



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project:

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
toby@abacusenergyuk.com

Report Issue Date: 29/11/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

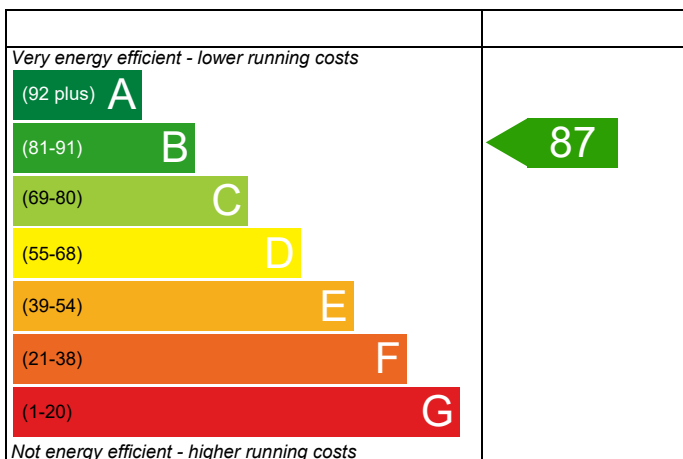
PREDICTED ENERGY ASSESSMENT

Dwelling type: House, Semi-Detached
Date of assessment: 29/11/2023
Produced by: Abacus Energy (UK) Ltd
Total floor area: 84.54 m²
DRRN: 5871-2499-2270

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

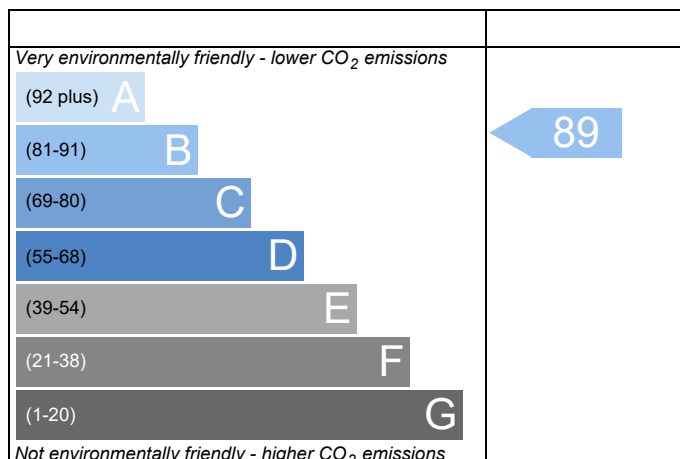


England

EU Directive
2002/91/EC

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



England

EU Directive
2002/91/EC

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 0906 Plot 29				Issued on Date	29/11/2023
Assessment Reference	Rev B	Prop Type Ref	Block F			
Property						
SAP Rating	87 B	DER	14.56	TER	18.03	
Environmental	89 B	% DER<TER	19.25			
CO ₂ Emissions (t/year)	0.91	DFEE	43.40	TFEE	51.25	
General Requirements Compliance	Pass	% DFEE<TFEE	15.32			
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)	18.03	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.56	kgCO ₂ /m ²	Pass
	-3.47 (-19.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.25	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.40	kWh/m ² /yr	
	-7.9 (-15.4%)	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
Worcester Greenstar 32CDi Compact ErP
Combi boiler
Efficiency: 89.8% 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 East

3.73 m², No overhang

Windows facing South

0.72 m², No overhang

Windows facing West

8.50 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

0.70

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	£85	B 88	B 91	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£85	B 88	B 91	

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0906 Plot 29	Issued on Date	29/11/2023
Assessment Reference	Rev B	Prop Type Ref	Block F
Property			

SAP Rating	87 B	DER	14.56	TER	18.03
Environmental	89 B	% DER<TER	19.25		
CO ₂ Emissions (t/year)	0.91	DFEE	43.40	TFEE	51.25
General Requirements Compliance	Pass	% DFEE<TFEE	15.32		

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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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.093	0.46	0.04	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	1.37	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	3.75	0.27	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	3.74	0.24	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	8.83	0.19	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	27.00	0.43	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	18.37	2.94	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.73	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Independently assessed	0.071	9.66	0.69	Knauf P16
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	8.86	0.39	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	10.00	0.39	Knauf P23
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	8.86	1.42	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.86	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.86	0.31	Knauf P29 Halved

Total: **7.87** W/mK:
Y-Value: **0.044** W/m²K:

FULL SAP CALCULATION PRINTOUT

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Client	Foreman Homes, FORE					

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 85 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) 18.03 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.56 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 51.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 43.4 kWh/m²/yr OK

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
Worcester Greenstar 32CDi Compact ErP
Combi boiler
Efficiency: 89.8% 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 East: 3.73 m², No overhang
Windows facing South: 0.72 m², No overhang
Windows facing West: 8.50 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 0.70 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	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (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) = 0.1893 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4393 (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) =	0.3734 (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	0.4760	0.4667	0.4574	0.4107	0.4014	0.3547	0.3547	0.3454	0.3734	0.4014	0.4200	0.4387 (22b)
Effective ac	0.6133	0.6089	0.6046	0.5843	0.5806	0.5629	0.5629	0.5596	0.5697	0.5806	0.5882	0.5962 (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)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			18.0000	760.8600 (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) = 15069.9280 (34)
178.2580 (35)
7.8704 (36)
(33) + (36) = 53.2151 (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	42.7757	42.4688	42.1680	40.7551	40.4908	39.2602	39.2602	39.0323	39.7342	40.4908	41.0255	41.5846 (38)
Heat transfer coeff	95.9907	95.6839	95.3831	93.9702	93.7059	92.4753	92.4753	92.2474	92.9493	93.7059	94.2406	94.7997 (39)
Average = Sum(39)m / 12 =												93.9689 (39)
HLP	1.1354	1.1318	1.1283	1.1115	1.1084	1.0939	1.0939	1.0912	1.0995	1.1084	1.1147	1.1214 (40)
HLP (average)												1.1115 (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												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (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	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (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	25.3185	22.8670	25.2767	24.4141	25.1935	24.3412	25.1280	25.1705	24.3809	25.2423	24.4815	25.3057 (61)
Total heat required for water heating calculated for each month	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (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	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (64)
Heat gains from water heating, kWh/month	57.6433	50.5960	52.6305	46.4789	45.0395	39.5159	37.2604	41.8408	42.0680	48.2333	51.8823	56.0209 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1785.6304 (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	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4560	19.0570	15.4982	11.7331	8.7707	7.4046	8.0009	10.3998	13.9587	17.7237	20.6862	22.0523 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.6671	231.0400	225.0605	212.3308	196.2619	181.1594	171.0700	168.6972	174.6767	187.4063	203.4752	218.5777 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169 (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)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353 (71)
Water heating gains (Table 5)	77.4775	75.2916	70.7399	64.5540	60.5370	54.8833	50.0812	56.2376	58.4277	64.8297	72.0588	75.2970 (72)
Total internal gains	391.7513	389.5394	375.4493	352.7687	329.7203	307.5980	293.3028	299.4854	311.2138	334.1105	360.3709	380.0777 (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	
East				3.7300	19.6403	0.6300	0.7000		0.7700		22.3887 (76)	
South				0.7200	46.7521	0.6300	0.7000		0.7700		10.2874 (78)	
West				8.5000	19.6403	0.6300	0.7000		0.7700		51.0197 (80)	
Solar gains	83.6958	160.4504	257.9541	369.1665	447.9770	457.0344	435.7240	376.9460	297.4697	188.5685	103.7257	69.2567 (83)
Total gains	475.4471	549.9898	633.4034	721.9352	777.6973	764.6324	729.0268	676.4314	608.6835	522.6790	464.0966	449.3345 (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	43.6093	43.7492	43.8872	44.5470	44.6727	45.2671	45.2671	45.3790	45.0363	44.6727	44.4192	44.1572
alpha	3.9073	3.9166	3.9258	3.9698	3.9782	4.0178	4.0178	4.0253	4.0024	3.9782	3.9613	3.9438
util living area	0.9939	0.9885	0.9742	0.9328	0.8419	0.6876	0.5331	0.5877	0.8204	0.9593	0.9893	0.9951 (86)
MIT	19.3700	19.5615	19.8937	20.3278	20.6855	20.9038	20.9734	20.9610	20.7936	20.3134	19.7673	19.3429 (87)
Th 2	19.9720	19.9749	19.9778	19.9914	19.9940	20.0058	20.0058	20.0081	20.0013	19.9940	19.9888	19.9834 (88)
util rest of house	0.9924	0.9857	0.9675	0.9147	0.7989	0.6072	0.4235	0.4772	0.7565	0.9448	0.9862	0.9939 (89)
MIT 2	18.4833	18.6757	19.0062	19.4377	19.7677	19.9540	19.9968	19.9935	19.8732	19.4332	18.8921	18.4649 (90)
Living area fraction									fLA = Living area / (4) =			0.2126 (91)
MIT	18.6717	18.8640	19.1948	19.6269	19.9628	20.1559	20.2044	20.1991	20.0688	19.6203	19.0781	18.6516 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6717	18.8640	19.1948	19.6269	19.9628	20.1559	20.2044	20.1991	20.0688	19.6203	19.0781	18.6516 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9897	0.9816	0.9609	0.9068	0.7974	0.6203	0.4463	0.4997	0.7614	0.9379	0.9824	0.9917 (94)
Useful gains	470.5688	539.8569	608.6554	654.6793	620.1014	474.2954	325.3626	338.0342	463.4573	490.2425	455.9155	445.5993 (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	1379.5545	1336.1325	1210.8733	1008.0055	774.2721	513.7833	333.3156	350.4587	554.7980	845.2555	1128.8232	1370.0026 (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	676.2854	535.0972	448.0501	254.3949	114.7030	0.0000	0.0000	0.0000	0.0000	264.1297	484.4936	687.7560 (98)
Space heating												3464.9098 (98)
Space heating per m2										(98) / (4) =		40.9854 (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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3820.1872 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	676.2854	535.0972	448.0501	254.3949	114.7030	0.0000	0.0000	0.0000	0.0000	264.1297	484.4936	687.7560	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	745.6288	589.9638	493.9913	280.4795	126.4642	0.0000	0.0000	0.0000	0.0000	291.2125	534.1715	758.2756	(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	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629	(64)
Efficiency of water heater (217)m	89.9423	89.8783	89.7325	89.3926	88.7317	87.2000	87.2000	87.2000	87.2000	89.3931	89.7964	87.2000	(216)
Fuel for water heating, kWh/month	199.7338	175.6177	183.3882	163.1497	159.7041	143.2162	135.6606	151.4705	152.0293	169.2812	180.5322	194.2494	(219)
Water heating fuel used												2008.0328	(219)
Annual totals kWh/year													
Space heating fuel - main system												3820.1872	(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)												378.9191	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.70 * 908 * 1.00) =										-508.3984		-508.3984	(233)
Total delivered energy for all uses												5773.7408	(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	3820.1872	0.2160	825.1604 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2008.0328	0.2160	433.7351 (264)
Space and water heating			1258.8955 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.9191	0.5190	196.6590 (268)
Energy saving/generation technologies			
PV Unit	-508.3984	0.5190	-263.8588 (269)
Total CO2, kg/year			1230.6208 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.5600 (273)

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

DER			14.5600 ZC1
Total Floor Area		TFA	84.5400
Assumed number of occupants		N	2.5434
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.0283 ZC2
CO2 emissions from cooking, equation (L16)			2.1297 ZC3
Total CO2 emissions			32.7180 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			32.7180 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	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (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) =	0.1419 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3919 (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) =					0.3332 (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	0.4248	0.4164	0.4081	0.3665	0.3581	0.3165	0.3165	0.3082	0.3332	0.3581	0.3748	0.3915	(22b)				
Effective ac	0.5902	0.5867	0.5833	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(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)			12.9500	1.3258	17.1686		(27)					
Ground Floor			42.2700	0.1300	5.4951		(28a)					
Brick and Block	93.6500	15.1000	78.5500	0.1800	14.1390		(29a)					
Pitched Roof	42.2700		42.2700	0.1300	5.4951		(30)					
Total net area of external elements Aum(A, m2)			178.1900				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.4478		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.6594 (36)					
Total fabric heat loss						(33) + (36) =	54.1072 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.1648	Feb 40.9205	Mar 40.6810	Apr 39.5561	May 39.3457	Jun 38.3659	Jul 38.3659	Aug 38.1845	Sep 38.7433	Oct 39.3457	Nov 39.7714	Dec 40.2165 (38)
Heat transfer coeff	95.2720	95.0277	94.7882	93.6633	93.4528	92.4731	92.4731	92.2917	92.8505	93.4528	93.8786	94.3237 (39)
Average = Sum(39)m / 12 =												93.6623 (39)
HLP	Jan 1.1269	Feb 1.1241	Mar 1.1212	Apr 1.1079	May 1.1054	Jun 1.0938	Jul 1.0938	Aug 1.0917	Sep 1.0983	Oct 1.1054	Nov 1.1105	Dec 1.1157 (40)
HLP (average)												1.1079 (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												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)											Total = Sum(45)m =	1488.5106 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (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	49.1740	45.7216	45.3173	41.9892	43.3889	45.3173	45.7216	49.1740	49.3151	50.9589 (61)
Solar input	205.2856	181.0025	188.4563	167.1512	161.8319	142.5325	136.5570	152.2290	153.9102	175.2575	186.9450	200.4161 (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	205.2856	181.0025	188.4563	167.1512	161.8319	142.5325	136.5570	152.2290	153.9102	175.2575	186.9450	200.4161 (64)
Heat gains from water heating, kWh/month	64.0534	56.3861	58.6049	51.8058	50.0704	43.9279	41.8256	46.8775	47.4031	54.2162	58.0907	62.4342 (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	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4560	19.0570	15.4982	11.7331	8.7707	7.4046	8.0009	10.3998	13.9587	17.7237	20.6862	22.0523	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.6671	231.0400	225.0605	212.3308	196.2619	181.1594	171.0700	168.6972	174.6767	187.4063	203.4752	218.5777	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	(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)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	(71)
Water heating gains (Table 5)	86.0932	83.9079	78.7700	71.9524	67.2990	61.0110	56.2172	63.0074	65.8377	72.8713	80.6815	83.9170	(72)
Total internal gains	400.3671	398.1556	383.4794	360.1671	336.4823	313.7257	299.4389	306.2551	318.6237	342.1521	368.9937	388.6978	(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			
East				3.7300	19.6403	0.6300	0.7000	0.7700	22.3887 (76)			
South				0.7200	46.7521	0.6300	0.7000	0.7700	10.2874 (78)			
West				8.5000	19.6403	0.6300	0.7000	0.7700	51.0197 (80)			
Solar gains	83.6958	160.4504	257.9541	369.1665	447.9770	457.0344	435.7240	376.9460	297.4697	188.5685	103.7257	69.2567 (83)
Total gains	484.0628	558.6060	641.4335	729.3336	784.4593	770.7601	735.1628	683.2011	616.0935	530.7206	472.7194	457.9545 (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	61.6218	61.7803	61.9364	62.6802	62.8214	63.4869	63.4869	63.6117	63.2289	62.8214	62.5364	62.2413	
alpha	5.1081	5.1187	5.1291	5.1787	5.1881	5.2325	5.2325	5.2408	5.2153	5.1881	5.1691	5.1494	
util living area	0.9984	0.9963	0.9892	0.9611	0.8781	0.7124	0.5420	0.6009	0.8551	0.9799	0.9966	0.9988	(86)
MIT	19.7642	19.9135	20.1737	20.5160	20.7981	20.9520	20.9905	20.9843	20.8723	20.4939	20.0670	19.7399	(87)
Th 2	19.9789	19.9812	19.9835	19.9944	19.9964	20.0059	20.0059	20.0076	20.0022	19.9964	19.9923	19.9880	(88)
util rest of house	0.9979	0.9951	0.9853	0.9463	0.8334	0.6232	0.4255	0.4815	0.7863	0.9696	0.9953	0.9984	(89)
MIT 2	18.3274	18.5471	18.9268	19.4222	19.7971	19.9737	20.0023	20.0011	19.8978	19.4001	18.7798	18.2984	(90)
Living area fraction	18.6328	18.8375	19.1918	19.6547	20.0099	20.1817	20.2124	20.2101	20.1049	19.6326	19.0534	18.6048	(91)
MIT	18.6328	18.8375	19.1918	19.6547	20.0099	20.1817	20.2124	20.2101	20.1049	19.6326	19.0534	18.6048	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6328	18.8375	19.1918	19.6547	20.0099	20.1817	20.2124	20.2101	20.1049	19.6326	19.0534	18.6048	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	482.4964	554.6951	629.2797	685.5817	654.3467	493.3635	331.0887	346.2990	489.4798	511.9160	469.5685	456.8305	(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	1365.5157	1324.4491	1203.0328	1007.3197	776.5790	516.1559	334.0494	351.6363	557.5581	844.1212	1122.1696	1358.7126	(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	656.9664	517.2746	426.8723	231.6514	90.9408	0.0000	0.0000	0.0000	0.0000	247.1607	469.8728	671.0003	(98)
Space heating												3311.7393	(98)
Space heating per m2												39.1736	(99)

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												3545.7594 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	656.9664	517.2746	426.8723	231.6514	90.9408	0.0000	0.0000	0.0000	0.0000	247.1607	469.8728	671.0003 (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)	703.3901	553.8272	457.0368	248.0207	97.3671	0.0000	0.0000	0.0000	0.0000	264.6261	503.0758	718.4157 (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	205.2856	181.0025	188.4563	167.1512	161.8319	142.5325	136.5570	152.2290	153.9102	175.2575	186.9450	200.4161 (64)
Efficiency of water heater (217)m	87.7716	87.5457	87.0468	85.8730	83.6629	80.3000	80.3000	80.3000	80.3000	85.9165	87.2756	80.3000 (216)
Fuel for water heating, kWh/month	233.8860	206.7520	216.5000	194.6494	193.4333	177.5000	170.0585	189.5754	191.6690	203.9858	214.2008	228.1124 (219)
Water heating fuel used												2420.3226 (219)
Annual totals kWh/year												
Space heating fuel - main system												3545.7594 (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)												378.9191 (232)
Total delivered energy for all uses												6420.0011 (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	3545.7594	0.2160	765.8840 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2420.3226	0.2160	522.7897 (264)
Space and water heating			1288.6737 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.9191	0.5190	196.6590 (268)
Total CO2, kg/m2/year			1524.2577 (272)
Emissions per m2 for space and water heating			15.2434 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3262 (272b)
Emissions per m2 for pumps and fans			0.4604 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.2434 * 1.00) + 2.3262 + 0.4604, rounded to 2 d.p.			18.0300 (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	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (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					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) = 0.1419 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3919 (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) =	0.3332 (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	0.4248	0.4164	0.4081	0.3665	0.3581	0.3165	0.3165	0.3082	0.3332	0.3581	0.3748	0.3915 (22b)
Effective ac	0.5902	0.5867	0.5833	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (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)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			9.0000	380.4300 (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) =	14689.4980 (34)
	173.7580 (35)
	7.8704 (36)
(33) + (36) =	53.2151 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1164	1.1135	1.1107	1.0974	1.0949	1.0833	1.0833	1.0811	1.0878	1.0949	1.0999	1.1052 (40)
HLP (average)												1.0974 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

HLP	Jan 1.1164	Feb 1.1135	Mar 1.1107	Apr 1.0974	May 1.0949	Jun 1.0833	Jul 1.0833	Aug 1.0811	Sep 1.0878	Oct 1.0949	Nov 1.0999	Dec 1.1052 (40)
HLP (average)												1.0974 (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												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)
Daily hot water use	Jan 104.0659	Feb 100.2817	Mar 96.4975	Apr 92.7132	May 88.9290	Jun 85.1448	Jul 85.1448	Aug 88.9290	Sep 92.7132	Oct 96.4975	Nov 100.2817	Dec 104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (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	32.7944	28.6822	29.5975	25.8038	24.7594	21.3654	19.7982	22.7188	22.9901	26.7927	29.2464	31.7596 (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	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4560	19.0570	15.4982	11.7331	8.7707	7.4046	8.0009	10.3998	13.9587	17.7237	20.6862	22.0523	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.6671	231.0400	225.0605	212.3308	196.2619	181.1594	171.0700	168.6972	174.6767	187.4063	203.4752	218.5777	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	(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)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	(71)
Water heating gains (Table 5)	44.0785	42.6819	39.7816	35.8386	33.2787	29.6742	26.6105	30.5360	31.9307	36.0117	40.6199	42.6877	(72)
Total internal gains	355.3524	353.9296	341.4910	321.0533	299.4620	279.3889	266.8322	270.7837	281.7167	302.2925	325.9321	344.4685	(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
East				3.7300	19.6403		0.6300		0.7000		0.7700		22.3887 (76)
South				0.7200	46.7521		0.6300		0.7000		0.7700		10.2874 (78)
West				8.5000	19.6403		0.6300		0.7000		0.7700		51.0197 (80)
Solar gains	83.6958	160.4504	257.9541	369.1665	447.9770	457.0344	435.7240	376.9460	297.4697	188.5685	103.7257	69.2567	(83)
Total gains	439.0481	514.3800	599.4451	690.2198	747.4390	736.4233	702.5561	647.7297	579.1865	490.8611	429.6578	413.7252	(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	43.2339	43.3462	43.4567	43.9836	44.0837	44.5553	44.5553	44.6437	44.3724	44.0837	43.8818	43.6728	
alpha	3.8823	3.8897	3.8971	3.9322	3.9389	3.9704	3.9704	3.9762	3.9582	3.9389	3.9255	3.9115	
util living area	0.9949	0.9901	0.9767	0.9374	0.8496	0.6992	0.5448	0.6029	0.8330	0.9642	0.9911	0.9960	(86)
MIT	19.3187	19.5139	19.8532	20.2950	20.6651	20.8940	20.9700	20.9554	20.7740	20.2741	19.7159	19.2871	(87)
Th 2	19.9875	19.9898	19.9921	20.0030	20.0050	20.0145	20.0145	20.0163	20.0108	20.0050	20.0009	19.9966	(88)
util rest of house	0.9937	0.9876	0.9707	0.9206	0.8086	0.6201	0.4350	0.4924	0.7722	0.9515	0.9885	0.9950	(89)
MIT 2	18.4464	18.6423	18.9799	19.4180	19.7612	19.9562	20.0039	19.9991	19.8677	19.4065	18.8528	18.4218	(90)
Living area fraction	18.6318	18.8276	19.1656	19.6044	19.9533	20.1556	20.2093	20.2023	20.0604	19.5909	19.0363	18.6057	(91)
Temperature adjustment	18.6318	18.8276	19.1656	19.6044	19.9533	20.1556	20.2093	20.2023	20.0604	19.5909	19.0363	18.6057	(92)
adjusted MIT	18.6318	18.8276	19.1656	19.6044	19.9533	20.1556	20.2093	20.2023	20.0604	19.5909	19.0363	18.6057	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	435.2747	506.0841	578.1078	629.8331	602.5377	465.7003	321.5602	333.3460	449.2881	463.6901	423.2510	410.8769	(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	1352.6339	1311.0833	1189.2457	993.0611	763.9339	508.7846	330.5419	347.5332	548.1081	832.2031	1109.9129	1345.9516	(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	682.5152	540.9595	454.6866	261.5242	120.0788	0.0000	0.0000	0.0000	0.0000	274.1737	494.3965	695.6956	(98)
Space heating												3524.0301	(98)
Space heating per m2												41.6848	(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	860.8615	677.6995	694.6368	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8385	0.8984	0.8717	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	721.8562	608.8350	605.4977	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	956.4402	914.9002	852.5800	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	168.9005	227.7125	183.8292	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												580.4423 (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	42.2251	56.9281	45.9573	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												145.1106 (107)
Space cooling per m2												1.7165 (108)
Energy for space heating												41.6848 (99)
Energy for space cooling												1.7165 (108)
Total												43.4012 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.4 (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	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (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					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) = 0.1419 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3919 (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) =	0.3332 (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	0.4248	0.4164	0.4081	0.3665	0.3581	0.3165	0.3165	0.3082	0.3332	0.3581	0.3748	0.3915 (22b)
Effective ac	0.5902	0.5867	0.5833	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686		(27)
Ground Floor			42.2700	0.1300	5.4951		(28a)
Brick and Block	93.6500	15.1000	78.5500	0.1800	14.1390		(29a)
Pitched Roof	42.2700		42.2700	0.1300	5.4951		(30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.4478		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.6594 (36)
Total fabric heat loss						(33) + (36) =	54.1072 (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	41.1648	40.9205	40.6810	39.5561	39.3457	38.3659	38.3659	38.1845	38.7433	39.3457	39.7714	40.2165 (38)
Heat transfer coeff	95.2720	95.0277	94.7882	93.6633	93.4528	92.4731	92.4731	92.2917	92.8505	93.4528	93.8786	94.3237 (39)
Average = Sum(39)m / 12 =												93.6623 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1269	1.1241	1.1212	1.1079	1.1054	1.0938	1.0938	1.0917	1.0983	1.1054	1.1105	1.1157 (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												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (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)
	32.7944	28.6822	29.5975	25.8038	24.7594	21.3654	19.7982	22.7188	22.9901	26.7927	29.2464	31.7596 (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	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4560	19.0570	15.4982	11.7331	8.7707	7.4046	8.0009	10.3998	13.9587	17.7237	20.6862	22.0523	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.6671	231.0400	225.0605	212.3308	196.2619	181.1594	171.0700	168.6972	174.6767	187.4063	203.4752	218.5777	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	(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)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	(71)
Water heating gains (Table 5)	44.0785	42.6819	39.7816	35.8386	33.2787	29.6742	26.6105	30.5360	31.9307	36.0117	40.6199	42.6877	(72)
Total internal gains	355.3524	353.9296	341.4910	321.0533	299.4620	279.3889	266.8322	270.7837	281.7167	302.2925	325.9321	344.4685	(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

East	3.7300	19.6403	0.6300	0.7000	0.7700	22.3887 (76)
South	0.7200	46.7521	0.6300	0.7000	0.7700	10.2874 (78)
West	8.5000	19.6403	0.6300	0.7000	0.7700	51.0197 (80)

Solar gains	83.6958	160.4504	257.9541	369.1665	447.9770	457.0344	435.7240	376.9460	297.4697	188.5685	103.7257	69.2567	(83)
Total gains	439.0481	514.3800	599.4451	690.2198	747.4390	736.4233	702.5561	647.7297	579.1865	490.8611	429.6578	413.7252	(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	61.6218	61.7803	61.9364	62.6802	62.8214	63.4869	63.4869	63.6117	63.2289	62.8214	62.5364	62.2413	
alpha	5.1081	5.1187	5.1291	5.1787	5.1881	5.2325	5.2325	5.2408	5.2153	5.1881	5.1691	5.1494	
util living area	0.9990	0.9975	0.9920	0.9686	0.8945	0.7361	0.5647	0.6289	0.8783	0.9855	0.9978	0.9993	(86)
MIT	19.7144	19.8650	20.1291	20.4796	20.7754	20.9441	20.9886	20.9807	20.8520	20.4532	20.0196	19.6907	(87)
Th 2	19.9789	19.9812	19.9835	19.9944	19.9964	20.0059	20.0059	20.0076	20.0022	19.9964	19.9923	19.9880	(88)
util rest of house	0.9986	0.9966	0.9890	0.9561	0.8534	0.6473	0.4446	0.5063	0.8150	0.9778	0.9969	0.9990	(89)
MIT 2	18.8016	18.9538	19.2183	19.5699	19.8424	19.9798	20.0029	20.0020	19.9170	19.5505	19.1173	18.7853	(90)
Living area fraction									fLA = Living area / (4) =			0.2126	(91)
MIT	18.9956	19.1475	19.4119	19.7633	20.0407	20.1848	20.2124	20.2100	20.1158	19.7424	19.3091	18.9778	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9956	19.1475	19.4119	19.7633	20.0407	20.1848	20.2124	20.2100	20.1158	19.7424	19.3091	18.9778	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	438.2413	512.1232	591.4832	657.4909	639.4035	489.3833	330.4353	344.9424	476.9706	478.6879	427.9696	413.1659	(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	(95)
Heat loss rate W	1400.0804	1353.9050	1223.8948	1017.4889	779.4647	516.4421	334.0530	351.6324	558.5663	854.3806	1146.1726	1393.8938	(96)
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	715.6083	565.6773	470.5142	259.1986	104.2055	0.0000	0.0000	0.0000	0.0000	279.5154	517.1062	729.6615	(98)
Space heating												3641.4871	(98)
Space heating per m2										(98) / (4) =		43.0741	(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	869.2470	684.3009	701.4166	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8768	0.9341	0.9095	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	762.1856	639.1786	637.9122	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	956.4402	914.9002	852.5800	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	139.8633	205.1369	159.7128	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												504.7131	(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 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.9658	51.2842	39.9282	0.0000	0.0000	0.0000 (107)
Space cooling											126.1783 (107)
Space cooling per m2											1.4925 (108)
Energy for space heating											43.0741 (99)
Energy for space cooling											1.4925 (108)
Total											44.5667 (109)
Target Fabric Energy Efficiency (TFEE)											51.3 (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	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (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) = 0.1893 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4393 (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) =	0.3734 (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	0.4760	0.4387	0.4294	0.4014	0.4014	0.3734	0.3734	0.3640	0.3734	0.4200	0.4107	0.4387 (22b)
Effective ac	0.6133	0.5962	0.5922	0.5806	0.5806	0.5697	0.5697	0.5663	0.5697	0.5882	0.5843	0.5962 (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)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			18.0000	760.8600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15069.9280 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 178.2580 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8704 (36)
Total fabric heat loss (33) + (36) = 53.2151 (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	42.7757	41.5846	41.3020	40.4908	40.4908	39.7342	39.7342	39.4942	39.7342	41.0255	40.7551	41.5846 (38)
Heat transfer coeff	95.9907	94.7997	94.5171	93.7059	93.7059	92.9493	92.9493	92.7093	92.9493	94.2406	93.9702	94.7997 (39)
Average = Sum(39)m / 12 =												93.9406 (39)
HLP	1.1354	1.1214	1.1180	1.1084	1.1084	1.0995	1.0995	1.0966	1.0995	1.1147	1.1115	1.1214 (40)
HLP (average)												1.1112 (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												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (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	25.3185	22.8670	25.2767	24.4141	25.1935	24.3412	25.1280	25.1705	24.3809	25.2423	24.4815	25.3057 (61)
Total heat required for water heating calculated for each month	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (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	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	57.6433	50.5960	52.6305	46.4789	45.0395	39.5159	37.2604	41.8408	42.0680	48.2333	51.8823	56.0209 (65)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Total per year (kWh/year) = Sum(64)m =												1785.6304 (64)
												1786 (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	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6399	47.6425	38.7455	29.3328	21.9266	18.5114	20.0022	25.9996	34.8966	44.3093	51.7155	55.1307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.2942	344.8358	335.9112	316.9117	292.9282	270.3872	255.3284	251.7868	260.7114	279.7109	303.6944	326.2354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	(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)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	(71)
Water heating gains (Table 5)	77.4775	75.2916	70.7399	64.5540	60.5370	54.8833	50.0812	56.2376	58.4277	64.8297	72.0588	75.2970	(72)
Total internal gains	579.0830	574.4413	552.0679	517.4698	482.0632	450.4532	432.0831	440.6954	460.7071	495.5213	534.1400	563.3345	(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
East			3.7300			25.9136			0.6300			0.7000			0.7700			29.5399 (76)
South			0.7200			58.2505			0.6300			0.7000			0.7700			12.8175 (78)
West			8.5000			25.9136			0.6300			0.7000			0.7700			67.3161 (80)
Solar gains	109.6736	179.6597	286.6699	416.2670	481.3718	531.0750	494.3465	437.5067	350.0249	223.1820	134.6892							86.6430 (83)
Total gains	688.7566	754.1010	838.7378	933.7368	963.4350	981.5282	926.4295	878.2021	810.7320	718.7033	668.8291							649.9775 (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	43.6093	44.1572	44.2892	44.6727	44.6727	45.0363	45.0363	45.1529	45.0363	44.4192	44.5470	44.1572	
alpha	3.9073	3.9438	3.9526	3.9782	3.9782	4.0024	4.0024	4.0102	4.0024	3.9613	3.9698	3.9438	
util living area	0.9734	0.9621	0.9284	0.8490	0.7115	0.5098	0.3668	0.3851	0.6311	0.8657	0.9521	0.9772 (86)	
MIT	19.8076	19.9513	20.2526	20.6003	20.8525	20.9707	20.9940	20.9929	20.9331	20.6453	20.2065	19.7932 (87)	
Th 2	19.9720	19.9834	19.9861	19.9940	19.9940	20.0013	20.0013	20.0036	20.0013	19.9888	19.9914	19.9834 (88)	
util rest of house	0.9671	0.9534	0.9118	0.8156	0.6517	0.4267	0.2700	0.2841	0.5452	0.8258	0.9389	0.9717 (89)	
MIT 2	18.9156	19.0646	19.3574	19.6857	19.8996	19.9884	19.9998	20.0019	19.9681	19.7306	19.3226	18.9108 (90)	
Living area fraction									fLA = Living area / (4) =			0.2126 (91)	
MIT	19.1052	19.2531	19.5477	19.8801	20.1022	20.1972	20.2112	20.2125	20.1732	19.9250	19.5105	19.0984 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.1052	19.2531	19.5477	19.8801	20.1022	20.1972	20.2112	20.2125	20.1732	19.9250	19.5105	19.0984 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9603	0.9456	0.9033	0.8114	0.6586	0.4435	0.2906	0.3056	0.5609	0.8229	0.9311	0.9655 (94)	
Ext temp.	661.4368	713.0677	757.6482	757.6199	634.4841	435.3510	269.1968	268.3631	454.7529	591.4266	622.7624	627.5754 (95)	
Heat loss rate W	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)	
Month fracti	1315.5746	1284.8304	1157.6150	963.3090	702.9973	445.8991	270.5897	270.0188	480.8455	765.7072	1044.0517	1289.1244 (97)	
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)	
Space heating	486.6785	384.2246	297.5753	148.0962	50.9738	0.0000	0.0000	0.0000	0.0000	129.6648	303.3282	492.1925 (98)	
RHI space heating demand												2292.7339 (98)	
												2293 (98)	

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	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (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) = 0.1893 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4393 (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) =	0.3734 (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	0.4760	0.4667	0.4574	0.4107	0.4014	0.3547	0.3547	0.3454	0.3734	0.4014	0.4200	0.4387 (22b)
Effective ac	0.6133	0.6089	0.6046	0.5843	0.5806	0.5629	0.5629	0.5596	0.5697	0.5806	0.5882	0.5962 (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)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			18.0000	760.8600 (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) =	15069.9280 (34)
	178.2580 (35)
	7.8704 (36)
(33) + (36) =	53.2151 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	Jan 42.7757 Feb 42.4688 Mar 42.1680 Apr 40.7551 May 40.4908 Jun 39.2602 Jul 39.2602 Aug 39.0323 Sep 39.7342 Oct 40.4908 Nov 41.0255 Dec 41.5846 (38)
Heat transfer coeff	95.9907 95.6839 95.3831 93.9702 93.7059 92.4753 92.4753 92.2474 92.9493 93.7059 94.2406 94.7997 (39)
Average = Sum(39)m / 12 =	93.9689 (39)
HLP	Jan 1.1354 Feb 1.1318 Mar 1.1283 Apr 1.1115 May 1.1084 Jun 1.0939 Jul 1.0939 Aug 1.0912 Sep 1.0995 Oct 1.1084 Nov 1.1147 Dec 1.1214 (40)
HLP (average)	1.1115 (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												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (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	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (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	25.3185	22.8670	25.2767	24.4141	25.1935	24.3412	25.1280	25.1705	24.3809	25.2423	24.4815	25.3057 (61)
Total heat required for water heating calculated for each month	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (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	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (64)
Heat gains from water heating, kWh/month	57.6433	50.5960	52.6305	46.4789	45.0395	39.5159	37.2604	41.8408	42.0680	48.2333	51.8823	56.0209 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1785.6304 (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	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6399	47.6425	38.7455	29.3328	21.9266	18.5114	20.0022	25.9996	34.8966	44.3093	51.7155	55.1307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.2942	344.8358	335.9112	316.9117	292.9282	270.3872	255.3284	251.7868	260.7114	279.7109	303.6944	326.2354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	(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)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	(71)
Water heating gains (Table 5)	77.4775	75.2916	70.7399	64.5540	60.5370	54.8833	50.0812	56.2376	58.4277	64.8297	72.0588	75.2970	(72)
Total internal gains	579.0830	574.4413	552.0679	517.4698	482.0632	450.4532	432.0831	440.6954	460.7071	495.5213	534.1400	563.3345	(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	
East				3.7300	19.6403	0.6300	0.7000		0.7700		22.3887 (76)	
South				0.7200	46.7521	0.6300	0.7000		0.7700		10.2874 (78)	
West				8.5000	19.6403	0.6300	0.7000		0.7700		51.0197 (80)	
Solar gains	83.6958	160.4504	257.9541	369.1665	447.9770	457.0344	435.7240	376.9460	297.4697	188.5685	103.7257	69.2567 (83)
Total gains	662.7787	734.8917	810.0220	886.6363	930.0402	907.4876	867.8071	817.6414	758.1769	684.0898	637.8657	632.5912 (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	43.6093	43.7492	43.8872	44.5470	44.6727	45.2671	45.2671	45.3790	45.0363	44.6727	44.4192	44.1572	
alpha	3.9073	3.9166	3.9258	3.9698	3.9782	4.0178	4.0178	4.0253	4.0024	3.9782	3.9613	3.9438	
util living area	0.9812	0.9704	0.9454	0.8844	0.7723	0.6060	0.4567	0.5005	0.7283	0.9120	0.9695	0.9840	(86)
MIT	19.6263	19.8061	20.1085	20.4883	20.7777	20.9390	20.9847	20.9780	20.8703	20.4911	19.9980	19.5966	(87)
Th 2	19.9720	19.9749	19.9778	19.9914	19.9940	20.0058	20.0058	20.0081	20.0013	19.9940	19.9888	19.9834	(88)
util rest of house	0.9768	0.9637	0.9327	0.8577	0.7219	0.5271	0.3590	0.4005	0.6552	0.8857	0.9614	0.9804	(89)
MIT 2	18.7364	18.9154	19.2123	19.5829	19.8404	19.9745	20.0008	20.0002	19.9260	19.5958	19.1174	18.7160	(90)
Living area fraction									fLA = Living area / (4) =			0.2126	(91)
MIT	18.9256	19.1048	19.4028	19.7753	20.0396	20.1795	20.2100	20.2081	20.1267	19.7861	19.3046	18.9032	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9256	19.1048	19.4028	19.7753	20.0396	20.1795	20.2100	20.2081	20.1267	19.7861	19.3046	18.9032	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9712	0.9566	0.9242	0.8512	0.7244	0.5416	0.3795	0.4213	0.6652	0.8792	0.9544	0.9753	(94)
Useful gains	643.6666	702.9723	748.5994	754.7041	673.6928	491.4978	329.3727	344.5054	504.3257	601.4682	608.8096	616.9537	(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	1403.9216	1359.1662	1230.7109	1021.9548	781.4736	515.9672	333.8321	351.2850	560.1773	860.7929	1150.1692	1393.8591	(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	565.6297	440.9623	358.6910	192.4205	80.1889	0.0000	0.0000	0.0000	0.0000	192.9376	389.7789	578.0176	(98)
Space heating												2798.6265	(98)
Space heating per m2												33.1042	(99)
										(98) / (4) =			

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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3085.5860 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	565.6297	440.9623	358.6910	192.4205	80.1889	0.0000	0.0000	0.0000	0.0000	192.9376	389.7789	578.0176	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	623.6270	486.1767	395.4697	212.1505	88.4111	0.0000	0.0000	0.0000	0.0000	212.7206	429.7452	637.2851	(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	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629	(64)
Efficiency of water heater (217)m	89.8309	89.7504	89.5694	89.1571	88.4332	87.2000	87.2000	87.2000	87.2000	89.1275	89.6431	87.2000	(216)
Fuel for water heating, kWh/month	199.9816	175.8678	183.7223	163.5806	160.2431	143.2162	135.6606	151.4705	152.0293	169.7856	180.8409	194.4778	(219)
Water heating fuel used												2010.8762	(219)
Annual totals kWh/year													
Space heating fuel - main system												3085.5860	(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)												378.9191	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.70 * 908 * 1.00) =										-508.3984		-508.3984	(233)
Total delivered energy for all uses												5041.9829	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3085.5860	3.4800	107.3784 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2010.8762	3.4800	69.9785 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	378.9191	13.1900	49.9794 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-508.3984	13.1900	-67.0577 (252)
Total energy cost			290.1711 (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] =	0.9408 (257)
SAP value		86.8758
SAP rating (Section 12)		87 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3085.5860	0.2160	666.4866 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2010.8762	0.2160	434.3493 (264)
Space and water heating			1100.8358 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.9191	0.5190	196.6590 (268)
Energy saving/generation technologies			
PV Unit	-508.3984	0.5190	-263.8588 (269)
Total kg/year			1072.5611 (272)
CO2 emissions per m2			12.6900 (273)
EI value			88.9051
EI rating			89 (274)
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	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8868 = 3.924$, stars = 4
Water heating environmental impact	$0.216 / 0.8868 = 0.2436$, 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	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (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) = 0.1893 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4393 (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) =	0.3734 (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	0.4760	0.4387	0.4294	0.4014	0.4014	0.3734	0.3734	0.3640	0.3734	0.4200	0.4107	0.4387 (22b)
Effective ac	0.6133	0.5962	0.5922	0.5806	0.5806	0.5697	0.5697	0.5663	0.5697	0.5882	0.5843	0.5962 (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)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			18.0000	760.8600 (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) = 15069.9280 (34)
178.2580 (35)
7.8704 (36)
(33) + (36) = 53.2151 (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	42.7757	41.5846	41.3020	40.4908	40.4908	39.7342	39.7342	39.4942	39.7342	41.0255	40.7551	41.5846 (38)
Heat transfer coeff	95.9907	94.7997	94.5171	93.7059	93.7059	92.9493	92.9493	92.7093	92.9493	94.2406	93.9702	94.7997 (39)
Average = Sum(39)m / 12 =												93.9406 (39)
HLP	1.1354	1.1214	1.1180	1.1084	1.1084	1.0995	1.0995	1.0966	1.0995	1.1147	1.1115	1.1214 (40)
HLP (average)												1.1112 (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)
2.5434 (42)
94.6054 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (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	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (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	25.3185	22.8670	25.2767	24.4141	25.1935	24.3412	25.1280	25.1705	24.3809	25.2423	24.4815	25.3057 (61)
Total heat required for water heating calculated for each month	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (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	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (64)
Heat gains from water heating, kWh/month	57.6433	50.5960	52.6305	46.4789	45.0395	39.5159	37.2604	41.8408	42.0680	48.2333	51.8823	56.0209 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1785.6304 (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	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6399	47.6425	38.7455	29.3328	21.9266	18.5114	20.0022	25.9996	34.8966	44.3093	51.7155	55.1307 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.2942	344.8358	335.9112	316.9117	292.9282	270.3872	255.3284	251.7868	260.7114	279.7109	303.6944	326.2354 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037 (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)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353 (71)
Water heating gains (Table 5)	77.4775	75.2916	70.7399	64.5540	60.5370	54.8833	50.0812	56.2376	58.4277	64.8297	72.0588	75.2970 (72)
Total internal gains	579.0830	574.4413	552.0679	517.4698	482.0632	450.4532	432.0831	440.6954	460.7071	495.5213	534.1400	563.3345 (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	
East					3.7300	25.9136	0.6300	0.7000	0.7700		29.5399 (76)	
South					0.7200	58.2505	0.6300	0.7000	0.7700		12.8175 (78)	
West					8.5000	25.9136	0.6300	0.7000	0.7700		67.3161 (80)	

Solar gains	109.6736	179.6597	286.6699	416.2670	481.3718	531.0750	494.3465	437.5067	350.0249	223.1820	134.6892	86.6430 (83)
Total gains	688.7566	754.1010	838.7378	933.7368	963.4350	981.5282	926.4295	878.2021	810.7320	718.7033	668.8291	649.9775 (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	43.6093	44.1572	44.2892	44.6727	44.6727	45.0363	45.0363	45.1529	45.0363	44.4192	44.5470	44.1572
alpha	3.9073	3.9438	3.9526	3.9782	3.9782	4.0024	4.0024	4.0102	4.0024	3.9613	3.9698	3.9438
util living area	0.9734	0.9621	0.9284	0.8490	0.7115	0.5098	0.3668	0.3851	0.6311	0.8657	0.9521	0.9772 (86)
MIT	19.8076	19.9513	20.2526	20.6003	20.8525	20.9707	20.9940	20.9929	20.9331	20.6453	20.2065	19.7932 (87)
Th 2	19.9720	19.9834	19.9861	19.9940	19.9940	20.0013	20.0013	20.0036	20.0013	19.9888	19.9914	19.9834 (88)
util rest of house	0.9671	0.9534	0.9118	0.8156	0.6517	0.4267	0.2700	0.2841	0.5452	0.8258	0.9389	0.9717 (89)
MIT 2	18.9156	19.0646	19.3574	19.6857	19.8996	19.9884	19.9998	20.0019	19.9681	19.7306	19.3226	18.9108 (90)
Living area fraction									fLA = Living area / (4) =			0.2126 (91)
MIT	19.1052	19.2531	19.5477	19.8801	20.1022	20.1972	20.2112	20.2125	20.1732	19.9250	19.5105	19.0984 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1052	19.2531	19.5477	19.8801	20.1022	20.1972	20.2112	20.2125	20.1732	19.9250	19.5105	19.0984 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9603	0.9456	0.9033	0.8114	0.6586	0.4435	0.2906	0.3056	0.5609	0.8229	0.9311	0.9655 (94)
Ext temp.	661.4368	713.0677	757.6482	757.6199	634.4841	435.3510	269.1968	268.3631	454.7529	591.4266	622.7624	627.5754 (95)
Heat loss rate W	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)
Month fracti	1315.5746	1284.8304	1157.6150	963.3090	702.9973	445.8991	270.5897	270.0188	480.8455	765.7072	1044.0517	1289.1244 (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	486.6785	384.2246	297.5753	148.0962	50.9738	0.0000	0.0000	0.0000	0.0000	129.6648	303.3282	492.1925 (98)
Space heating per m2												2292.7339 (98)
(98) / (4) =												27.1201 (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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2527.8213 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	486.6785	384.2246	297.5753	148.0962	50.9738	0.0000	0.0000	0.0000	0.0000	129.6648	303.3282	492.1925	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	536.5805	423.6214	328.0874	163.2814	56.2004	0.0000	0.0000	0.0000	0.0000	142.9601	334.4303	542.6598	(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	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629	(64)
Efficiency of water heater (217)m	89.7290	89.6522	89.4219	88.9290	88.0994	87.2000	87.2000	87.2000	87.2000	88.7809	89.4495	87.2000	(216)
Fuel for water heating, kWh/month	200.2086	176.0605	184.0252	164.0002	160.8504	143.2162	135.6606	151.4705	152.0293	170.4484	181.2323	194.7089	(219)
Water heating fuel used												2013.9110	(219)
Annual totals kWh/year													
Space heating fuel - main system												2527.8213	(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)												378.9191	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.70 * 1054 * 1.00) =										-590.4879		-590.4879	(233)
Total delivered energy for all uses												4405.1634	(238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2527.8213	10.2300	258.5961 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2013.9110	10.2300	206.0231 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	378.9191	36.7200	139.1391 (250)
Additional standing charges			103.0000 (251)
Energy saving/generation technologies			
PV Unit	-590.4879	36.7200	-216.8272 (252)
Total energy cost			517.4711 (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	2527.8213	0.2160	546.0094 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2013.9110	0.2160	435.0048 (264)
Space and water heating			981.0142 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.9191	0.5190	196.6590 (268)
Energy saving/generation technologies			
PV Unit	-590.4879	0.5190	-306.4632 (269)
Total kg/year			910.1350 (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	2527.8213	1.2200	3083.9419 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2013.9110	1.2200	2456.9714 (264)
Space and water heating			5540.9133 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	378.9191	3.0700	1163.2817 (268)
Energy saving/generation technologies			
PV Unit	-590.4879	3.0700	-1812.7979 (269)
Primary energy kWh/year			5121.6471 (272)
Primary energy kWh/m2/year			60.5825 (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 87
Current environmental impact rating: B 89

(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	+ 1.2	-£ 85	-193 kg (21.2%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£85 2.28 kg/m²	B 88	B 91
Total Savings	£85 2.28 kg/m²		

Potential energy efficiency rating: B 88
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 531 TEST (31 Oct 2023)
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	£167	£185	-£18
Mains gas	£568	£464	£104
Space heating	£389	£389	£0
Water heating	£206	£121	£85
Lighting	£139	£139	£0
Generated (PV)	-£217	-£217	£0
Total cost of fuels	£518	£432	£86
Total cost of uses	£517	£432	£85
Delivered energy	52 kWh/m²	41 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	8 kg/m²	2 kg/m²
Primary energy	61 kWh/m²	48 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	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (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) = 0.1893 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4393 (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) =	0.3734 (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	0.4760	0.4667	0.4574	0.4107	0.4014	0.3547	0.3547	0.3454	0.3734	0.4014	0.4200	0.4387 (22b)
Effective ac	0.6133	0.6089	0.6046	0.5843	0.5806	0.5629	0.5629	0.5596	0.5697	0.5806	0.5882	0.5962 (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)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			18.0000	760.8600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15069.9280 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 178.2580 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8704 (36)
Total fabric heat loss (33) + (36) = 53.2151 (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	42.7757	42.4688	42.1680	40.7551	40.4908	39.2602	39.2602	39.0323	39.7342	40.4908	41.0255	41.5846 (38)
Heat transfer coeff	95.9907	95.6839	95.3831	93.9702	93.7059	92.4753	92.4753	92.2474	92.9493	93.7059	94.2406	94.7997 (39)
Average = Sum(39)m / 12 =												93.9689 (39)
HLP	1.1354	1.1318	1.1283	1.1115	1.1084	1.0939	1.0939	1.0912	1.0995	1.1084	1.1147	1.1214 (40)
HLP (average)												1.1115 (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												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (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	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (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	25.3185	22.8670	25.2767	24.4141	25.1935	24.3412	25.1280	25.1705	24.3809	25.2423	24.4815	25.3057 (61)
Total heat required for water heating calculated for each month	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (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												1.2184 (H8)
Utilisation factor												0.5599 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.6054 (H14)
Volume ratio Veff/V												0.7928 (H15)
Solar storage volume factor												0.9536 (H16)
Solar input												-851.3931 (H17)
Solar input	-24.6887	-41.1983	-70.1655	-94.0356	-116.1731	-114.2166	-112.7072	-98.4729	-77.1240	-52.6666	-29.2844	-20.6602 (63)
Solar input (sum of months) = Sum (63)m =												-851.3931 (63)
Output from w/h	154.9565	116.6437	94.3934	51.8081	25.5351	10.6679	5.5888	33.6094	55.4456	98.6591	132.8270	154.1027 (64)
Total per year (kWh/year) = Sum (64)m =												934.2373 (64)
Heat gains from water heating, kWh/month	57.6433	50.5960	52.6305	46.4789	45.0395	39.5159	37.2604	41.8408	42.0680	48.2333	51.8823	56.0209 (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	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6399	47.6425	38.7455	29.3328	21.9266	18.5114	20.0022	25.9996	34.8966	44.3093	51.7155	55.1307 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.2942	344.8358	335.9112	316.9117	292.9282	270.3872	255.3284	251.7868	260.7114	279.7109	303.6944	326.2354 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037 (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)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353 (71)
Water heating gains (Table 5)	77.4775	75.2916	70.7399	64.5540	60.5370	54.8833	50.0812	56.2376	58.4277	64.8297	72.0588	75.2970 (72)
Total internal gains	579.0830	574.4413	552.0679	517.4698	482.0632	450.4532	432.0831	440.6954	460.7071	495.5213	534.1400	563.3345 (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			
East				3.7300	19.6403	0.6300	0.7000	0.7700	22.3887 (76)			
South				0.7200	46.7521	0.6300	0.7000	0.7700	10.2874 (78)			
West				8.5000	19.6403	0.6300	0.7000	0.7700	51.0197 (80)			
Solar gains	83.6958	160.4504	257.9541	369.1665	447.9770	457.0344	435.7240	376.9460	297.4697	188.5685	103.7257	69.2567 (83)
Total gains	662.7787	734.8917	810.0220	886.6363	930.0402	907.4876	867.8071	817.6414	758.1769	684.0898	637.8657	632.5912 (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	43.6093	43.7492	43.8872	44.5470	44.6727	45.2671	45.2671	45.3790	45.0363	44.6727	44.4192	44.1572
alpha	3.9073	3.9166	3.9258	3.9698	3.9782	4.0178	4.0178	4.0253	4.0024	3.9782	3.9613	3.9438
util living area	0.9812	0.9704	0.9454	0.8844	0.7723	0.6060	0.4567	0.5005	0.7283	0.9120	0.9695	0.9840 (86)
MIT	19.6263	19.8061	20.1085	20.4883	20.7777	20.9390	20.9847	20.9780	20.8703	20.4911	19.9980	19.5966 (87)
Th 2	19.9720	19.9749	19.9778	19.9914	19.9940	20.0058	20.0058	20.0081	20.0013	19.9940	19.9888	19.9834 (88)
util rest of house	0.9768	0.9637	0.9327	0.8577	0.7219	0.5271	0.3590	0.4005	0.6552	0.8857	0.9614	0.9804 (89)
MIT 2	18.7364	18.9154	19.2123	19.5829	19.8404	19.9745	20.0008	20.0002	19.9260	19.5958	19.1174	18.7160 (90)
Living area fraction												0.2126 (91)
MIT	18.9256	19.1048	19.4028	19.7753	20.0396	20.1795	20.2100	20.2081	20.1267	19.7861	19.3046	18.9032 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9256	19.1048	19.4028	19.7753	20.0396	20.1795	20.2100	20.2081	20.1267	19.7861	19.3046	18.9032 (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	0.9712	0.9566	0.9242	0.8512	0.7244	0.5416	0.3795	0.4213	0.6652	0.8792	0.9544	0.9753	(94)
Useful gains	643.6666	702.9723	748.5994	754.7041	673.6928	491.4978	329.3727	344.5054	504.3257	601.4682	608.8096	616.9537	(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	1403.9216	1359.1662	1230.7109	1021.9548	781.4736	515.9672	333.8321	351.2850	560.1773	860.7929	1150.1692	1393.8591	(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	565.6297	440.9623	358.6910	192.4205	80.1889	0.0000	0.0000	0.0000	0.0000	192.9376	389.7789	578.0176	(98)
Space heating												2798.6265	(98)
Space heating per m2											(98) / (4) =	33.1042	(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 %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													3085.5860	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	565.6297	440.9623	358.6910	192.4205	80.1889	0.0000	0.0000	0.0000	0.0000	192.9376	389.7789	578.0176	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	623.6270	486.1767	395.4697	212.1505	88.4111	0.0000	0.0000	0.0000	0.0000	212.7206	429.7452	637.2851	(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	154.9565	116.6437	94.3934	51.8081	25.5351	10.6679	5.5888	33.6094	55.4456	98.6591	132.8270	154.1027	(64)	
Efficiency of water heater	89.9238	89.9448	89.9478	89.9343	89.8292	87.2000	87.2000	87.2000	87.2000	89.4848	89.7841	89.9401	(216)	
(217)m	89.9238	89.9448	89.9478	89.9343	89.8292	87.2000	87.2000	87.2000	87.2000	89.4848	89.7841	89.9401	(217)	
Fuel for water heating, kWh/month	172.3197	129.6837	104.9424	57.6066	28.4263	12.2338	6.4092	38.5429	63.5844	110.2524	147.9405	171.3392	(219)	
Water heating fuel used												1043.2810	(219)	
Annual totals kWh/year														
Space heating fuel - main system												3085.5860	(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)												378.9191	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.70 * 908 * 1.00) =										-508.3984		-508.3984	(233)	
Total delivered energy for all uses												4124.3877	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3085.5860	3.4800	107.3784	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1043.2810	3.4800	36.3062	(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	378.9191	13.1900	49.9794	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-508.3984	13.1900	-67.0577	(252)
Total energy cost			263.0938	(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] =	0.8530	(257)
SAP value			88.1005	
SAP rating (Section 12)			88	(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	3085.5860	0.2160	666.4866 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1043.2810	0.2160	225.3487 (264)
Space and water heating			891.8353 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	378.9191	0.5190	196.6590 (268)
Energy saving/generation technologies			
PV Unit	-508.3984	0.5190	-263.8588 (269)
Total kg/year			889.5105 (272)
CO2 emissions per m2			10.5200 (273)
EI value			90.7986
EI rating			91 (274)
EI band			B

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	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (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) = 0.1893 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4393 (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) =		0.3734 (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	0.4760	0.4387	0.4294	0.4014	0.4014	0.3734	0.3734	0.3640	0.3734	0.4200	0.4107	0.4387 (22b)
Effective ac	0.6133	0.5962	0.5922	0.5806	0.5806	0.5697	0.5697	0.5663	0.5697	0.5882	0.5843	0.5962 (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)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			18.0000	760.8600 (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) =	15069.9280 (34)
	178.2580 (35)
	7.8704 (36)
(33) + (36) =	53.2151 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	Jan 42.7757 Feb 41.5846 Mar 41.3020 Apr 40.4908 May 40.4908 Jun 39.7342 Jul 39.7342 Aug 39.4942 Sep 39.7342 Oct 41.0255 Nov 40.7551 Dec 41.5846 (38)
Heat transfer coeff	95.9907 94.7997 94.5171 93.7059 93.7059 92.9493 92.9493 92.7093 92.9493 94.2406 93.9702 94.7997 (39)
Average = Sum(39)m / 12 =	93.9406 (39)
HLP	Jan 1.1354 Feb 1.1214 Mar 1.1180 Apr 1.1084 May 1.1084 Jun 1.0995 Jul 1.0995 Aug 1.0966 Sep 1.0995 Oct 1.1147 Nov 1.1115 Dec 1.1214 (40)
HLP (average)	1.1112 (40)
Days in month	31 28 31 30 31 30 31 31 30 31 30 31 (41)

4. Water heating energy requirements (kWh/year)

												2.5434 (42)
Assumed occupancy												
Average daily hot water use (litres/day)												94.6054 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)	Total = Sum(45)m =											1488.5106 (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	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (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	25.3185	22.8670	25.2767	24.4141	25.1935	24.3412	25.1280	25.1705	24.3809	25.2423	24.4815	25.3057 (61)
Total heat required for water heating calculated for each month	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (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												1.3933 (H8)
Utilisation factor												0.5121 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.6054 (H14)
Volume ratio Veff/V												0.7928 (H15)
Solar storage volume factor												0.9536 (H16)
Solar input	-29.2250	-41.7196	-70.7076	-96.4849	-113.8733	-121.1827	-116.7087	-104.1196	-82.4045	-56.4222	-34.3598	-890.5523 (H17)
Solar input (sum of months) = Sum (63)m =												-890.5523 (63)
Output from w/h	150.4202	116.1225	93.8513	49.3588	27.8348	3.7018	1.5873	27.9627	50.1650	94.9035	127.7515	151.4187 (64)
Total per year (kWh/year) = Sum (64)m =												895.0781 (64)
Heat gains from water heating, kWh/month	57.6433	50.5960	52.6305	46.4789	45.0395	39.5159	37.2604	41.8408	42.0680	48.2333	51.8823	56.0209 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6399	47.6425	38.7455	29.3328	21.9266	18.5114	20.0022	25.9996	34.8966	44.3093	51.7155	55.1307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.2942	344.8358	335.9112	316.9117	292.9282	270.3872	255.3284	251.7868	260.7114	279.7109	303.6944	326.2354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	(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)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	(71)
Water heating gains (Table 5)	77.4775	75.2916	70.7399	64.5540	60.5370	54.8833	50.0812	56.2376	58.4277	64.8297	72.0588	75.2970	(72)
Total internal gains	579.0830	574.4413	552.0679	517.4698	482.0632	450.4532	432.0831	440.6954	460.7071	495.5213	534.1400	563.3345	(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			
East				3.7300	25.9136	0.6300	0.7000	0.7700	29.5399 (76)			
South				0.7200	58.2505	0.6300	0.7000	0.7700	12.8175 (78)			
West				8.5000	25.9136	0.6300	0.7000	0.7700	67.3161 (80)			
Solar gains	109.6736	179.6597	286.6699	416.2670	481.3718	531.0750	494.3465	437.5067	350.0249	223.1820	134.6892	86.6430 (83)
Total gains	688.7566	754.1010	838.7378	933.7368	963.4350	981.5282	926.4295	878.2021	810.7320	718.7033	668.8291	649.9775 (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	43.6093	44.1572	44.2892	44.6727	44.6727	45.0363	45.0363	45.1529	45.0363	44.4192	44.5470	44.1572	
alpha	3.9073	3.9438	3.9526	3.9782	3.9782	4.0024	4.0024	4.0102	4.0024	3.9613	3.9698	3.9438	
util living area	0.9734	0.9621	0.9284	0.8490	0.7115	0.5098	0.3668	0.3851	0.6311	0.8657	0.9521	0.9772 (86)	
MIT	19.8076	19.9513	20.2526	20.6003	20.8525	20.9707	20.9940	20.9929	20.9331	20.6453	20.2065	19.7932 (87)	
Th 2	19.9720	19.9834	19.9861	19.9940	19.9940	20.0013	20.0013	20.0036	20.0013	19.9888	19.9914	19.9834 (88)	
util rest of house	0.9671	0.9534	0.9118	0.8156	0.6517	0.4267	0.2700	0.2841	0.5452	0.8258	0.9389	0.9717 (89)	
MIT 2	18.9156	19.0646	19.3574	19.6857	19.8996	19.9884	19.9998	20.0019	19.9681	19.7306	19.3226	18.9108 (90)	
Living area fraction									fLA = Living area / (4) =				0.2126 (91)
MIT	19.1052	19.2531	19.5477	19.8801	20.1022	20.1972	20.2112	20.2125	20.1732	19.9250	19.5105	19.0984 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.1052	19.2531	19.5477	19.8801	20.1022	20.1972	20.2112	20.2125	20.1732	19.9250	19.5105	19.0984 (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	0.9603	0.9456	0.9033	0.8114	0.6586	0.4435	0.2906	0.3056	0.5609	0.8229	0.9311	0.9655	(94)
Useful gains	661.4368	713.0677	757.6482	757.6199	634.4841	435.3510	269.1968	268.3631	454.7529	591.4266	622.7624	627.5754	(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	1315.5746	1284.8304	1157.6150	963.3090	702.9973	445.8991	270.5897	270.0188	480.8455	765.7072	1044.0517	1289.1244	(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	486.6785	384.2246	297.5753	148.0962	50.9738	0.0000	0.0000	0.0000	0.0000	129.6648	303.3282	492.1925	(98)
Space heating												2292.7339	(98)
Space heating per m2											(98) / (4) =	27.1201	(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 %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2527.8213	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	486.6785	384.2246	297.5753	148.0962	50.9738	0.0000	0.0000	0.0000	0.0000	129.6648	303.3282	492.1925	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	536.5805	423.6214	328.0874	163.2814	56.2004	0.0000	0.0000	0.0000	0.0000	142.9601	334.4303	542.6598	(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	150.4202	116.1225	93.8513	49.3588	27.8348	3.7018	1.5873	27.9627	50.1650	94.9035	127.7515	151.4187	(64)	
Efficiency of water heater	89.8485	89.8629	89.8355	89.7990	89.4322	87.2000	87.2000	87.2000	87.2000	89.1872	89.6338	89.8515	(217)	
Fuel for water heating, kWh/month	167.4153	129.2218	104.4702	54.9658	31.1240	4.2452	1.8203	32.0673	57.5287	106.4094	142.5260	168.5209	(219)	
Water heating fuel used												1000.3149	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2527.8213	(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)													378.9191	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.70 * 1054 * 1.00) =										-590.4879			-590.4879	(233)
Total delivered energy for all uses													3441.5674	(238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2527.8213	10.2300	258.5961	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1000.3149	10.2300	102.3322	(247)
Pumps and fans for heating	75.0000	36.7200	27.5400	(249)
Pump for solar water heating	50.0000	36.7200	18.3600	(249)
Energy for lighting	378.9191	36.7200	139.1391	(250)
Additional standing charges			103.0000	(251)
Energy saving/generation technologies				
PV Unit	-590.4879	36.7200	-216.8272	(252)
Total energy cost			432.1403	(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	2527.8213	0.2160	546.0094	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1000.3149	0.2160	216.0680	(264)
Space and water heating			762.0774	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	378.9191	0.5190	196.6590	(268)
Energy saving/generation technologies				
PV Unit	-590.4879	0.5190	-306.4632	(269)
Total kg/year			717.1482	(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	2527.8213	1.2200	3083.9419	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1000.3149	1.2200	1220.3842	(264)
Space and water heating			4304.3261	(265)
Pumps and fans	125.0000	3.0700	383.7500	(267)
Energy for lighting	378.9191	3.0700	1163.2817	(268)
Energy saving/generation technologies				
PV Unit	-590.4879	3.0700	-1812.7979	(269)
Primary energy kWh/year			4038.5599	(272)
Primary energy kWh/m2/year			47.7710	(273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0906 Plot 29	Issued on Date	29/11/2023
Assessment Reference	Rev B	Prop Type Ref	Block F
Project			
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	14.56	TER	18.03
Environmental	89 B	% DER<TER	19.25		
CO ₂ Emissions (t/year)	0.91	DFEE	43.40	TFEE	51.25
General Requirements Compliance	Pass	% DFEE<TFEE	15.32		

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 0906 Plot 29	Issued on Date	29/11/2023
Assessment Reference	Rev B	Prop Type Ref	Block F
Project			
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	14.56	TER	18.03
Environmental	89 B	% DER<TER	19.25		
CO ₂ Emissions (t/year)	0.91	DFEE	43.40	TFEE	51.25
General Requirements Compliance	Pass	% DFEE<TFEE	15.32		

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/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0906 Plot 29	Issued on Date	29/11/2023
Assessment Reference	Rev B	Prop Type Ref	Block F
Project			
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	14.56	TER	18.03
Environmental	89 B	% DER<TER	19.25		
CO ₂ Emissions (t/year)	0.91	DFEE	43.40	TFEE	51.25
General Requirements Compliance	Pass	% DFEE<TFEE	15.32		

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

Building Elements

Floor 000003 - Worst Case Slab

Floor Type: Slab On Ground Floor

Area = 42.27 m², Perimeter = 18.36 m, Wall thickness = 275.00 mm, Soil: Unknown

Horizontal edge insulation: none

Vertical edge insulation: none

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	Concrete, medium density						
	Main construction	100	1.3500	0.0741	100.00		
Layer 2	Polythene, 1000 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 3	Celotex XR4000						
	Main construction	150	0.0220	6.8182	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Polythene, 500 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 5	Screed						
	Main construction	70	1.1500	0.0609	100.00	1200	1000
Int surface				0.1700			

Total resistance: Upper limit = 6.953 m² K/W Lower limit = 6.953 m² K/W Average = 6.953 m² K/W

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	SAP 0906 Plot 29	Issued on Date	29/11/2023
Assessment Reference	Rev B	Prop Type Ref	Block F
Property			

SAP Rating	87 B	DER	14.56	TER	18.03
Environmental	89 B	% DER<TER	19.25		
CO ₂ Emissions (t/year)	0.91	DFEE	43.40	TFEE	51.25
General Requirements Compliance	Pass	% DFEE<TFEE	15.32		

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	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Urban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2022
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:	18.73 m	42.27 m ²	2.39 m
	1st Storey:	18.73 m	42.27 m ²	2.61 m

7.0 Living Area	17.97	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	178.26	kJ/m ² K

9.0 External Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Brick and Block	Cavity Wall	Other	0.24	42.22	93.65	78.55

9.1 Party Walls			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Description	Type	Construction			
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	44.28

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
Ground Floor Stud	Plasterboard on timber frame		9.00	69.16
First Floor Stud	Plasterboard on timber frame		9.00	89.25

10.0 External Roofs			U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type	Construction				
Pitched Roof	External Plane Roof	Other	0.10	9.10	42.27	42.27

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	42.27

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Other	0.12	84.00	42.27

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	42.27

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
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 (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	East							2.15	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					3.73	
Side Elevation	Window	[1] Brick and Block	South	None	0.00					0.72	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					8.50	

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)	0.46	0.093	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.37	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.75	0.071	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	3.74	0.064	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.59	0.067	No	Birtley Supatherm
Independently assessed	E3 Sill	8.83	0.021	No	Knauf P5
Independently assessed	E4 Jamb	27.00	0.016	No	Knauf P6
Table K1 - Approved	E5 Ground floor (normal)	18.37	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	18.73	0.000	No	CD0029
Independently assessed	E10 Eaves (insulation at ceiling level)	9.66	0.071	No	Knauf P16
Independently assessed	E12 Gable (insulation at ceiling level)	8.86	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	10.00	0.039	No	Knauf P23
Independently assessed	E18 Party wall between dwellings	10.00	0.036	No	Knauf P25 Halved
Table K1 - Default	P1 Party wall - Ground floor	8.86	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.86	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.86	0.035	No	Knauf P29 Halved

Y-value 0.044 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

Property Tested ?

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

As Built AP₅₀

m³/(h.m²) @ 50 Pa

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

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

Description	Database	
Percentage of Heat	Mains Gas Combi	%
Database Ref. No.	100	
Fuel Type	17513	
Main Heating	Mains gas	
SAP Code	BGW	
In Winter	104	
In Summer	90.7	
Controls	87.2	
PCDF Controls	CBE Programmer, room thermostat and TRVs	
Delayed Start Stat	0	
Sap Code	No	
Flue Type	2106	
Fan Assisted Flue	Balanced	
Is MHS Pumped	Yes	
Heat Emitter	Pump in heated space	
Flow Temperature	Radiators	
Combi boiler type	Normal (> 45°C)	
Combi keep hot type	Standard Combi	
	Gas/Oil, time clock	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

SAP Code

29.0 Hot Water Cylinder

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.70	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	£85	B 88	