	96.4421	96.1967	95.9561	94.8260	94.6146	93.6304	93.6304	93.4481	94.0095	94.6146	95.0423	95.4895 (39)
Average = Sum(39)m / 12 =												94.8250 (39)
HLP	Jan 1.1214	Feb 1.1186	Mar 1.1158	Apr 1.1026	May 1.1002	Jun 1.0887	Jul 1.0887	Aug 1.0866	Sep 1.0931	Oct 1.1002	Nov 1.1051	Dec 1.1103 (40)
HLP (average)												1.1026 (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												2.5669 (42)
Average daily hot water use (litres/day)												95.1643 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.6808	100.8742	97.0676	93.2610	89.4545	85.6479	85.6479	89.4545	93.2610	97.0676	100.8742	104.6808 (44)
Energy conte	155.2385	135.7726	140.1052	122.1471	117.2030	101.1373	93.7186	107.5434	108.8279	126.8284	138.4431	150.3402 (45)
Energy content (annual)												Total = Sum(45)m = 1497.3054 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.2858	20.3659	21.0158	18.3221	17.5805	15.1706	14.0578	16.1315	16.3242	19.0243	20.7665	22.5510 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi 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 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	49.4646	45.9917	45.5850	42.2373	43.6452	45.5850	45.9917	49.4646	49.3151	50.9589 (61)
Solar input	206.1974	181.8000	189.5698	168.1388	162.7881	143.3746	137.3638	153.1285	154.8196	176.2930	187.7582	201.2991 (62)
	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								Solar input (sum of months) =	Sum (63)m =			0.0000 (63)
Heat gains from water heating, kWh/month	206.1974	181.8000	189.5698	168.1388	162.7881	143.3746	137.3638	153.1285	154.8196	176.2930	187.7582	201.2991 (64)
	64.3565	56.6512	58.9511	52.1118	50.3663	44.1875	42.0727	47.1544	47.6832	54.5366	58.3611	62.7279 (65)
								Total per year (kWh/year) =	Sum (64)m =			2062.5309 (64)

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	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0412	19.5768	15.9209	12.0532	9.0099	7.6065	8.2191	10.6835	14.3394	18.2072	21.2504	22.6538	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	(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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)	86.5007	84.3024	79.2354	72.3776	67.6966	61.3715	56.5494	63.3796	66.2267	73.3019	81.0571	84.3116	(72)
Total internal gains	404.5691	402.3089	387.5318	363.9176	339.9237	316.9041	302.4791	309.3713	321.9284	345.7600	372.8281	392.7772	(73)

6. Solar gains

[Jan]																
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W				
Northeast					7.0000	11.2829	0.6300		0.7000		0.7700	24.1375 (75)				
Southeast					1.4400	36.7938	0.6300		0.7000		0.7700	16.1923 (77)				
Southwest					3.8600	36.7938	0.6300		0.7000		0.7700	43.4044 (79)				
Solar gains					83.7343	150.6479	227.4190	317.4784	388.1832	399.7073	379.3965	324.4565	258.2614	172.2400	101.7544	70.7143 (83)
Total gains					488.3034	552.9569	614.9508	681.3959	728.1068	716.6114	681.8756	633.8278	580.1898	518.0000	474.5825	463.4915 (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	61.9255	62.0835	62.2391	62.9808	63.1216	63.7851	63.7851	63.9095	63.5279	63.1216	62.8375	62.5433	
alpha	5.1284	5.1389	5.1493	5.1987	5.2081	5.2523	5.2523	5.2606	5.2352	5.2081	5.1892	5.1696	
util living area	0.9985	0.9968	0.9916	0.9718	0.9069	0.7567	0.5865	0.6472	0.8826	0.9829	0.9968	0.9988	(86)
MIT	19.7672	19.9043	20.1411	20.4655	20.7580	20.9371	20.9867	20.9783	20.8492	20.4767	20.0663	19.7446	(87)
Th 2	19.9834	19.9857	19.9880	19.9987	20.0007	20.0101	20.0101	20.0118	20.0064	20.0007	19.9966	19.9924	(88)
util rest of house	0.9979	0.9956	0.9885	0.9605	0.8689	0.6690	0.4636	0.5233	0.8206	0.9741	0.9955	0.9984	(89)
MIT 2	18.3350	18.5369	18.8833	19.3567	19.7542	19.9662	20.0049	20.0023	19.8785	19.3795	18.7819	18.3084	(90)
Living area fraction									fLA = Living area / (4) =			0.2112	(91)
MIT	18.6374	18.8256	19.1489	19.5908	19.9662	20.1712	20.2122	20.2084	20.0835	19.6112	19.0531	18.6117	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6374	18.8256	19.1489	19.5908	19.9662	20.1712	20.2122	20.2084	20.0835	19.6112	19.0531	18.6117	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	486.7829	549.5006	605.6573	650.4374	631.5323	490.6023	333.8712	348.1878	479.4387	502.1084	471.5886	462.3825	(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	1382.7290	1339.5969	1213.7370	1013.7682	782.1017	521.6353	338.2129	355.8888	562.5071	852.5890	1136.0516	1376.1643	(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	666.5839	530.9447	452.4113	261.5982	112.0236	0.0000	0.0000	0.0000	0.0000	260.7576	478.4133	679.8537	(98)
Space heating												3442.5862	(98)
Space heating per m2												40.0301	(99)
												(98) / (4) =	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3685.8525 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	666.5839	530.9447	452.4113	261.5982	112.0236	0.0000	0.0000	0.0000	0.0000	260.7576	478.4133	679.8537 (98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000 (210)
Space heating fuel (main heating system)	713.6872	568.4633	484.3804	280.0837	119.9396	0.0000	0.0000	0.0000	0.0000	279.1837	512.2199	727.8947 (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	206.1974	181.8000	189.5698	168.1388	162.7881	143.3746	137.3638	153.1285	154.8196	176.2930	187.7582	201.2991 (64)
Efficiency of water heater (217)m	87.7912	87.5899	87.1627	86.1599	84.1317	80.3000	80.3000	80.3000	80.3000	86.0350	87.3050	80.3000 (216)
Fuel for water heating, kWh/month	234.8725	207.5582	217.4896	195.1474	193.4920	178.5487	171.0633	190.6955	192.8015	204.9084	215.0600	229.0744 (219)
Water heating fuel used												2430.7114 (219)
Annual totals kWh/year												
Space heating fuel - main system												3685.8525 (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)												389.2545 (232)
Total delivered energy for all uses												6580.8185 (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	3685.8525	0.2160	796.1441 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2430.7114	0.2160	525.0337 (264)
Space and water heating			1321.1778 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	389.2545	0.5190	202.0231 (268)
Total CO2, kg/m2/year			1562.1259 (272)
Emissions per m2 for space and water heating			15.3625 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3491 (272b)
Emissions per m2 for pumps and fans			0.4526 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3625 * 1.00) + 2.3491 + 0.4526, rounded to 2 d.p.			18.1600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	43.7100 (1b)	x 2.3900 (2b)	= 104.4669 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 214.8438 (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					3 * 10 = 30.0000 (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) =				30.0000 / (5) = 0.1396 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3896 (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) =				0.3312 (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	0.4223	0.4140	0.4057	0.3643	0.3560	0.3146	0.3146	0.3064	0.3312	0.3560	0.3726	0.3891 (22b)
Effective ac	0.5892	0.5857	0.5823	0.5664	0.5634	0.5495	0.5495	0.5469	0.5548	0.5634	0.5694	0.5757 (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
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.3000	1.1450	14.0840		(27)
Ground Floor			43.7100	0.1200	5.2452	90.0000	3933.9000 (28a)
Brick and Block	93.7600	14.4500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	43.7100		43.7100	0.1000	4.3710	9.1000	397.7610 (30)
Total net area of external elements Aum(A, m ²)			181.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.0996		(33)
Party Wall 1			45.5200	0.0000	0.0000	110.0000	5007.2000 (32)
Ground Floor Stud			73.7000			9.0000	663.3000 (32c)
First Floor Stud			98.1700			9.0000	883.5300 (32c)
Internal Floor 1			42.2900			18.0000	761.2200 (32d)
Internal Ceiling 1			42.2900			9.0000	380.6100 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 15375.9892 (34)
178.7906 (35)
8.3083 (36)
(33) + (36) = 53.4079 (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	41.7702	41.5247	41.2842	40.1541	39.9427	38.9584	38.9584	38.7762	39.3376	39.9427	40.3704	40.8176 (38)
Heat transfer coeff	95.1781	94.9326	94.6921	93.5620	93.3506	92.3663	92.3663	92.1841	92.7455	93.3506	93.7783	94.2255 (39)
Average = Sum(39)m / 12 =												93.5610 (39)
HLP	1.1067	1.1039	1.1011	1.0879	1.0855	1.0740	1.0740	1.0719	1.0784	1.0855	1.0904	1.0956 (40)
HLP (average)												1.0879 (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												2.5669 (42)
Average daily hot water use (litres/day)												95.1643 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.6808	100.8742	97.0676	93.2610	89.4545	85.6479	85.6479	89.4545	93.2610	97.0676	100.8742	104.6808 (44)
Energy conte	155.2385	135.7726	140.1052	122.1471	117.2030	101.1373	93.7186	107.5434	108.8279	126.8284	138.4431	150.3402 (45)
Energy content (annual)										Total = Sum(45)m =		1497.3054 (45)

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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	32.9882	28.8517	29.7723	25.9563	24.9056	21.4917	19.9152	22.8530	23.1259	26.9510	29.4192	31.9473 (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	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0412	19.5768	15.9209	12.0532	9.0099	7.6065	8.2191	10.6835	14.3394	18.2072	21.2504	22.6538	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	(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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)	44.3390	42.9340	40.0166	36.0504	33.4753	29.8496	26.7677	30.7164	32.1193	36.2245	40.8599	42.9399	(72)
Total internal gains	359.4074	357.9405	345.3130	324.5904	302.7024	282.3821	269.6975	273.7080	284.8211	305.6827	329.6310	348.4055	(73)

6. Solar gains

[Jan]																		
			Area m2			Solar flux Table 6a W/m2			g Specific data or Table 6b			FF Specific data or Table 6c			Access factor Table 6d			Gains W

Northeast			7.0000			11.2829			0.6300			0.7000			0.7700			24.1375 (75)
Southeast			1.4400			36.7938			0.6300			0.7000			0.7700			16.1923 (77)
Southwest			3.8600			36.7938			0.6300			0.7000			0.7700			43.4044 (79)

Solar gains			83.7343	150.6479	227.4190	317.4784	388.1832	399.7073	379.3965	324.4565	258.2614	172.2400	101.7544	70.7143	(83)			
Total gains			443.1416	508.5885	572.7320	642.0687	690.8856	682.0894	649.0939	598.1645	543.0825	477.9226	431.3854	419.1198	(84)			

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	44.8749	44.9909	45.1052	45.6500	45.7534	46.2410	46.2410	46.3324	46.0519	45.7534	45.5447	45.3286	
alpha	3.9917	3.9994	4.0070	4.0433	4.0502	4.0827	4.0827	4.0888	4.0701	4.0502	4.0363	4.0219	
util living area	0.9956	0.9918	0.9822	0.9536	0.8817	0.7420	0.5880	0.6477	0.8626	0.9704	0.9923	0.9965	(86)
MIT	19.3650	19.5409	19.8444	20.2566	20.6293	20.8780	20.9645	20.9475	20.7542	20.2743	19.7486	19.3363	(87)
Th 2	19.9953	19.9977	20.0000	20.0107	20.0127	20.0221	20.0221	20.0238	20.0185	20.0127	20.0086	20.0044	(88)
util rest of house	0.9945	0.9897	0.9775	0.9402	0.8456	0.6644	0.4734	0.5345	0.8070	0.9594	0.9899	0.9956	(89)
MIT 2	18.4958	18.6727	18.9755	19.3873	19.7383	19.9538	20.0094	20.0032	19.8599	19.4114	18.8887	18.4741	(90)
Living area fraction	18.6793	18.8560	19.1590	19.5709	19.9264	20.1489	20.2111	20.2026	20.0487	19.5936	19.0703	18.6562	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6793	18.8560	19.1590	19.5709	19.9264	20.1489	20.2111	20.2026	20.0487	19.5936	19.0703	18.6562	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9925	0.9865	0.9722	0.9329	0.8420	0.6755	0.4968	0.5568	0.8090	0.9533	0.9869	0.9939	(94)
Ext temp.	439.8048	501.7228	556.8321	598.9628	581.7039	460.7502	322.4696	333.0664	439.3792	455.6121	425.7448	416.5785	(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	1368.5948	1324.8823	1198.7057	998.3889	767.9433	512.5347	333.5451	350.5397	551.7181	839.5608	1122.5511	1362.1383	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	691.0198	553.1632	477.5539	287.5868	138.5621	0.0000	0.0000	0.0000	0.0000	285.6578	501.7006	703.4965	(98)
												3638.7407	(98)
												42.3109	(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	868.2437	683.5110	700.5990	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8149	0.8812	0.8511	0.0000	0.0000	0.0000	0.0000	(101)

FULL SAP CALCULATION PRINTOUT

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	707.5076	602.2842	596.2918	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	894.1276	853.5904	795.8987	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	134.3664	186.9718	148.5075	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												469.8458 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.5916	46.7430	37.1269	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												117.4614 (107)
Space cooling per m2												1.3658 (108)
Energy for space heating												42.3109 (99)
Energy for space cooling												1.3658 (108)
Total												43.6768 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	43.7100 (1b)	x 2.3900 (2b)	= 104.4669 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 214.8438 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour
										heating	heating			
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)		
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)		
Number of intermittent fans											3 * 10 =	30.0000 (7a)		
Number of passive vents											0 * 10 =	0.0000 (7b)		
Number of flueless gas fires											0 * 40 =	0.0000 (7c)		
												Air changes per hour		
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =										30.0000 / (5) =	0.1396 (8)		
Pressure test											Yes			
Measured/design AP50											5.0000			
Infiltration rate											0.3896 (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) =	0.3312 (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	0.4223	0.4140	0.4057	0.3643	0.3560	0.3146	0.3146	0.3064	0.3312	0.3560	0.3726	0.3891 (22b)		
Effective ac	0.5892	0.5857	0.5823	0.5664	0.5634	0.5495	0.5495	0.5469	0.5548	0.5634	0.5694	0.5757 (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 Opaque door			2.1500	1.0000	2.1500		(26)					
TER Opening Type (Uw = 1.40)			12.3000	1.3258	16.3068		(27)					
Ground Floor			43.7100	0.1300	5.6823		(28a)					
Brick and Block	93.7600	14.4500	79.3100	0.1800	14.2758		(29a)					
Pitched Roof	43.7100		43.7100	0.1300	5.6823		(30)					
Total net area of external elements Aum(A, m2)			181.1800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	44.0972		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5747 (36)					
Total fabric heat loss						(33) + (36) =	54.6719 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.7702	Feb 41.5247	Mar 41.2842	Apr 40.1541	May 39.9427	Jun 38.9584	Jul 38.9584	Aug 38.7762	Sep 39.3376	Oct 39.9427	Nov 40.3704	Dec 40.8176 (38)
Heat transfer coeff	96.4421	96.1967	95.9561	94.8260	94.6146	93.6304	93.6304	93.4481	94.0095	94.6146	95.0423	95.4895 (39)
Average = Sum(39)m / 12 =												94.8250 (39)
HLP	Jan 1.1214	Feb 1.1186	Mar 1.1158	Apr 1.1026	May 1.1002	Jun 1.0887	Jul 1.0887	Aug 1.0866	Sep 1.0931	Oct 1.1002	Nov 1.1051	Dec 1.1103 (40)
HLP (average)												1.1026 (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												2.5669 (42)
Average daily hot water use (litres/day)												95.1643 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.6808	100.8742	97.0676	93.2610	89.4545	85.6479	85.6479	89.4545	93.2610	97.0676	100.8742	104.6808 (44)
Energy conte	155.2385	135.7726	140.1052	122.1471	117.2030	101.1373	93.7186	107.5434	108.8279	126.8284	138.4431	150.3402 (45)
Energy content (annual)											Total = Sum(45)m =	1497.3054 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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 (57)
Heat gains from water heating, kWh/month	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)
	32.9882	28.8517	29.7723	25.9563	24.9056	21.4917	19.9152	22.8530	23.1259	26.9510	29.4192	31.9473 (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	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	128.3459	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.0412	19.5768	15.9209	12.0532	9.0099	7.6065	8.2191	10.6835	14.3394	18.2072	21.2504	22.6538	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.5234	233.9259	227.8717	214.9831	198.7134	183.4223	173.2069	170.8044	176.8586	189.7472	206.0168	221.3080	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	35.8346	(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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)	44.3390	42.9340	40.0166	36.0504	33.4753	29.8496	26.7677	30.7164	32.1193	36.2245	40.8599	42.9399	(72)
Total internal gains	359.4074	357.9405	345.3130	324.5904	302.7024	282.3821	269.6975	273.7080	284.8211	305.6827	329.6310	348.4055	(73)

6. Solar gains

[Jan]												
					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W
Northeast					7.0000	11.2829		0.6300	0.7000		0.7700	24.1375 (75)
Southeast					1.4400	36.7938		0.6300	0.7000		0.7700	16.1923 (77)
Southwest					3.8600	36.7938		0.6300	0.7000		0.7700	43.4044 (79)
Solar gains	83.7343	150.6479	227.4190	317.4784	388.1832	399.7073	379.3965	324.4565	258.2614	172.2400	101.7544	70.7143 (83)
Total gains	443.1416	508.5885	572.7320	642.0687	690.8856	682.0894	649.0939	598.1645	543.0825	477.9226	431.3854	419.1198 (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	61.9255	62.0835	62.2391	62.9808	63.1216	63.7851	63.7851	63.9095	63.5279	63.1216	62.8375	62.5433	
alpha	5.1284	5.1389	5.1493	5.1987	5.2081	5.2523	5.2523	5.2606	5.2352	5.2081	5.1892	5.1696	
util living area	0.9990	0.9978	0.9939	0.9779	0.9216	0.7811	0.6121	0.6779	0.9041	0.9879	0.9980	0.9993	(86)
MIT	19.7180	19.8563	20.0966	20.4277	20.7320	20.9266	20.9838	20.9731	20.8260	20.4359	20.0194	19.6961	(87)
Th 2	19.9834	19.9857	19.9880	19.9987	20.0007	20.0101	20.0101	20.0118	20.0064	20.0007	19.9966	19.9924	(88)
util rest of house	0.9987	0.9970	0.9916	0.9687	0.8875	0.6952	0.4858	0.5518	0.8488	0.9814	0.9971	0.9990	(89)
MIT 2	18.8088	18.9487	19.1898	19.5245	19.8109	19.9743	20.0057	20.0036	19.9024	19.5374	19.1207	18.7942	(90)
Living area fraction									fLA = Living area / (4) =			0.2112	(91)
MIT	19.0008	19.1404	19.3813	19.7152	20.0054	20.1754	20.2122	20.2083	20.0974	19.7271	19.3105	18.9846	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0008	19.1404	19.3813	19.7152	20.0054	20.1754	20.2122	20.2083	20.0974	19.7271	19.3105	18.9846	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	442.3583	506.6184	566.8271	619.8067	613.3245	485.0066	332.8451	346.1140	464.2936	467.8700	429.7868	418.5664	(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	1417.7745	1369.8777	1236.0358	1025.5627	785.8151	522.0283	338.2140	355.8770	563.8146	863.5586	1160.5098	1411.7763	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(98)
Space heating kWh	725.7097	580.1102	497.8913	292.1443	128.3330	0.0000	0.0000	0.0000	0.0000	294.3923	526.1206	738.9482	(98)
Space heating												3783.6496	(98)
Space heating per m2												43.9959	(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	880.1254	692.8647	710.2056	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8466	0.9136	0.8840	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	745.1272	633.0100	627.8480	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	894.1276	853.5904	795.8987	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	107.2803	164.1118	125.0297	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												396.4218	(104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.8201	41.0280	31.2574	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												99.1055 (107)
Space cooling per m2												1.1524 (108)
Energy for space heating												43.9959 (99)
Energy for space cooling												1.1524 (108)
Total												45.1483 (109)
Target Fabric Energy Efficiency (TFEE)												51.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	43.7100 (1b)	x 2.3900 (2b)	= 104.4669 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 214.8438 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1862 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4362 (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) =	0.3708 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.4727	0.4356	0.4264	0.3986	0.3986	0.3708	0.3708	0.3615	0.3708	0.4171	0.4078	0.4356 (22b)
Effective ac	0.6117	0.5949	0.5909	0.5794	0.5794	0.5687	0.5687	0.5653	0.5687	0.5870	0.5832	0.5949 (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
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.3000	1.1450	14.0840		(27)
Ground Floor			43.7100	0.1200	5.2452	90.0000	3933.9000 (28a)
Brick and Block	93.7600	14.4500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	43.7100		43.7100	0.1000	4.3710	9.1000	397.7610 (30)
Total net area of external elements Aum(A, m ²)			181.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.0996		(33)
Party Wall 1			45.5200	0.0000	0.0000	110.0000	5007.2000 (32)
Ground Floor Stud			73.7000			9.0000	663.3000 (32c)
First Floor Stud			98.1700			9.0000	883.5300 (32c)
Internal Floor 1			42.2900			18.0000	761.2200 (32d)
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

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	43.3706	42.1768	41.8935	41.0804	41.0804	40.3220	40.3220	40.0814	40.3220	41.6164	41.3453	42.1768 (38)
Average = Sum(39)m / 12 =	96.7785	95.5847	95.3014	94.4883	94.4883	93.7299	93.7299	93.4893	93.7299	95.0243	94.7532	95.5847 (39)
												94.7235 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1253	1.1114	1.1082	1.0987	1.0987	1.0899	1.0899	1.0871	1.0899	1.1049	1.1018	1.1114 (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												2.5669 (42)
Average daily hot water use (litres/day)												95.1643 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	104.6808	100.8742	97.0676	93.2610	89.4545	85.6479	85.6479	89.4545	93.2610	97.0676	100.8742	104.6808 (44)
Energy content (annual)	155.2385	135.7726	140.1052	122.1471	117.2030	101.1373	93.7186	107.5434	108.8279	126.8284	138.4431	150.3402 (45)
										Total = Sum(45)m =		1497.3054 (45)

Distribution loss	(46)m = 0.15 x (45)											
	23.2858	20.3659	21.0158	18.3221	17.5805	15.1706	14.0578	16.1315	16.3242	19.0243	20.7665	22.5510 (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)
Combi loss	0.6707	0.6073	0.6120	0.5126	0.4718	0.3898	0.3612	0.4329	0.4567	0.5540	0.6193	0.6496 (61)
Total heat required for water heating calculated for each month												
	155.9093	136.3799	140.7172	122.6597	117.6748	101.5271	94.0798	107.9764	109.2846	127.3824	139.0624	150.9898 (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												
	155.9093	136.3799	140.7172	122.6597	117.6748	101.5271	94.0798	107.9764	109.2846	127.3824	139.0624	150.9898 (64)
								Total per year (kWh/year) = Sum(64)m =				1503.6433 (64)
RHI water heating demand												1504 (64)
Heat gains from water heating, kWh/month												
	51.7845	45.2962	46.7380	40.7421	39.0880	33.7256	31.2517	35.8664	36.2994	42.3089	46.1871	50.1505 (65)

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	43.7100 (1b)	x 2.3900 (2b)	= 104.4669 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 214.8438 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1862 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4362 (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) =	0.3708 (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	0.4727	0.4634	0.4542	0.4078	0.3986	0.3522	0.3522	0.3429	0.3708	0.3986	0.4171	0.4356 (22b)
Effective ac	0.6117	0.6074	0.6031	0.5832	0.5794	0.5620	0.5620	0.5588	0.5687	0.5794	0.5870	0.5949 (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
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.3000	1.1450	14.0840		(27)
Ground Floor			43.7100	0.1200	5.2452	90.0000	3933.9000 (28a)
Brick and Block	93.7600	14.4500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	43.7100		43.7100	0.1000	4.3710	9.1000	397.7610 (30)
Total net area of external elements Aum(A, m ²)			181.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.0996		(33)
Party Wall 1			45.5200	0.0000	0.0000	110.0000	5007.2000 (32)
Ground Floor Stud			73.7000			9.0000	663.3000 (32c)
First Floor Stud			98.1700			9.0000	883.5300 (32c)
Internal Floor 1			42.2900			18.0000	761.2200 (32d)
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

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	43.3706	43.0630	42.7615	41.3453	41.0804	39.8469	39.8469	39.6185	40.3220	41.0804	41.6164	42.1768 (38)
Average = Sum(39)m / 12 =	96.7785	96.4709	96.1694	94.7532	94.4883	93.2548	93.2548	93.0264	93.7299	94.4883	95.0243	95.5847 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1253	1.1218	1.1182	1.1018	1.0987	1.0844	1.0844	1.0817	1.0899	1.0987	1.1049	1.1114 (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												
Average daily hot water use (litres/day)												2.5669 (42)
												95.1643 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	104.6808	100.8742	97.0676	93.2610	89.4545	85.6479	85.6479	89.4545	93.2610	97.0676	100.8742	104.6808 (44)
Energy content (annual)	155.2385	135.7726	140.1052	122.1471	117.2030	101.1373	93.7186	107.5434	108.8279	126.8284	138.4431	150.3402 (45)
										Total = Sum(45)m =		1497.3054 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.2858	20.3659	21.0158	18.3221	17.5805	15.1706	14.0578	16.1315	16.3242	19.0243	20.7665	22.5510 (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)
Combi loss	0.6707	0.6073	0.6120	0.5126	0.4718	0.3898	0.3612	0.4329	0.4567	0.5540	0.6193	0.6496 (61)
Total heat required for water heating calculated for each month	155.9093	136.3799	140.7172	122.6597	117.6748	101.5271	94.0798	107.9764	109.2846	127.3824	139.0624	150.9898 (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	155.9093	136.3799	140.7172	122.6597	117.6748	101.5271	94.0798	107.9764	109.2846	127.3824	139.0624	150.9898 (64)
Heat gains from water heating, kWh/month	51.7845	45.2962	46.7380	40.7421	39.0880	33.7256	31.2517	35.8664	36.2994	42.3089	46.1871	50.1505 (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	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.1030	48.9420	39.8023	30.1329	22.5247	19.0163	20.5478	26.7088	35.8485	45.5179	53.1261	56.6345	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	345.5573	349.1431	340.1070	320.8702	296.5872	273.7646	258.5177	254.9319	263.9680	283.2048	307.4878	330.3104	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	(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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)	69.6028	67.4051	62.8198	56.5862	52.5376	46.8411	42.0050	48.2076	50.4159	56.8668	64.1488	67.4066	(72)
Total internal gains	577.5700	572.7970	550.0360	514.8961	478.9563	446.9288	428.3773	437.1550	457.5392	492.8963	532.0695	561.6583	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				7.0000	11.2829	0.6300	0.7000	0.7700	24.1375 (75)			
Southeast				1.4400	36.7938	0.6300	0.7000	0.7700	16.1923 (77)			
Southwest				3.8600	36.7938	0.6300	0.7000	0.7700	43.4044 (79)			
Solar gains	83.7343	150.6479	227.4190	317.4784	388.1832	399.7073	379.3965	324.4565	258.2614	172.2400	101.7544	70.7143 (83)
Total gains	661.3042	723.4450	777.4550	832.3745	867.1395	846.6361	807.7738	761.6116	715.8006	665.1363	633.8239	632.3727 (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	45.2253	45.3695	45.5117	46.1919	46.3214	46.9341	46.9341	47.0494	46.6962	46.3214	46.0602	45.7901	
alpha	4.0150	4.0246	4.0341	4.0795	4.0881	4.1289	4.1289	4.1366	4.1131	4.0881	4.0707	4.0527	
util living area	0.9835	0.9748	0.9558	0.9076	0.8088	0.6460	0.4922	0.5380	0.7616	0.9240	0.9732	0.9860	(86)
MIT	19.6552	19.8183	20.0915	20.4526	20.7514	20.9299	20.9821	20.9744	20.8574	20.4843	20.0151	19.6279	(87)
Th 2	19.9802	19.9831	19.9860	19.9994	20.0019	20.0136	20.0136	20.0158	20.0091	20.0019	19.9968	19.9915	(88)
util rest of house	0.9796	0.9689	0.9450	0.8845	0.7613	0.5657	0.3889	0.4331	0.6903	0.9001	0.9658	0.9827	(89)
MIT 2	18.7693	18.9322	19.2018	19.5577	19.8277	19.9772	20.0078	20.0067	19.9253	19.5961	19.1388	18.7511	(90)
Living area fraction									fLA = Living area / (4) =			0.2112	(91)
MIT	18.9564	19.1193	19.3897	19.7466	20.0228	20.1784	20.2135	20.2110	20.1221	19.7836	19.3238	18.9362	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9564	19.1193	19.3897	19.7466	20.0228	20.1784	20.2135	20.2110	20.1221	19.7836	19.3238	18.9362	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9745	0.9625	0.9372	0.8776	0.7624	0.5799	0.4105	0.4548	0.6993	0.8938	0.9595	0.9782	(94)
Ext temp.	644.4492	696.3187	728.6530	730.5237	661.0786	490.9538	331.6038	346.3500	500.5620	594.5126	608.1749	618.5594	(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	1418.4209	1371.7501	1239.5946	1027.7546	786.4057	520.2082	336.9787	354.5257	564.4507	867.7459	1161.5582	1408.5586	(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	575.8349	453.8899	380.1405	214.0062	93.2434	0.0000	0.0000	0.0000	0.0000	203.2856	398.4360	587.7594	(98)
Space heating per m2												2906.5959	(98)
										(98) / (4) =		33.7976	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3222.3901	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	575.8349	453.8899	380.1405	214.0062	93.2434	0.0000	0.0000	0.0000	0.0000	203.2856	398.4360	587.7594	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	638.3979	503.2039	421.4418	237.2574	103.3740	0.0000	0.0000	0.0000	0.0000	225.3720	441.7251	651.6180	(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	155.9093	136.3799	140.7172	122.6597	117.6748	101.5271	94.0798	107.9764	109.2846	127.3824	139.0624	150.9898	(64)
Efficiency of water heater (217)m	86.8572	86.5864	86.0031	84.6305	81.9422	76.4000	76.4000	76.4000	76.4000	84.3319	86.1729	76.4000	(216)
Fuel for water heating, kWh/month	179.5006	157.5073	163.6187	144.9356	143.6071	132.8889	123.1411	141.3303	143.0426	151.0488	161.3759	173.5743	(219)
Water heating fuel used												1815.5712	(219)
Annual totals kWh/year													
Space heating fuel - main system												3222.3901	(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)												389.2545	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.82 * 1029 * 1.00) =										-675.1465		-675.1465	(233)
Total delivered energy for all uses												4827.0693	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3222.3901	3.4800	112.1392 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1815.5712	3.4800	63.1819 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	389.2545	13.1900	51.3427 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-675.1465	13.1900	-89.0518 (252)
Total energy cost			267.5044 (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] =	0.8576 (257)
SAP value	88.0358	
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	3222.3901	0.2160	696.0363 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1815.5712	0.2160	392.1634 (264)
Space and water heating			1088.1996 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	389.2545	0.5190	202.0231 (268)
Energy saving/generation technologies			
PV Unit	-675.1465	0.5190	-350.4010 (269)
Total kg/year			978.7467 (272)
CO2 emissions per m2			11.3800 (273)
EI value			89.9884
EI rating			90
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8243 = 4.222$, stars = 4
Water heating environmental impact	$0.216 / 0.8243 = 0.2621$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 WORKSHEET FOR New Build (As Designed) (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	43.7100 (1b)	x 2.3900 (2b)	= 104.4669 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 214.8438 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1862 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4362 (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) =	0.3708 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.4727	0.4356	0.4264	0.3986	0.3986	0.3708	0.3708	0.3615	0.3708	0.4171	0.4078	0.4356 (22b)
Effective ac	0.6117	0.5949	0.5909	0.5794	0.5794	0.5687	0.5687	0.5653	0.5687	0.5870	0.5832	0.5949 (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
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.3000	1.1450	14.0840		(27)
Ground Floor			43.7100	0.1200	5.2452	90.0000	3933.9000 (28a)
Brick and Block	93.7600	14.4500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	43.7100		43.7100	0.1000	4.3710	9.1000	397.7610 (30)
Total net area of external elements Aum(A, m ²)			181.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.0996		(33)
Party Wall 1			45.5200	0.0000	0.0000	110.0000	5007.2000 (32)
Ground Floor Stud			73.7000			9.0000	663.3000 (32c)
First Floor Stud			98.1700			9.0000	883.5300 (32c)
Internal Floor 1			42.2900			18.0000	761.2200 (32d)
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15756.5992 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 183.2163 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3083 (36)
Total fabric heat loss (33) + (36) = 53.4079 (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	43.3706	42.1768	41.8935	41.0804	41.0804	40.3220	40.3220	40.0814	40.3220	41.6164	41.3453	42.1768 (38)
Heat transfer coeff	96.7785	95.5847	95.3014	94.4883	94.4883	93.7299	93.7299	93.4893	93.7299	95.0243	94.7532	95.5847 (39)
Average = Sum(39)m / 12 =												94.7235 (39)
HLP	1.1253	1.1114	1.1082	1.0987	1.0987	1.0899	1.0899	1.0871	1.0899	1.1049	1.1018	1.1114 (40)
HLP (average)												1.1014 (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												2.5669 (42)
Average daily hot water use (litres/day)												95.1643 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.6808	100.8742	97.0676	93.2610	89.4545	85.6479	85.6479	89.4545	93.2610	97.0676	100.8742	104.6808 (44)
Energy conte	155.2385	135.7726	140.1052	122.1471	117.2030	101.1373	93.7186	107.5434	108.8279	126.8284	138.4431	150.3402 (45)
Energy content (annual)										Total = Sum(45)m =		1497.3054 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	23.2858	20.3659	21.0158	18.3221	17.5805	15.1706	14.0578	16.1315	16.3242	19.0243	20.7665	22.5510 (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)
Combi loss	0.6707	0.6073	0.6120	0.5126	0.4718	0.3898	0.3612	0.4329	0.4567	0.5540	0.6193	0.6496 (61)
Total heat required for water heating calculated for each month	155.9093	136.3799	140.7172	122.6597	117.6748	101.5271	94.0798	107.9764	109.2846	127.3824	139.0624	150.9898 (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	155.9093	136.3799	140.7172	122.6597	117.6748	101.5271	94.0798	107.9764	109.2846	127.3824	139.0624	150.9898 (64)
Heat gains from water heating, kWh/month	51.7845	45.2962	46.7380	40.7421	39.0880	33.7256	31.2517	35.8664	36.2994	42.3089	46.1871	50.1505 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1503.6433 (64)												

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	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.1030	48.9420	39.8023	30.1329	22.5247	19.0163	20.5478	26.7088	35.8485	45.5179	53.1261	56.6345	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	345.5573	349.1431	340.1070	320.8702	296.5872	273.7646	258.5177	254.9319	263.9680	283.2048	307.4878	330.3104	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	(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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)	69.6028	67.4051	62.8198	56.5862	52.5376	46.8411	42.0050	48.2076	50.4159	56.8668	64.1488	67.4066	(72)
Total internal gains	577.5700	572.7970	550.0360	514.8961	478.9563	446.9288	428.3773	437.1550	457.5392	492.8963	532.0695	561.6583	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				7.0000	15.0428	0.6300	0.7000	0.7700	32.1810 (75)			
Southeast				1.4400	46.3896	0.6300	0.7000	0.7700	20.4153 (77)			
Southwest				3.8600	46.3896	0.6300	0.7000	0.7700	54.7242 (79)			
Solar gains	107.3205	165.6794	250.3713	358.0341	419.3285	467.5493	433.0855	377.6096	302.2664	200.8092	129.3650	86.4572 (83)
Total gains	684.8905	738.4764	800.4073	872.9302	898.2848	914.4781	861.4628	814.7647	759.8056	693.7056	661.4345	648.1155 (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	45.2253	45.7901	45.9262	46.3214	46.3214	46.6962	46.6962	46.8164	46.6962	46.0602	46.1919	45.7901	
alpha	4.0150	4.0527	4.0617	4.0881	4.0881	4.1131	4.1131	4.1211	4.1131	4.0707	4.0795	4.0527	
util living area	0.9767	0.9679	0.9421	0.8778	0.7509	0.5475	0.3968	0.4173	0.6691	0.8834	0.9578	0.9800	(86)
MIT	19.8293	19.9557	20.2290	20.5644	20.8330	20.9660	20.9930	20.9917	20.9242	20.6343	20.2155	19.8177	(87)
Th 2	19.9802	19.9915	19.9942	20.0019	20.0019	20.0091	20.0091	20.0114	20.0091	19.9968	19.9994	19.9915	(88)
util rest of house	0.9710	0.9602	0.9279	0.8480	0.6925	0.4608	0.2934	0.3094	0.5823	0.8463	0.9457	0.9750	(89)
MIT 2	18.9415	19.0739	19.3412	19.6620	19.8936	19.9941	20.0074	20.0094	19.9711	19.7285	19.3364	18.9393	(90)
Living area fraction									fLA = Living area / (4) =			0.2112	(91)
MIT	19.1289	19.2601	19.5287	19.8526	20.0920	20.1994	20.2156	20.2168	20.1724	19.9198	19.5220	19.1248	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1289	19.2601	19.5287	19.8526	20.0920	20.1994	20.2156	20.2168	20.1724	19.9198	19.5220	19.1248	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	660.8260	703.9610	736.3439	735.8111	627.2258	437.1554	271.6119	270.6905	454.0720	584.8070	620.7887	628.2822	(94)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W	1328.6659	1296.1340	1165.4110	968.7459	707.9025	449.8440	273.2761	272.6918	484.8045	771.5751	1053.8497	1302.3186	(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	496.8729	397.9403	319.2259	167.7130	60.0234	0.0000	0.0000	0.0000	0.0000	138.9554	311.8039	501.4830	(98)
Space heating												2394.0179	(98)
Space heating per m2												(98) / (4) =	27.8374 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2654.1219 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	496.8729	397.9403	319.2259	167.7130	60.0234	0.0000	0.0000	0.0000	0.0000	138.9554	311.8039	501.4830	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	550.8569	441.1754	353.9090	185.9346	66.5448	0.0000	0.0000	0.0000	0.0000	154.0526	345.6806	555.9679	(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	155.9093	136.3799	140.7172	122.6597	117.6748	101.5271	94.0798	107.9764	109.2846	127.3824	139.0624	150.9898	(64)
Efficiency of water heater (217)m	86.4696	86.2247	85.4764	83.8055	80.5634	76.4000	76.4000	76.4000	76.4000	83.0273	85.4400	76.4000	(216)
Fuel for water heating, kWh/month	180.3053	158.1680	164.6270	146.3623	146.0649	132.8889	123.1411	141.3303	143.0426	153.4223	162.7603	174.3915	(219)
Water heating fuel used												1826.5044	(219)
Annual totals kWh/year													
Space heating fuel - main system												2654.1219	(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)												389.2545	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.82 * 1182 * 1.00) =										-775.1995		-775.1995	(233)
Total delivered energy for all uses												4169.6813	(238)

10a. Fuel costs - using BEDF prices (536)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2654.1219	7.6100	201.9787 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1826.5044	7.6100	138.9970 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	389.2545	31.0800	120.9803 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-775.1995	31.0800	-240.9320 (252)
Total energy cost			349.3340 (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	2654.1219	0.2160	573.2903 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1826.5044	0.2160	394.5249 (264)
Space and water heating			967.8153 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	389.2545	0.5190	202.0231 (268)
Energy saving/generation technologies			
PV Unit	-775.1995	0.5190	-402.3285 (269)
Total kg/year			806.4348 (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	2654.1219	1.2200	3238.0287 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1826.5044	1.2200	2228.3353 (264)
Space and water heating			5466.3640 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	389.2545	3.0700	1195.0114 (268)
Energy saving/generation technologies			
PV Unit	-775.1995	3.0700	-2379.8625 (269)
Primary energy kWh/year			4511.7630 (272)
Primary energy kWh/m2/year			52.4624 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 88
Current environmental impact rating: B 90

(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	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Already installed
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
N Solar water heating	+ 1.3	-£ 66	-205 kg (25.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£66 2.38 kg/m²	B 89	A 92
Total Savings	£66 2.38 kg/m²		

Potential energy efficiency rating: B 89
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 536 TEST (31 Jan 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£144	£160	-£16
Mains gas	£446	£365	£81
Space heating	£330	£330	£0
Water heating	£139	£73	£66
Lighting	£121	£121	£0
Generated (PV)	-£241	-£241	£0
Total cost of fuels	£349	£284	£65
Total cost of uses	£349	£283	£66
Delivered energy	48 kWh/m²	37 kWh/m²	12 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	9 kg/m²	7 kg/m²	2 kg/m²
Primary energy	52 kWh/m²	39 kWh/m²	13 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.7100 (1b)	x 2.3900 (2b)	= 104.4669 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 214.8438 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1862 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4362 (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) =	0.3708 (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	0.4727	0.4634	0.4542	0.4078	0.3986	0.3522	0.3522	0.3429	0.3708	0.3986	0.4171	0.4356 (22b)
Effective ac	0.6117	0.6074	0.6031	0.5832	0.5794	0.5620	0.5620	0.5588	0.5687	0.5794	0.5870	0.5949 (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
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.3000	1.1450	14.0840		(27)
Ground Floor			43.7100	0.1200	5.2452	90.0000	3933.9000 (28a)
Brick and Block	93.7600	14.4500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	43.7100		43.7100	0.1000	4.3710	9.1000	397.7610 (30)
Total net area of external elements Aum(A, m ²)			181.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.0996		(33)
Party Wall 1			45.5200	0.0000	0.0000	110.0000	5007.2000 (32)
Ground Floor Stud			73.7000			9.0000	663.3000 (32c)
First Floor Stud			98.1700			9.0000	883.5300 (32c)
Internal Floor 1			42.2900			18.0000	761.2200 (32d)
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15756.5992 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 183.2163 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3083 (36)
Total fabric heat loss (33) + (36) = 53.4079 (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	43.3706	43.0630	42.7615	41.3453	41.0804	39.8469	39.8469	39.6185	40.3220	41.0804	41.6164	42.1768 (38)
Heat transfer coeff	96.7785	96.4709	96.1694	94.7532	94.4883	93.2548	93.2548	93.0264	93.7299	94.4883	95.0243	95.5847 (39)
Average = Sum(39)m / 12 =												94.7520 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1253	1.1218	1.1182	1.1018	1.0987	1.0844	1.0844	1.0817	1.0899	1.0987	1.1049	1.1114 (40)
HLP (average)												1.1018 (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												2.5669 (42)
Average daily hot water use (litres/day)												95.1643 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.6808	100.8742	97.0676	93.2610	89.4545	85.6479	85.6479	89.4545	93.2610	97.0676	100.8742	104.6808 (44)
Energy conte	155.2385	135.7726	140.1052	122.1471	117.2030	101.1373	93.7186	107.5434	108.8279	126.8284	138.4431	150.3402 (45)
Energy content (annual)										Total = Sum(45)m =		1497.3054 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.2858	20.3659	21.0158	18.3221	17.5805	15.1706	14.0578	16.1315	16.3242	19.0243	20.7665	22.5510 (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)
Combi loss	0.6707	0.6073	0.6120	0.5126	0.4718	0.3898	0.3612	0.4329	0.4567	0.5540	0.6193	0.6496 (61)
Total heat required for water heating calculated for each month	155.9093	136.3799	140.7172	122.6597	117.6748	101.5271	94.0798	107.9764	109.2846	127.3824	139.0624	150.9898 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2112 (H8)
Utilisation factor												0.5620 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												95.1643 (H14)
Volume ratio Veff/V												0.7881 (H15)
Solar storage volume factor												0.9524 (H16)
Solar input												-853.5746 (H17)
Solar input	-24.7520	-41.3039	-70.3453	-94.2766	-116.4707	-114.5093	-112.9960	-98.7252	-77.3216	-52.8016	-29.3594	-20.7132 (63)
Solar input (sum of months) = Sum (63)m =												-853.5746 (63)
Output from w/h	131.1573	95.0760	70.3719	28.3832	1.2041	0.0000	0.0000	9.2512	31.9630	74.5808	109.7030	130.2767 (64)
Total per year (kWh/year) = Sum (64)m =												681.9670 (64)
Heat gains from water heating, kWh/month	51.7845	45.2962	46.7380	40.7421	39.0880	33.7256	31.2517	35.8664	36.2994	42.3089	46.1871	50.1505 (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	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.1030	48.9420	39.8023	30.1329	22.5247	19.0163	20.5478	26.7088	35.8485	45.5179	53.1261	56.6345 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	345.5573	349.1431	340.1070	320.8702	296.5872	273.7646	258.5177	254.9319	263.9680	283.2048	307.4878	330.3104 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684 (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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768 (71)
Water heating gains (Table 5)	69.6028	67.4051	62.8198	56.5862	52.5376	46.8411	42.0050	48.2076	50.4159	56.8668	64.1488	67.4066 (72)
Total internal gains	577.5700	572.7970	550.0360	514.8961	478.9563	446.9288	428.3773	437.1550	457.5392	492.8963	532.0695	561.6583 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				7.0000	11.2829	0.6300	0.7000	0.7700	24.1375 (75)			
Southeast				1.4400	36.7938	0.6300	0.7000	0.7700	16.1923 (77)			
Southwest				3.8600	36.7938	0.6300	0.7000	0.7700	43.4044 (79)			
Solar gains	83.7343	150.6479	227.4190	317.4784	388.1832	399.7073	379.3965	324.4565	258.2614	172.2400	101.7544	70.7143 (83)
Total gains	661.3042	723.4450	777.4550	832.3745	867.1395	846.6361	807.7738	761.6116	715.8006	665.1363	633.8239	632.3727 (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	45.2253	45.3695	45.5117	46.1919	46.3214	46.9341	46.9341	47.0494	46.6962	46.3214	46.0602	45.7901
alpha	4.0150	4.0246	4.0341	4.0795	4.0881	4.1289	4.1289	4.1366	4.1131	4.0881	4.0707	4.0527
util living area	0.9835	0.9748	0.9558	0.9076	0.8088	0.6460	0.4922	0.5380	0.7616	0.9240	0.9732	0.9860 (86)
MIT	19.6552	19.8183	20.0915	20.4526	20.7514	20.9299	20.9821	20.9744	20.8574	20.4843	20.0151	19.6279 (87)
Th 2	19.9802	19.9831	19.9860	19.9994	20.0019	20.0136	20.0136	20.0158	20.0091	20.0019	19.9968	19.9915 (88)
util rest of house	0.9796	0.9689	0.9450	0.8845	0.7613	0.5657	0.3889	0.4331	0.6903	0.9001	0.9658	0.9827 (89)
MIT 2	18.7693	18.9322	19.2018	19.5577	19.8277	19.9772	20.0078	20.0067	19.9253	19.5961	19.1388	18.7511 (90)
Living area fraction									fLA = Living area / (4) =			0.2112 (91)
MIT	18.9564	19.1193	19.3897	19.7466	20.0228	20.1784	20.2135	20.2110	20.1221	19.7836	19.3238	18.9362 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9564	19.1193	19.3897	19.7466	20.0228	20.1784	20.2135	20.2110	20.1221	19.7836	19.3238	18.9362 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9745	0.9625	0.9372	0.8776	0.7624	0.5799	0.4105	0.4548	0.6993	0.8938	0.9595	0.9782	(94)
Useful gains	644.4492	696.3187	728.6530	730.5237	661.0786	490.9538	331.6038	346.3500	500.5620	594.5126	608.1749	618.5594	(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	1418.4209	1371.7501	1239.5946	1027.7546	786.4057	520.2082	336.9787	354.5257	564.4507	867.7459	1161.5582	1408.5586	(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	575.8349	453.8899	380.1405	214.0062	93.2434	0.0000	0.0000	0.0000	0.0000	203.2856	398.4360	587.7594	(98)
Space heating												2906.5959	(98)
Space heating per m2											(98) / (4) =	33.7976	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3222.3901 (211)
Space heating requirement	575.8349	453.8899	380.1405	214.0062	93.2434	0.0000	0.0000	0.0000	0.0000	203.2856	398.4360	587.7594	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	638.3979	503.2039	421.4418	237.2574	103.3740	0.0000	0.0000	0.0000	0.0000	225.3720	441.7251	651.6180	(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	131.1573	95.0760	70.3719	28.3832	1.2041	0.0000	0.0000	9.2512	31.9630	74.5808	109.7030	130.2767	(64)
Efficiency of water heater	87.2755	87.4638	87.7249	88.3317	89.9928	76.4000	76.4000	76.4000	76.4000	86.0292	86.8146	87.3377	(216)
(217)m	87.2755	87.4638	87.7249	88.3317	89.9928	76.4000	76.4000	76.4000	76.4000	86.0292	86.8146	87.3377	(217)
Fuel for water heating, kWh/month	150.2797	108.7032	80.2189	32.1325	1.3380	0.0000	0.0000	12.1089	41.8364	86.6925	126.3647	149.1642	(219)
Water heating fuel used	150.2797	108.7032	80.2189	32.1325	1.3380	0.0000	0.0000	12.1089	41.8364	86.6925	126.3647	149.1642	(219)
Annual totals kWh/year												788.8388	(219)
Space heating fuel - main system												3222.3901	(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)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													125.0000 (231)
Electricity for lighting (calculated in Appendix L)													389.2545 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.82 * 1029 * 1.00) =										-675.1465		-675.1465	(233)
Total delivered energy for all uses												3850.3370	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3222.3901	3.4800	112.1392	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	788.8388	3.4800	27.4516	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	389.2545	13.1900	51.3427	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-675.1465	13.1900	-89.0518	(252)
Total energy cost			238.3691	(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] =	0.7642 (257)
SAP value			89.3389
SAP rating (Section 12)			89 (258)
SAP band			B

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

Energy	Emission factor	Emissions
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	3222.3901	0.2160	696.0363	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	788.8388	0.2160	170.3892	(264)
Space and water heating			866.4255	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	389.2545	0.5190	202.0231	(268)
Energy saving/generation technologies				
PV Unit	-675.1465	0.5190	-350.4010	(269)
Total kg/year			782.9225	(272)
CO2 emissions per m2			9.1000	(273)
EI value			91.9915	
EI rating			92	(274)
EI band			A	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.7100 (1b)	x 2.3900 (2b)	= 104.4669 (1b) - (3b)
First floor	42.2900 (1c)	x 2.6100 (2c)	= 110.3769 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	86.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 214.8438 (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					4 * 10 = 40.0000 (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) =				40.0000 / (5) =	0.1862 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4362 (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) =		0.3708 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.4727	0.4356	0.4264	0.3986	0.3986	0.3708	0.3708	0.3615	0.3708	0.4171	0.4078	0.4356 (22b)
Effective ac	0.6117	0.5949	0.5909	0.5794	0.5794	0.5687	0.5687	0.5653	0.5687	0.5870	0.5832	0.5949 (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
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.3000	1.1450	14.0840		(27)
Ground Floor			43.7100	0.1200	5.2452	90.0000	3933.9000 (28a)
Brick and Block	93.7600	14.4500	79.3100	0.2400	19.0344	42.2200	3348.4682 (29a)
Pitched Roof	43.7100		43.7100	0.1000	4.3710	9.1000	397.7610 (30)
Total net area of external elements Aum(A, m ²)			181.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.0996		(33)
Party Wall 1			45.5200	0.0000	0.0000	110.0000	5007.2000 (32)
Ground Floor Stud			73.7000			9.0000	663.3000 (32c)
First Floor Stud			98.1700			9.0000	883.5300 (32c)
Internal Floor 1			42.2900			18.0000	761.2200 (32d)
Internal Ceiling 1			42.2900			18.0000	761.2200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15756.5992 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 183.2163 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3083 (36)
Total fabric heat loss (33) + (36) = 53.4079 (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	43.3706	42.1768	41.8935	41.0804	41.0804	40.3220	40.3220	40.0814	40.3220	41.6164	41.3453	42.1768 (38)
Heat transfer coeff	96.7785	95.5847	95.3014	94.4883	94.4883	93.7299	93.7299	93.4893	93.7299	95.0243	94.7532	95.5847 (39)
Average = Sum(39)m / 12 =												94.7235 (39)
HLP	1.1253	1.1114	1.1082	1.0987	1.0987	1.0899	1.0899	1.0871	1.0899	1.1049	1.1018	1.1114 (40)
HLP (average)												1.1014 (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												2.5669 (42)
Average daily hot water use (litres/day)												95.1643 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.6808	100.8742	97.0676	93.2610	89.4545	85.6479	85.6479	89.4545	93.2610	97.0676	100.8742	104.6808 (44)
Energy conte	155.2385	135.7726	140.1052	122.1471	117.2030	101.1373	93.7186	107.5434	108.8279	126.8284	138.4431	150.3402 (45)
Energy content (annual)										Total = Sum(45)m =		1497.3054 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	23.2858	20.3659	21.0158	18.3221	17.5805	15.1706	14.0578	16.1315	16.3242	19.0243	20.7665	22.5510 (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)
Combi loss	0.6707	0.6073	0.6120	0.5126	0.4718	0.3898	0.3612	0.4329	0.4567	0.5540	0.6193	0.6496 (61)
Total heat required for water heating calculated for each month	155.9093	136.3799	140.7172	122.6597	117.6748	101.5271	94.0798	107.9764	109.2846	127.3824	139.0624	150.9898 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1234.4649 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2073.9010 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3851 (H8)
Utilisation factor												0.5142 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												95.1643 (H14)
Volume ratio Veff/V												0.7881 (H15)
Solar storage volume factor												0.9524 (H16)
Solar input												-893.0374 (H17)
Solar input	-29.3066	-41.8360	-70.9049	-96.7542	-114.1911	-121.5209	-117.0344	-104.4101	-82.6345	-56.5796	-34.4557	-23.4094 (63)
Solar input (sum of months) = Sum (63)m =												-893.0374 (63)
Output from w/h	126.6027	94.5439	69.8122	25.9055	3.4838	0.0000	0.0000	3.5663	26.6501	70.8027	104.6066	127.5804 (64)
Total per year (kWh/year) = Sum (64)m =												653.5543 (64)
Heat gains from water heating, kWh/month	51.7845	45.2962	46.7380	40.7421	39.0880	33.7256	31.2517	35.8664	36.2994	42.3089	46.1871	50.1505 (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	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	154.0151	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.1030	48.9420	39.8023	30.1329	22.5247	19.0163	20.5478	26.7088	35.8485	45.5179	53.1261	56.6345	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	345.5573	349.1431	340.1070	320.8702	296.5872	273.7646	258.5177	254.9319	263.9680	283.2048	307.4878	330.3104	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	52.9684	(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)	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	-102.6768	(71)
Water heating gains (Table 5)	69.6028	67.4051	62.8198	56.5862	52.5376	46.8411	42.0050	48.2076	50.4159	56.8668	64.1488	67.4066	(72)
Total internal gains	577.5700	572.7970	550.0360	514.8961	478.9563	446.9288	428.3773	437.1550	457.5392	492.8963	532.0695	561.6583	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				7.0000	15.0428	0.6300	0.7000	0.7700	32.1810 (75)			
Southeast				1.4400	46.3896	0.6300	0.7000	0.7700	20.4153 (77)			
Southwest				3.8600	46.3896	0.6300	0.7000	0.7700	54.7242 (79)			
Solar gains	107.3205	165.6794	250.3713	358.0341	419.3285	467.5493	433.0855	377.6096	302.2664	200.8092	129.3650	86.4572 (83)
Total gains	684.8905	738.4764	800.4073	872.9302	898.2848	914.4781	861.4628	814.7647	759.8056	693.7056	661.4345	648.1155 (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	45.2253	45.7901	45.9262	46.3214	46.3214	46.6962	46.6962	46.8164	46.6962	46.0602	46.1919	45.7901	
alpha	4.0150	4.0527	4.0617	4.0881	4.0881	4.1131	4.1131	4.1211	4.1131	4.0707	4.0795	4.0527	
util living area	0.9767	0.9679	0.9421	0.8778	0.7509	0.5475	0.3968	0.4173	0.6691	0.8834	0.9578	0.9800 (86)	
MIT	19.8293	19.9557	20.2290	20.5644	20.8330	20.9660	20.9930	20.9917	20.9242	20.6343	20.2155	19.8177 (87)	
Th 2	19.9802	19.9915	19.9942	20.0019	20.0019	20.0091	20.0091	20.0114	20.0091	19.9968	19.9994	19.9915 (88)	
util rest of house	0.9710	0.9602	0.9279	0.8480	0.6925	0.4608	0.2934	0.3094	0.5823	0.8463	0.9457	0.9750 (89)	
MIT 2	18.9415	19.0739	19.3412	19.6620	19.8936	19.9941	20.0074	20.0094	19.9711	19.7285	19.3364	18.9393 (90)	
Living area fraction									fLA = Living area / (4) =			0.2112 (91)	
MIT	19.1289	19.2601	19.5287	19.8526	20.0920	20.1994	20.2156	20.2168	20.1724	19.9198	19.5220	19.1248 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.1289	19.2601	19.5287	19.8526	20.0920	20.1994	20.2156	20.2168	20.1724	19.9198	19.5220	19.1248 (93)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9649	0.9533	0.9200	0.8429	0.6982	0.4780	0.3153	0.3322	0.5976	0.8430	0.9385	0.9694	(94)
Useful gains	660.8260	703.9610	736.3439	735.8111	627.2258	437.1554	271.6119	270.6905	454.0720	584.8070	620.7887	628.2822	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W	1328.6659	1296.1340	1165.4110	968.7459	707.9025	449.8440	273.2761	272.6918	484.8045	771.5751	1053.8497	1302.3186	(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	496.8729	397.9403	319.2259	167.7130	60.0234	0.0000	0.0000	0.0000	0.0000	138.9554	311.8039	501.4830	(98)
Space heating												2394.0179	(98)
Space heating per m2											(98) / (4) =	27.8374	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.2000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2654.1219	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	496.8729	397.9403	319.2259	167.7130	60.0234	0.0000	0.0000	0.0000	0.0000	138.9554	311.8039	501.4830	(98)	
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)	
Space heating fuel (main heating system)	550.8569	441.1754	353.9090	185.9346	66.5448	0.0000	0.0000	0.0000	0.0000	154.0526	345.6806	555.9679	(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														
Water heating requirement	126.6027	94.5439	69.8122	25.9055	3.4838	0.0000	0.0000	3.5663	26.6501	70.8027	104.6066	127.5804	(64)	
Efficiency of water heater	87.0087	87.1771	87.3681	88.0715	89.3150	76.4000	76.4000	76.4000	76.4000	85.0165	86.2848	87.0125	(217)	
Fuel for water heating, kWh/month	145.5059	108.4504	79.9059	29.4142	3.9005	0.0000	0.0000	4.6679	34.8823	83.2811	121.2342	146.6232	(219)	
Water heating fuel used												757.8656	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2654.1219	(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)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													389.2545	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.82 * 1182 * 1.00) =									-775.1995				-775.1995	(233)
Total delivered energy for all uses													3151.0425	(238)

10a. Fuel costs - using BEDF prices (536)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2654.1219	7.6100	201.9787	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	757.8656	7.6100	57.6736	(247)
Pumps and fans for heating	75.0000	31.0800	23.3100	(249)
Pump for solar water heating	50.0000	31.0800	15.5400	(249)
Energy for lighting	389.2545	31.0800	120.9803	(250)
Additional standing charges			105.0000	(251)
Energy saving/generation technologies				
PV Unit	-775.1995	31.0800	-240.9320	(252)
Total energy cost			283.5505	(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	2654.1219	0.2160	573.2903	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	757.8656	0.2160	163.6990	(264)
Space and water heating			736.9893	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	389.2545	0.5190	202.0231	(268)
Energy saving/generation technologies				
PV Unit	-775.1995	0.5190	-402.3285	(269)
Total kg/year			601.5588	(272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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	2654.1219	1.2200	3238.0287 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	757.8656	1.2200	924.5960 (264)
Space and water heating			4162.6247 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	389.2545	3.0700	1195.0114 (268)
Energy saving/generation technologies			
PV Unit	-775.1995	3.0700	-2379.8625 (269)
Primary energy kWh/year			3361.5236 (272)
Primary energy kWh/m2/year			39.0875 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 53	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block H
Project	Plot 53		
Calculation Type	New Build (As Designed)		

SAP Rating	88 B	DER	13.31	TER	18.16
Environmental	90 B	% DER<TER	26.72		
CO ₂ Emissions (t/year)	0.81	DFEE	43.68	TFEE	51.92
General Requirements Compliance	Pass	% DFEE<TFEE	15.88		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
Client	Foreman Homes, FORE		

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Mineral wool batt						
	Main construction	350	0.0380	9.2105	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Mineral wool batt						
	Main construction	100	0.0380	2.6316	87.50		
	Main construction	100	0.1300	0.7692	12.50		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance: Upper limit = 11.772 m² K/W Lower limit = 11.430 m² K/W Average = 11.601 m² K/W
Total correction = 0.0096 m² K/W U-value (unrounded) = 0.1 W/m² K

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 53	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block H
Project	Plot 53		
Calculation Type	New Build (As Designed)		

SAP Rating	88 B	DER	13.31	TER	18.16
Environmental	90 B	% DER<TER	26.72		
CO ₂ Emissions (t/year)	0.81	DFEE	43.68	TFEE	51.92
General Requirements Compliance	Pass	% DFEE<TFEE	15.88		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Wall 000001

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Brick, outer leaf						
	Main construction	102	0.7700	0.1325	82.81		
	Main construction	102	0.9407	0.1084	17.19		
Layer 2	Supafil 34						
	Main construction	100	0.0340	2.9412	100.00		
	Corrections - Air Gap: Level 0, Fasteners: None or plastic						
Layer 3	Supabloc						
	Main construction	100	0.1100	0.9091	94.04	460	1000
	Main construction	100	0.8803	0.1136	5.96	460	1000
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	airspace/plaster dabs						
	Main construction	15	0.0882	0.1700	80.00		
	Main construction	15	0.0882	0.1700	20.00		
	Corrections - Cavity Unventilated, Emissivity: Normal						
Layer 5	Plasterboard, standard						
	Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1300			

Total resistance:	Upper limit = 4.321 m ² K/W	Lower limit = 4.110 m ² K/W	Average = 4.215 m ² K/W
	Total correction = 0.0002 m ² K/W	U-value (unrounded) = 0.24 W/m ² K	

Unheated space: None		
Total thickness: 330 mm	U-value: 0.24 W/m ² K	Kappa: 42.22 kJ/m ² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 53	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block H
Project	Plot 53		
Calculation Type	New Build (As Designed)		

SAP Rating	88 B	DER	13.31	TER	18.16
Environmental	90 B	% DER<TER	26.72		
CO ₂ Emissions (t/year)	0.81	DFEE	43.68	TFEE	51.92
General Requirements Compliance	Pass	% DFEE<TFEE	15.88		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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Building Elements

Floor 000003

Floor Type: Suspended Floor

Area = 43.48 m², Perimeter = 19.02 m, Wall thickness = 275.00 mm, Soil: Unknown

Depth of underfloor space below ground: 0.200 m Floor wind shielding: Average (suburban)

Floor height above ground: h = 0.200 m

U-value of walls above ground: U_w = 1.500 m

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.1700			
Layer 1	EPS 200 Lower portion						
	Main construction	55	0.0340	1.6176	80.65		
	Main construction	55	2.0000	0.0275	19.35		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	EPS Upper portion						
	Main construction	100	0.0340	2.9412	87.10		
	Main construction	100	2.0000	0.0500	12.90		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Grey EPS 100 Topsheet						
	Main construction	155	0.0300	5.1667	100.00	15	1450
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Screed						
	Main construction	75	1.1500	0.0652	100.00	1200	1000
Int surface				0.1700			

Total resistance:	Upper limit = 9.271 m ² K/W	Lower limit = 6.052 m ² K/W	Average = 7.661 m ² K/W
	Total correction = 0.0046 m ² K/W	U-value (unrounded) = 0.12 W/m ² K	

Unheated space: None

Total thickness: 385 mm

U-value: 0.12 W/m² K

Kappa: 90.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 53			Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block H		
Property	Plot 53				
SAP Rating	88 B	DER	13.31	TER	18.16
Environmental	90 B	% DER<TER	26.72		
CO ₂ Emissions (t/year)	0.81	DFEE	43.68	TFEE	51.92
General Requirements Compliance	Pass	% DFEE<TFEE	15.88		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com			Assessor ID	E477-0001
Client	Foreman Homes, FORE				

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South West						
Property Tenure	Unknown						
Transaction Type	New dwelling						
Terrain Type	Suburban						
1.0 Property Type	House, Semi-Detached						
2.0 Number of Storeys	2						
3.0 Date Built	2023						
4.0 Sheltered Sides	2						
5.0 Sunlight/Shade	Average or unknown						
6.0 Measurements							
		Heat Loss Perimeter		Internal Floor Area		Average Storey Height	
Ground Floor:		19.05 m		43.71 m²		2.39 m	
1st Storey:		18.48 m		42.29 m²		2.61 m	
7.0 Living Area	18.16			m²			
8.0 Thermal Mass Parameter	Precise calculation						
Thermal Mass	183.22			kJ/m²K			
9.0 External Walls							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Brick and Block	Cavity Wall	Other		0.24	42.22	93.76	79.31
9.1 Party Walls							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill		0.00	110.00	45.52	
9.2 Internal Walls							
Description	Construction				Kappa (kJ/m²K)	Area (m²)	
Ground Floor Stud	Plasterboard on timber frame				9.00	73.70	
First Floor Stud	Plasterboard on timber frame				9.00	98.17	
10.0 External Roofs							
Description	Type	Construction		U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area (m²)	Nett Area (m²)
Pitched Roof	External Plane Roof	Other		0.10	9.10	43.71	43.71

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.29

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Other	0.12	90.00	43.71

11.2 Internal Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.29

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Front Door	Manufacturer	Solid Door							1.10
Windows	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	South West							2.15	
Windows	Window	[1] Brick and Block	South West	None	0.00					3.86	
Rear Elevation	Window	[1] Brick and Block	North East	None	0.00					7.00	
Side Elevation	Window	[1] Brick and Block	South East	None	0.00					1.44	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	10.45	0.043	No	Catnic Thermally Broken
Independently assessed	E3 Sill	7.84	0.021	No	Knauf P5
Independently assessed	E4 Jamb	26.40	0.016	No	Knauf P6
Table K1 - Approved	E5 Ground floor (normal)	19.05	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	18.48	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	12.01	0.060	No	
Table K1 - Default	E24 Eaves (insulation at ceiling level - inverted)	2.55	0.240	No	
Independently assessed	E12 Gable (insulation at ceiling level)	9.46	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	12.30	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	2.30	-0.091	No	Knauf P24
Independently assessed	E18 Party wall between dwellings	10.00	0.036	No	Knauf P25 Halved
Table K1 - Default	P1 Party wall - Ground floor	9.46	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	9.46	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	9.46	0.035	No	Knauf P29 Halved
Y-value	0.046	W/m ² K			

18.0 Pressure Testing

Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?		
As Built AP ₅₀		m ³ /(h.m ²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	4.00

Mechanical Ventilation

Mechanical Ventilation System Present	No
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20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				4
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	19	
Total number of L.E.L. fittings	19	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17960	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.2	
In Summer	76.4	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	
Combi boiler type	Standard Combi	
Combi keep hot type	None	

25.0 Main Heating 2

None

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.82	South West	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£66	B 89	