



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 48

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

Report Issue Date: 08/02/2024

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

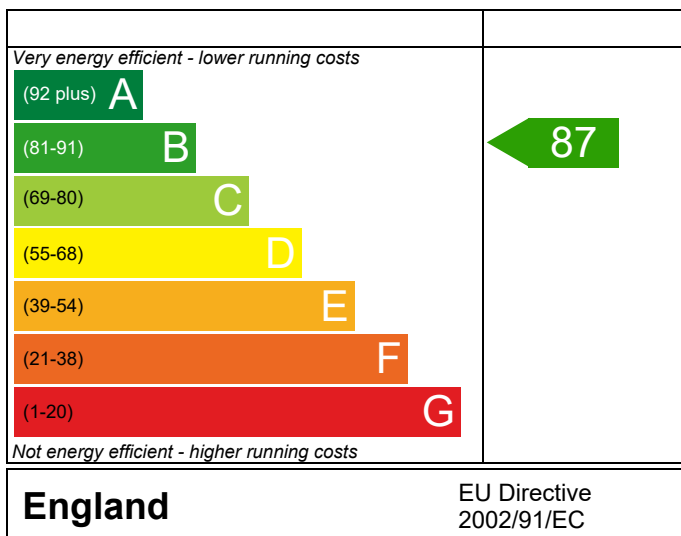
Plot 48

Dwelling type: House, Semi-Detached
Date of assessment: 08/02/2024
Produced by: Abacus Energy (UK) Ltd
Total floor area: 72.74 m²
DRRN: 1204-4921-8025

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

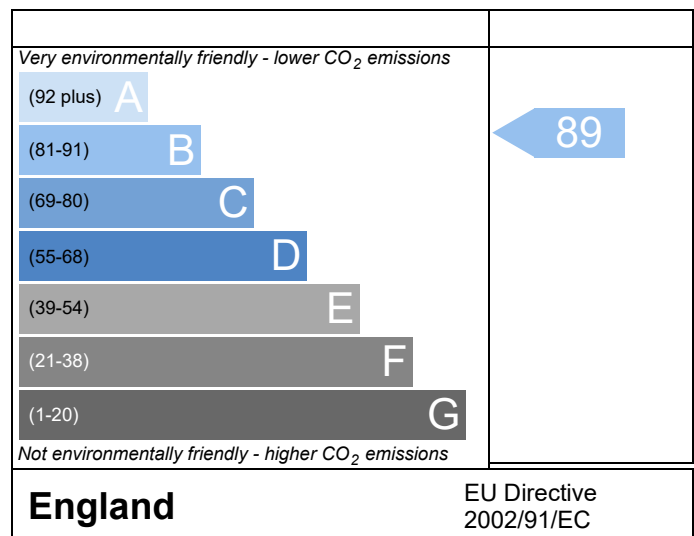
The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



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

Environmental Impact (CO₂) Rating



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

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 48			Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block L		
Property	Plot 48				
SAP Rating	87 B	DER	15.04	TER	19.39
Environmental	89 B	% DER<TER	22.44		
CO ₂ Emissions (t/year)	0.81	DFEE	46.20	TFEE	54.82
General Requirements Compliance	Pass	% DFEE<TFEE	15.71		
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)	19.39	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.04	kgCO ₂ /m ²	Pass
	-4.35 (-22.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.82	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	46.20	kWh/m ² /yr	
	-8.6 (-15.7%)	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	1.18 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 830 VUW 306/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

0.72 m², No overhang

Windows facing East

7.82 m², No overhang

Windows facing West

3.14 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

0.63

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	£63	B 88	B 91	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£63	B 88	B 91	

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 48	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block L
Property	Plot 48		

SAP Rating	87 B	DER	15.04	TER	19.39
Environmental	89 B	% DER<TER	22.44		
CO ₂ Emissions (t/year)	0.81	DFEE	46.20	TFEE	54.82
General Requirements Compliance	Pass	% DFEE<TFEE	15.71		

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	0.043	9.75	0.42	Catnic Thermally Broken
External wall	E3 Sill	Independently assessed	0.021	7.16	0.15	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	24.60	0.39	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	17.86	2.86	
External wall	E20 Exposed floor (normal)	Table K1 - Default	0.320	1.27	0.41	
External wall	E21 Exposed floor (inverted)	Table K1 - Default	0.320	2.41	0.77	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	14.71	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	8.40	0.50	
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	8.71	0.38	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	14.15	0.55	Knauf P23
External wall	E17 Corner (inverted – internal area greater than external area)	Independently assessed	-0.091	4.16	-0.38	Knauf P24
External wall	E18 Party wall between dwellings	Independently assessed	0.036	10.00	0.36	Knauf P25 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.72	1.40	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.72	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.72	0.31	Knauf P29 Halved

Total: **8.12** W/mK:
Y-Value: **0.051** 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 73 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) 19.39 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.04 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 46.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant ecoFIT sustain 830 VUW 306/6-3 (H-GB)
Combi boiler
Efficiency: 89.3% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading:
Average
Windows facing North: 0.72 m², No overhang
Windows facing East: 7.82 m², No overhang
Windows facing West: 3.14 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 0.63 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	36.1500 (1b)	x 2.6700 (2b)	= 96.5205 (1b) - (3b)
First floor	36.5900 (1c)	x 2.3200 (2c)	= 84.8888 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.4093 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1654 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4154 (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) =	0.3531 (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	0.4502	0.4413	0.4325	0.3884	0.3795	0.3354	0.3354	0.3266	0.3531	0.3795	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)
Ground Floor			36.1500	0.1200	4.3380	90.0000	3253.5000 (28a)
Brick and Block	87.3800	13.8000	73.5800	0.2400	17.6592	42.2200	3106.5476 (29a)
Pitched Roof	36.5900		36.5900	0.1000	3.6590	9.1000	332.9690 (30)
Total net area of external elements Aum(A, m ²)			160.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.3622		(33)
Party Wall 1			43.5600	0.0000	0.0000	110.0000	4791.6000 (32)
Ground Floor Stud			57.0500			9.0000	513.4500 (32c)
First Floor Stud			64.8700			9.0000	583.8300 (32c)
Internal Floor 1			36.1500			18.0000	650.7000 (32d)
Internal Ceiling 1			36.1500			18.0000	650.7000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13883.2966 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							190.8619 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1193 (36)
Total fabric heat loss						(33) + (36) =	49.4816 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.9982	35.7626	35.5318	34.4474	34.2445	33.3000	33.3000	33.1251	33.6638	34.2445	34.6549	35.0840 (38)
Average = Sum(39)m / 12 =	85.4798	85.2442	85.0133	83.9289	83.7261	82.7816	82.7816	82.6067	83.1454	83.7261	84.1365	84.5656 (39)
												83.9280 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1751	1.1719	1.1687	1.1538	1.1510	1.1380	1.1380	1.1356	1.1430	1.1510	1.1567	1.1626 (40)
HLP (average)												1.1538 (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												2.3108 (42)
Average daily hot water use (litres/day)												89.0807 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.9888	94.4255	90.8623	87.2991	83.7358	80.1726	80.1726	83.7358	87.2991	90.8623	94.4255	97.9888 (44)
Energy conte	145.3145	127.0930	131.1486	114.3385	109.7105	94.6718	87.7274	100.6684	101.8707	118.7205	129.5927	140.7293 (45)
Energy content (annual)										Total = Sum(45)m =		1401.5861 (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	21.7972	19.0639	19.6723	17.1508	16.4566	14.2008	13.1591	15.1003	15.2806	17.8081	19.4389	21.1094 (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	1.6375	1.3801	1.3704	1.1479	1.0565	0.8729	0.8088	0.9694	1.0227	1.2405	1.4072	1.5858 (61)
Total heat required for water heating calculated for each month	146.9520	128.4731	132.5190	115.4864	110.7670	95.5447	88.5362	101.6378	102.8935	119.9611	131.0000	142.3152 (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	146.9520	128.4731	132.5190	115.4864	110.7670	95.5447	88.5362	101.6378	102.8935	119.9611	131.0000	142.3152 (64)
Heat gains from water heating, kWh/month	48.7264	42.6034	43.9495	38.3045	36.7429	31.6966	29.3716	33.7146	34.1277	39.7847	43.4414	47.1890 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1416.0859 (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	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9239	16.8080	13.6692	10.3485	7.7356	6.5307	7.0567	9.1725	12.3114	15.6321	18.2450	19.4499 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6057	205.7185	200.3943	189.0598	174.7520	161.3047	152.3211	150.2083	155.5325	166.8670	181.1748	194.6221 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538 (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)	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306 (71)
Water heating gains (Table 5)	65.4925	63.3980	59.0719	53.2007	49.3856	44.0231	39.4779	45.3153	47.3996	53.4741	60.3353	63.4260 (72)
Total internal gains	348.6836	346.5860	333.7970	313.2705	292.5347	272.5200	259.5172	265.3577	275.9049	296.6347	320.4165	338.1595 (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	
North	0.7200				10.6334		0.6300		0.7000		0.7700		2.3398 (74)	
East	7.8200				19.6403		0.6300		0.7000		0.7700		46.9381 (76)	
West	3.1400				19.6403		0.6300		0.7000		0.7700		18.8473 (80)	
Solar gains	68.1252	133.1617	219.5326	321.2983	395.2467	405.3756	385.6100	330.1551	255.6240	158.0245	84.9131	56.0493	(83)	
Total gains	416.8089	479.7477	553.3296	634.5689	687.7814	677.8956	645.1272	595.5128	531.5289	454.6592	405.3296	394.2088	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.1156	45.2403	45.3631	45.9492	46.0606	46.5861	46.5861	46.6847	46.3823	46.0606	45.8359	45.6033
alpha	4.0077	4.0160	4.0242	4.0633	4.0707	4.1057	4.1057	4.1123	4.0922	4.0707	4.0557	4.0402
util living area	0.9949	0.9904	0.9777	0.9388	0.8492	0.6949	0.5397	0.5976	0.8330	0.9648	0.9911	0.9959 (86)
MIT	19.4005	19.5820	19.9061	20.3339	20.6911	20.9064	20.9745	20.9616	20.7918	20.3139	19.7825	19.3719 (87)
Th 2	19.9399	19.9425	19.9451	19.9571	19.9594	19.9699	19.9699	19.9718	19.9658	19.9594	19.9548	19.9501 (88)
util rest of house	0.9935	0.9978	0.9714	0.9210	0.8050	0.6106	0.4245	0.4811	0.7676	0.9511	0.9882	0.9948 (89)
MIT 2	18.4827	18.6650	18.9875	19.4119	19.7404	19.9211	19.9617	19.9582	19.8391	19.4018	18.8749	18.4619 (90)
Living area fraction									fLA = Living area / (4) =			0.2448 (91)
MIT	18.7074	18.8895	19.2124	19.6377	19.9732	20.1624	20.2097	20.2039	20.0723	19.6251	19.0972	18.6847 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7074	18.8895	19.2124	19.6377	19.9732	20.1624	20.2097	20.2039	20.0723	19.6251	19.0972	18.6847 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	413.2052	472.2681	534.4174	580.2301	554.0962	425.4182	291.8716	303.0962	412.1320	429.8757	399.2753	391.4596 (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	1231.5415	1192.5273	1080.7252	901.2018	692.6822	460.4628	298.8143	314.2286	496.5706	755.6379	1009.3984	1224.9043 (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	608.8423	484.0142	406.4531	231.0996	103.1080	0.0000	0.0000	0.0000	0.0000	242.3671	439.2886	620.0828 (98)
Space heating												3135.2555 (98)
Space heating per m2												(98) / (4) = 43.1022 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3475.8931 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	608.8423	484.0142	406.4531	231.0996	103.1080	0.0000	0.0000	0.0000	0.0000	242.3671	439.2886	620.0828	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	674.9914	536.6011	450.6131	256.2080	114.3104	0.0000	0.0000	0.0000	0.0000	268.6996	487.0162	687.4532	(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	146.9520	128.4731	132.5190	115.4864	110.7670	95.5447	88.5362	101.6378	102.8935	119.9611	131.0000	142.3152	(64)
Efficiency of water heater (217)m	87.0889	86.8529	86.3015	84.9965	82.3629	76.2000	76.2000	76.2000	76.2000	85.0278	86.5474	76.2000	(216)
Fuel for water heating, kWh/month	168.7378	147.9204	153.5536	135.8719	134.4865	125.3867	116.1893	133.3830	135.0308	141.0845	151.3622	163.1885	(219)
Water heating fuel used												1706.1951	(219)
Annual totals kWh/year													
Space heating fuel - main system												3475.8931	(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)												334.2020	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.63 * 908 * 1.00) =										-457.5585		-457.5585	(233)
Total delivered energy for all uses												5133.7316	(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	3475.8931	0.2160	750.7929 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1706.1951	0.2160	368.5381 (264)
Space and water heating			1119.3310 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	334.2020	0.5190	173.4508 (268)
Energy saving/generation technologies			
PV Unit	-457.5585	0.5190	-237.4729 (269)
Total CO2, kg/year			1094.2340 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.0400 (273)

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

DER		15.0400	ZC1
Total Floor Area	TFA	72.7400	
Assumed number of occupants	N	2.3108	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5868	ZC2
CO2 emissions from cooking, equation (L16)		2.3984	ZC3
Total CO2 emissions		34.0252	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		34.0252	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	36.1500 (1b)	x 2.6700 (2b)	= 96.5205 (1b) - (3b)
First floor	36.5900 (1c)	x 2.3200 (2c)	= 84.8888 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.4093 (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) =	0.1654 (8)	
Pressure test												Yes		
Measured/design AP50												5.0000		
Infiltration rate												0.4154 (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) =	0.3531 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind factor	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)		
Adj infilt rate	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)		
	0.4502	0.4413	0.4325	0.3884	0.3795	0.3354	0.3354	0.3266	0.3531	0.3795	0.3972	0.4149 (22b)		
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (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			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			11.6800	1.3258	15.4848		(27)					
Ground Floor			36.1500	0.1300	4.6995		(28a)					
Brick and Block	87.3800	13.8000	73.5800	0.1800	13.2444		(29a)					
Pitched Roof	36.5900		36.5900	0.1300	4.7567		(30)					
Total net area of external elements Aum(A, m2)			160.1200				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		40.3054		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3804 (36)					
Total fabric heat loss						(33) + (36) =	50.6858 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.9982	Feb 35.7626	Mar 35.5318	Apr 34.4474	May 34.2445	Jun 33.3000	Jul 33.3000	Aug 33.1251	Sep 33.6638	Oct 34.2445	Nov 34.6549	Dec 35.0840 (38)
Heat transfer coeff	86.6840	86.4485	86.2176	85.1332	84.9303	83.9858	83.9858	83.8109	84.3496	84.9303	85.3408	85.7699 (39)
Average = Sum(39)m / 12 =												85.1322 (39)
HLP	Jan 1.1917	Feb 1.1885	Mar 1.1853	Apr 1.1704	May 1.1676	Jun 1.1546	Jul 1.1546	Aug 1.1522	Sep 1.1596	Oct 1.1676	Nov 1.1732	Dec 1.1791 (40)
HLP (average)												1.1704 (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												2.3108 (42)
Average daily hot water use (litres/day)												89.0807 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.9888	94.4255	90.8623	87.2991	83.7358	80.1726	80.1726	83.7358	87.2991	90.8623	94.4255	97.9888 (44)
Energy conte	145.3145	127.0930	131.1486	114.3385	109.7105	94.6718	87.7274	100.6684	101.8707	118.7205	129.5927	140.7293 (45)
Energy content (annual)												Total = Sum(45)m = 1401.5861 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.7972	19.0639	19.6723	17.1508	16.4566	14.2008	13.1591	15.1003	15.2806	17.8081	19.4389	21.1094 (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	49.9340	43.4616	46.3024	43.0516	42.6709	39.5372	40.8551	42.6709	43.0516	46.3024	46.5660	49.9340 (61)
Solar input	195.2485	170.5546	177.4510	157.3901	152.3814	134.2090	128.5825	143.3393	144.9223	165.0230	176.1588	190.6633 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	195.2485	170.5546	177.4510	157.3901	152.3814	134.2090	128.5825	143.3393	144.9223	165.0230	176.1588	190.6633 (64)
	60.8006	53.1238	55.1825	48.7805	47.1465	41.3627	39.3831	44.1400	44.6349	51.0502	54.7311	59.2760 (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	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9239	16.8080	13.6692	10.3485	7.7356	6.5307	7.0567	9.1725	12.3114	15.6321	18.2450	19.4499	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6057	205.7185	200.3943	189.0598	174.7520	161.3047	152.3211	150.2083	155.5325	166.8670	181.1748	194.6221	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	(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)	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	(71)
Water heating gains (Table 5)	81.7212	79.0533	74.1700	67.7506	63.3689	57.4482	52.9343	59.3279	61.9929	68.6158	76.0154	79.6720	(72)
Total internal gains	364.9123	362.2413	348.8951	327.8204	306.5180	285.9451	272.9736	279.3703	290.4983	311.7764	336.0967	354.4055	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					0.7200	10.6334	0.6300	0.7000	0.7700		2.3398 (74)	
East					7.8200	19.6403	0.6300	0.7000	0.7700		46.9381 (76)	
West					3.1400	19.6403	0.6300	0.7000	0.7700		18.8473 (80)	
Solar gains	68.1252	133.1617	219.5326	321.2983	395.2467	405.3756	385.6100	330.1551	255.6240	158.0245	84.9131	56.0493 (83)
Total gains	433.0375	495.4030	568.4277	649.1188	701.7647	691.3207	658.5836	609.5254	546.1223	469.8009	421.0098	410.4548 (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	58.2736	58.4324	58.5888	59.3351	59.4769	60.1457	60.1457	60.2712	59.8863	59.4769	59.1908	58.8947	
alpha	4.8849	4.8955	4.9059	4.9557	4.9651	5.0097	5.0097	5.0181	4.9924	4.9651	4.9461	4.9263	
util living area	0.9981	0.9959	0.9885	0.9599	0.8775	0.7146	0.5471	0.6076	0.8585	0.9791	0.9962	0.9985	(86)
MIT	19.6989	19.8481	20.1170	20.4765	20.7760	20.9439	20.9881	20.9804	20.8541	20.4553	20.0141	19.6758	(87)
Th 2	19.9266	19.9292	19.9318	19.9438	19.9460	19.9565	19.9565	19.9584	19.9525	19.9460	19.9415	19.9367	(88)
util rest of house	0.9974	0.9945	0.9843	0.9445	0.8315	0.6222	0.4245	0.4823	0.7884	0.9684	0.9946	0.9980	(89)
MIT 2	18.1950	18.4146	18.8071	19.3275	19.7258	19.9192	19.9521	19.9504	19.8334	19.3074	18.6663	18.1684	(90)
Living area fraction	18.5632	18.7655	19.1278	19.6088	19.9830	20.1701	20.2058	20.2026	20.0833	19.5884	18.9963	18.5374	(91)
MIT	18.5632	18.7655	19.1278	19.6088	19.9830	20.1701	20.2058	20.2026	20.0833	19.5884	18.9963	18.5374	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5632	18.7655	19.1278	19.6088	19.9830	20.1701	20.2058	20.2026	20.0833	19.5884	18.9963	18.5374	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9961	0.9922	0.9799	0.9383	0.8334	0.6425	0.4547	0.5130	0.7986	0.9635	0.9924	0.9970	(94)
Ext temp.	431.3608	491.5378	556.9785	609.0991	584.8294	444.1674	299.4641	312.7016	436.1464	452.6306	417.8238	409.2247	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1236.3928	1198.6551	1088.7401	911.6779	703.4738	467.8072	302.8332	318.6955	504.6892	763.3913	1015.2386	1229.7207	(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	598.9438	475.1829	395.6306	217.8567	88.2714	0.0000	0.0000	0.0000	0.0000	231.2060	430.1387	610.4491	(98)
Space heating per m2												3047.6792	(98)
												41.8983	(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												3263.0399 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	598.9438	475.1829	395.6306	217.8567	88.2714	0.0000	0.0000	0.0000	0.0000	231.2060	430.1387	610.4491 (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)	641.2675	508.7611	423.5874	233.2513	94.5090	0.0000	0.0000	0.0000	0.0000	247.5439	460.5339	653.5857 (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	195.2485	170.5546	177.4510	157.3901	152.3814	134.2090	128.5825	143.3393	144.9223	165.0230	176.1588	190.6633 (64)
Efficiency of water heater (217)m	87.6885	87.4934	87.0112	85.8699	83.7314	80.3000	80.3000	80.3000	80.3000	85.9002	87.2128	80.3000 (216)
Fuel for water heating, kWh/month	222.6615	194.9343	203.9404	183.2890	181.9884	167.1345	160.1276	178.5048	180.4761	192.1102	201.9872	217.2244 (219)
Water heating fuel used												2284.3784 (219)
Annual totals kWh/year												
Space heating fuel - main system												3263.0399 (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)												334.2020 (232)
Total delivered energy for all uses												5956.6202 (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	3263.0399	0.2160	704.8166 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2284.3784	0.2160	493.4257 (264)
Space and water heating			1198.2423 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	334.2020	0.5190	173.4508 (268)
Total CO2, kg/m2/year			1410.6182 (272)
Emissions per m2 for space and water heating			16.4729 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3845 (272b)
Emissions per m2 for pumps and fans			0.5351 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.4729 * 1.00) + 2.3845 + 0.5351, rounded to 2 d.p.			19.3900 (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	36.1500 (1b)	x 2.6700 (2b)	= 96.5205 (1b) - (3b)
First floor	36.5900 (1c)	x 2.3200 (2c)	= 84.8888 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.4093 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1654 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4154 (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) =	0.3531 (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	0.4502	0.4413	0.4325	0.3884	0.3795	0.3354	0.3354	0.3266	0.3531	0.3795	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)
Ground Floor			36.1500	0.1200	4.3380	90.0000	3253.5000 (28a)
Brick and Block	87.3800	13.8000	73.5800	0.2400	17.6592	42.2200	3106.5476 (29a)
Pitched Roof	36.5900		36.5900	0.1000	3.6590	9.1000	332.9690 (30)
Total net area of external elements Aum(A, m ²)			160.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.3622		(33)
Party Wall 1			43.5600	0.0000	0.0000	110.0000	4791.6000 (32)
Ground Floor Stud			57.0500			9.0000	513.4500 (32c)
First Floor Stud			64.8700			9.0000	583.8300 (32c)
Internal Floor 1			36.1500			18.0000	650.7000 (32d)
Internal Ceiling 1			36.1500			9.0000	325.3500 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13557.9466 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 186.3891 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1193 (36)
Total fabric heat loss (33) + (36) = 49.4816 (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	35.9982	35.7626	35.5318	34.4474	34.2445	33.3000	33.3000	33.1251	33.6638	34.2445	34.6549	35.0840 (38)
Heat transfer coeff	85.4798	85.2442	85.0133	83.9289	83.7261	82.7816	82.7816	82.6067	83.1454	83.7261	84.1365	84.5656 (39)
Average = Sum(39)m / 12 =												83.9280 (39)
HLP	1.1751	1.1719	1.1687	1.1538	1.1510	1.1380	1.1380	1.1356	1.1430	1.1510	1.1567	1.1626 (40)
HLP (average)												1.1538 (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												2.3108 (42)
Average daily hot water use (litres/day)												89.0807 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.9888	94.4255	90.8623	87.2991	83.7358	80.1726	80.1726	83.7358	87.2991	90.8623	94.4255	97.9888 (44)
Energy conte	145.3145	127.0930	131.1486	114.3385	109.7105	94.6718	87.7274	100.6684	101.8707	118.7205	129.5927	140.7293 (45)
Energy content (annual)										Total = Sum(45)m =		1401.5861 (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	30.8793	27.0073	27.8691	24.2969	23.3135	20.1178	18.6421	21.3920	21.6475	25.2281	27.5385	29.9050 (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	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9239	16.8080	13.6692	10.3485	7.7356	6.5307	7.0567	9.1725	12.3114	15.6321	18.2450	19.4499	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6057	205.7185	200.3943	189.0598	174.7520	161.3047	152.3211	150.2083	155.5325	166.8670	181.1748	194.6221	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	(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)	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	(71)
Water heating gains (Table 5)	41.5045	40.1894	37.4584	33.7457	31.3353	27.9413	25.0565	28.7527	30.0660	33.9088	38.2479	40.1949	(72)
Total internal gains	321.6956	320.3774	309.1835	290.8155	271.4845	253.4383	242.0958	245.7951	255.5714	274.0693	295.3291	311.9283	(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		
North					0.7200	10.6334	0.6300	0.7000	0.7700		2.3398 (74)		
East					7.8200	19.6403	0.6300	0.7000	0.7700		46.9381 (76)		
West					3.1400	19.6403	0.6300	0.7000	0.7700		18.8473 (80)		
Solar gains	68.1252	133.1617	219.5326	321.2983	395.2467	405.3756	385.6100	330.1551	255.6240	158.0245	84.9131	56.0493	(83)
Total gains	389.8208	453.5391	528.7161	612.1139	666.7311	658.8139	627.7058	575.9502	511.1953	432.0938	380.2422	367.9776	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	44.0583	44.1801	44.3001	44.8724	44.9812	45.4944	45.4944	45.5907	45.2953	44.9812	44.7617	44.5346	
alpha	3.9372	3.9453	3.9533	3.9915	3.9987	4.0330	4.0330	4.0394	4.0197	3.9987	3.9841	3.9690	
util living area	0.9956	0.9915	0.9796	0.9428	0.8568	0.7060	0.5513	0.6121	0.8441	0.9685	0.9923	0.9965	(86)
MIT	19.3297	19.5160	19.8497	20.2920	20.6649	20.8952	20.9705	20.9554	20.7698	20.2692	19.7216	19.3014	(87)
Th 2	19.9399	19.9425	19.9451	19.9571	19.9594	19.9699	19.9699	19.9718	19.9658	19.9594	19.9548	19.9501	(88)
util rest of house	0.9945	0.9892	0.9739	0.9261	0.8143	0.6226	0.4349	0.4949	0.7815	0.9563	0.9899	0.9956	(89)
MIT 2	18.4145	18.6019	18.9343	19.3739	19.7192	19.9143	19.9602	19.9556	19.8230	19.3608	18.8168	18.3940	(90)
Living area fraction	18.6386	18.8257	19.1584	19.5987	19.9508	20.1544	20.2076	20.2004	20.0549	19.5832	19.0384	18.6161	(91)
Temperature adjustment												0.0000	(92)
adjusted MIT	18.6386	18.8257	19.1584	19.5987	19.9508	20.1544	20.2076	20.2004	20.0549	19.5832	19.0384	18.6161	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9925	0.9860	0.9684	0.9191	0.8139	0.6388	0.4630	0.5227	0.7878	0.9505	0.9869	0.9940	(94)
Useful gains	386.8875	447.1906	512.0226	562.5856	542.6387	420.8655	290.6209	301.0236	402.7142	410.7137	375.2748	365.7586	(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	1225.6583	1187.0874	1076.1348	897.9316	690.8039	459.8049	298.6388	313.9402	495.1190	752.1308	1004.4526	1219.1099	(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	624.0454	497.2107	419.6995	241.4491	110.2349	0.0000	0.0000	0.0000	0.0000	254.0144	453.0080	634.8934	(98)
Space heating												3234.5554	(98)
Space heating per m2												44.4674	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
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	778.1469	612.5837	627.8108	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8377	0.8980	0.8696	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	651.8243	550.1051	545.9628	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	856.2278	818.1468	759.1619	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	147.1705	199.4231	158.6202	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												505.2137 (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	36.7926	49.8558	39.6550	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												126.3034 (107)
Space cooling per m2												1.7364 (108)
Energy for space heating												44.4674 (99)
Energy for space cooling												1.7364 (108)
Total												46.2037 (109)
Dwelling Fabric Energy Efficiency (DFEE)												46.2 (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	36.1500 (1b)	x 2.6700 (2b)	= 96.5205 (1b) - (3b)
First floor	36.5900 (1c)	x 2.3200 (2c)	= 84.8888 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.4093 (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) =	0.1654 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4154 (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) =					0.3531	(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	0.4502	0.4413	0.4325	0.3884	0.3795	0.3354	0.3354	0.3266	0.3531	0.3795	0.3972	0.4149	(22b)				
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861	(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			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			11.6800	1.3258	15.4848		(27)					
Ground Floor			36.1500	0.1300	4.6995		(28a)					
Brick and Block	87.3800	13.8000	73.5800	0.1800	13.2444		(29a)					
Pitched Roof	36.5900		36.5900	0.1300	4.7567		(30)					
Total net area of external elements Aum(A, m2)			160.1200				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.3054		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3804 (36)					
Total fabric heat loss						(33) + (36) =	50.6858 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.9982	Feb 35.7626	Mar 35.5318	Apr 34.4474	May 34.2445	Jun 33.3000	Jul 33.3000	Aug 33.1251	Sep 33.6638	Oct 34.2445	Nov 34.6549	Dec 35.0840 (38)
Heat transfer coeff	86.6840	86.4485	86.2176	85.1332	84.9303	83.9858	83.9858	83.8109	84.3496	84.9303	85.3408	85.7699 (39)
Average = Sum(39)m / 12 =												85.1322 (39)
HLP	Jan 1.1917	Feb 1.1885	Mar 1.1853	Apr 1.1704	May 1.1676	Jun 1.1546	Jul 1.1546	Aug 1.1522	Sep 1.1596	Oct 1.1676	Nov 1.1732	Dec 1.1791 (40)
HLP (average)												1.1704 (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												2.3108 (42)
Average daily hot water use (litres/day)												89.0807 (43)
Daily hot water use	Jan 97.9888	Feb 94.4255	Mar 90.8623	Apr 87.2991	May 83.7358	Jun 80.1726	Jul 80.1726	Aug 83.7358	Sep 87.2991	Oct 90.8623	Nov 94.4255	Dec 97.9888 (44)
Energy conte	145.3145	127.0930	131.1486	114.3385	109.7105	94.6718	87.7274	100.6684	101.8707	118.7205	129.5927	140.7293 (45)
Energy content (annual)										Total = Sum(45)m =		1401.5861 (45)
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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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)
	30.8793	27.0073	27.8691	24.2969	23.3135	20.1178	18.6421	21.3920	21.6475	25.2281	27.5385	29.9050 (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	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	115.5383	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.9239	16.8080	13.6692	10.3485	7.7356	6.5307	7.0567	9.1725	12.3114	15.6321	18.2450	19.4499	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6057	205.7185	200.3943	189.0598	174.7520	161.3047	152.3211	150.2083	155.5325	166.8670	181.1748	194.6221	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	34.5538	(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)	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	(71)
Water heating gains (Table 5)	41.5045	40.1894	37.4584	33.7457	31.3353	27.9413	25.0565	28.7527	30.0660	33.9088	38.2479	40.1949	(72)
Total internal gains	321.6956	320.3774	309.1835	290.8155	271.4845	253.4383	242.0958	245.7951	255.5714	274.0693	295.3291	311.9283	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	0.7200	10.6334	0.6300		0.7000	0.7700	2.3398 (74)
East	7.8200	19.6403	0.6300		0.7000	0.7700	46.9381 (76)
West	3.1400	19.6403	0.6300		0.7000	0.7700	18.8473 (80)

Solar gains	68.1252	133.1617	219.5326	321.2983	395.2467	405.3756	385.6100	330.1551	255.6240	158.0245	84.9131	56.0493 (83)
Total gains	389.8208	453.5391	528.7161	612.1139	666.7311	658.8139	627.7058	575.9502	511.1953	432.0938	380.2422	367.9776 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nilm (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.2736	58.4324	58.5888	59.3351	59.4769	60.1457	60.1457	60.2712	59.8863	59.4769	59.1908	58.8947	
alpha	4.8849	4.8955	4.9059	4.9557	4.9651	5.0097	5.0097	5.0181	4.9924	4.9651	4.9461	4.9263	
util living area	0.9988	0.9972	0.9915	0.9678	0.8944	0.7391	0.5709	0.6370	0.8822	0.9851	0.9976	0.9991	(86)
MIT	19.6439	19.7954	20.0687	20.4369	20.7509	20.9347	20.9856	20.9759	20.8311	20.4111	19.9626	19.6216	(87)
Th 2	19.9266	19.9292	19.9318	19.9438	19.9460	19.9565	19.9565	19.9584	19.9525	19.9460	19.9415	19.9367	(88)
util rest of house	0.9984	0.9962	0.9883	0.9549	0.8521	0.6472	0.4446	0.5085	0.8182	0.9771	0.9965	0.9988	(89)
MIT 2	18.6896	18.8427	19.1165	19.4862	19.7759	19.9262	19.9528	19.9515	19.8553	19.4678	19.0197	18.6753	(90)
Living area fraction									fLA = Living area / (4) =			0.2448	(91)
MIT	18.9233	19.0760	19.3496	19.7190	20.0146	20.1731	20.2057	20.2023	20.0942	19.6988	19.2505	18.9070	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9233	19.0760	19.3496	19.7190	20.0146	20.1731	20.2057	20.2023	20.0942	19.6988	19.2505	18.9070	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9978	0.9951	0.9859	0.9515	0.8553	0.6679	0.4759	0.5403	0.8285	0.9746	0.9956	0.9984	(94)
Useful gains	388.9696	451.3323	521.2865	582.4045	570.2778	440.0197	298.7091	311.1574	423.5324	421.1268	378.5524	367.3743	(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	1267.6038	1225.4915	1107.8639	921.0573	706.1629	468.0645	302.8277	318.6741	505.6112	772.7627	1036.9351	1261.4154	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	653.7039	520.2350	436.4136	243.8301	101.0985	0.0000	0.0000	0.0000	0.0000	261.6171	474.0355	665.1666	(98)
Space heating												3356.1002	(98)
Space heating per m2										(98) / (4) =		46.1383	(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	789.4669	621.4953	636.9632	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8655	0.9250	0.8977	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	683.2995	574.8754	571.8045	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	856.2278	818.1468	759.1619	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	124.5083	180.9939	139.3939	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												444.8962	(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	31.1271	45.2485	34.8485	0.0000	0.0000	0.0000 (107)
Space cooling											111.2240 (107)
Space cooling per m2											1.5291 (108)
Energy for space heating											46.1383 (99)
Energy for space cooling											1.5291 (108)
Total											47.6674 (109)
Target Fabric Energy Efficiency (TFEE)											54.8 (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	36.1500 (1b)	x 2.6700 (2b)	= 96.5205 (1b) - (3b)
First floor	36.5900 (1c)	x 2.3200 (2c)	= 84.8888 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.4093 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1654 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4154 (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) =	0.3531 (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	0.4502	0.4149	0.4060	0.3795	0.3795	0.3531	0.3531	0.3442	0.3531	0.3972	0.3884	0.4149 (22b)
Effective ac	0.6013	0.5861	0.5824	0.5720	0.5720	0.5623	0.5623	0.5593	0.5623	0.5789	0.5754	0.5861 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)
Ground Floor			36.1500	0.1200	4.3380	90.0000	3253.5000 (28a)
Brick and Block	87.3800	13.8000	73.5800	0.2400	17.6592	42.2200	3106.5476 (29a)
Pitched Roof	36.5900		36.5900	0.1000	3.6590	9.1000	332.9690 (30)
Total net area of external elements Aum(A, m ²)			160.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.3622		(33)
Party Wall 1			43.5600	0.0000	0.0000	110.0000	4791.6000 (32)
Ground Floor Stud			57.0500			9.0000	513.4500 (32c)
First Floor Stud			64.8700			9.0000	583.8300 (32c)
Internal Floor 1			36.1500			18.0000	650.7000 (32d)
Internal Ceiling 1			36.1500			18.0000	650.7000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13883.2966 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 190.8619 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1193 (36)
Total fabric heat loss (33) + (36) = 49.4816 (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	35.9982	35.0840	34.8671	34.2445	34.2445	33.6638	33.6638	33.4796	33.6638	34.6549	34.4474	35.0840 (38)
Heat transfer coeff	85.4798	84.5656	84.3487	83.7261	83.7261	83.1454	83.1454	82.9611	83.1454	84.1365	83.9289	84.5656 (39)
Average = Sum(39)m / 12 =												83.9062 (39)
HLP	1.1751	1.1626	1.1596	1.1510	1.1510	1.1430	1.1430	1.1405	1.1430	1.1567	1.1538	1.1626 (40)
HLP (average)												1.1535 (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												2.3108 (42)
Average daily hot water use (litres/day)												89.0807 (43)
Daily hot water use	97.9888	94.4255	90.8623	87.2991	83.7358	80.1726	80.1726	83.7358	87.2991	90.8623	94.4255	97.9888 (44)
Energy conte	145.3145	127.0930	131.1486	114.3385	109.7105	94.6718	87.7274	100.6684	101.8707	118.7205	129.5927	140.7293 (45)
Energy content (annual)										Total = Sum(45)m =		1401.5861 (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	21.7972	19.0639	19.6723	17.1508	16.4566	14.2008	13.1591	15.1003	15.2806	17.8081	19.4389	21.1094 (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	1.6375	1.3801	1.3704	1.1479	1.0565	0.8729	0.8088	0.9694	1.0227	1.2405	1.4072	1.5858 (61)
Total heat required for water heating calculated for each month	146.9520	128.4731	132.5190	115.4864	110.7670	95.5447	88.5362	101.6378	102.8935	119.9611	131.0000	142.3152 (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	146.9520	128.4731	132.5190	115.4864	110.7670	95.5447	88.5362	101.6378	102.8935	119.9611	131.0000	142.3152 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	48.7264	42.6034	43.9495	38.3045	36.7429	31.6966	29.3716	33.7146	34.1277	39.7847	43.4414	47.1890 (65)
												1416 (64)
												0.0000 (63)
												Sum(63)m =
												1416.0859 (64)
												1416 (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	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.3097	42.0201	34.1730	25.8712	19.3390	16.3268	17.6417	22.9313	30.7784	39.0803	45.6124	48.6246	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.8891	307.0425	299.0960	282.1788	260.8239	240.7533	227.3449	224.1915	232.1380	249.0552	270.4101	290.4807	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	(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)	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	(71)
Water heating gains (Table 5)	65.4925	63.3980	59.0719	53.2007	49.3856	44.0231	39.4779	45.3153	47.3996	53.4741	60.3353	63.4260	(72)
Total internal gains	517.0821	512.8513	492.7317	461.6414	429.9392	401.4939	384.8552	392.8289	410.7067	442.0002	476.7485	502.9221	(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
North			0.7200		13.8645		0.6300		0.7000		0.7700		3.0508 (74)
East			7.8200		25.9136		0.6300		0.7000		0.7700		61.9309 (76)
West			3.1400		25.9136		0.6300		0.7000		0.7700		24.8674 (80)
Solar gains	89.8490	150.0307	245.3036	363.8516	426.1112	472.3739	438.8148	384.6825	302.2979	188.1504	110.9699	70.5769	(83)
Total gains	606.9311	662.8820	738.0352	825.4931	856.0504	873.8678	823.6700	777.5114	713.0046	630.1506	587.7184	573.4990	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.1156	45.6033	45.7206	46.0606	46.0606	46.3823	46.3823	46.4853	46.3823	45.8359	45.9492	45.6033	
alpha	4.0077	4.0402	4.0480	4.0707	4.0707	4.0922	4.0922	4.0990	4.0922	4.0557	4.0633	4.0402	
util living area	0.9763	0.9661	0.9343	0.8564	0.7172	0.5131	0.3693	0.3895	0.6415	0.8751	0.9570	0.9797	(86)
MIT	19.8299	19.9652	20.2615	20.6070	20.8581	20.9726	20.9945	20.9934	20.9340	20.6470	20.2144	19.8140	(87)
Th 2	19.9399	19.9501	19.9525	19.9594	19.9594	19.9658	19.9658	19.9679	19.9658	19.9548	19.9571	19.9501	(88)
util rest of house	0.9702	0.9577	0.9179	0.8221	0.6546	0.4262	0.2692	0.2835	0.5513	0.8348	0.9441	0.9745	(89)
MIT 2	18.9071	19.0470	19.3348	19.6598	19.8708	19.9544	19.9646	19.9664	19.9343	19.7010	19.2985	18.8999	(90)
Living area fraction	19.1331	19.2718	19.5617	19.8917	20.1125	20.2037	20.2168	20.2179	20.1791	19.9326	19.5227	19.1237	(92)
MIT	19.1331	19.2718	19.5617	19.8917	20.1125	20.2037	20.2168	20.2179	20.1791	19.9326	19.5227	19.1237	(93)
Temperature adjustment													
adjusted MIT	19.1331	19.2718	19.5617	19.8917	20.1125	20.2037	20.2168	20.2179	20.1791	19.9326	19.5227	19.1237	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	585.2961	630.3570	672.1039	676.5930	568.8024	390.4342	241.3667	240.6706	407.1583	525.4103	550.9736	555.7771	(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	1173.8997	1147.7112	1034.2610	861.6831	628.9920	399.4052	242.5179	242.0696	430.6180	684.2493	933.5195	1152.0986	(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	437.9210	347.6620	269.4448	133.2649	44.7811	0.0000	0.0000	0.0000	0.0000	118.1762	275.4331	443.6632	(98)
Space heating													2070.3464 (98)
RHI space heating demand													2070 (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	36.1500 (1b)	x 2.6700 (2b)	= 96.5205 (1b) - (3b)
First floor	36.5900 (1c)	x 2.3200 (2c)	= 84.8888 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.4093 (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) = 0.1654 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4154 (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) =	0.3531 (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	0.4502	0.4413	0.4325	0.3884	0.3795	0.3354	0.3354	0.3266	0.3531	0.3795	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)
Ground Floor			36.1500	0.1200	4.3380	90.0000	3253.5000 (28a)
Brick and Block	87.3800	13.8000	73.5800	0.2400	17.6592	42.2200	3106.5476 (29a)
Pitched Roof	36.5900		36.5900	0.1000	3.6590	9.1000	332.9690 (30)
Total net area of external elements Aum(A, m ²)			160.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.3622		(33)
Party Wall 1			43.5600	0.0000	0.0000	110.0000	4791.6000 (32)
Ground Floor Stud			57.0500			9.0000	513.4500 (32c)
First Floor Stud			64.8700			9.0000	583.8300 (32c)
Internal Floor 1			36.1500			18.0000	650.7000 (32d)
Internal Ceiling 1			36.1500			18.0000	650.7000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13883.2966 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 190.8619 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1193 (36)
Total fabric heat loss (33) + (36) = 49.4816 (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	35.9982	35.7626	35.5318	34.4474	34.2445	33.3000	33.3000	33.1251	33.6638	34.2445	34.6549	35.0840 (38)
Heat transfer coeff	85.4798	85.2442	85.0133	83.9289	83.7261	82.7816	82.7816	82.6067	83.1454	83.7261	84.1365	84.5656 (39)
Average = Sum(39)m / 12 =												83.9280 (39)
HLP	1.1751	1.1719	1.1687	1.1538	1.1510	1.1380	1.1380	1.1356	1.1430	1.1510	1.1567	1.1626 (40)
HLP (average)												1.1538 (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												2.3108 (42)
Average daily hot water use (litres/day)												89.0807 (43)
Daily hot water use	97.9888	94.4255	90.8623	87.2991	83.7358	80.1726	80.1726	83.7358	87.2991	90.8623	94.4255	97.9888 (44)
Energy conte	145.3145	127.0930	131.1486	114.3385	109.7105	94.6718	87.7274	100.6684	101.8707	118.7205	129.5927	140.7293 (45)
Energy content (annual)										Total = Sum(45)m =		1401.5861 (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	21.7972	19.0639	19.6723	17.1508	16.4566	14.2008	13.1591	15.1003	15.2806	17.8081	19.4389	21.1094 (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	1.6375	1.3801	1.3704	1.1479	1.0565	0.8729	0.8088	0.9694	1.0227	1.2405	1.4072	1.5858 (61)
Total heat required for water heating calculated for each month	146.9520	128.4731	132.5190	115.4864	110.7670	95.5447	88.5362	101.6378	102.8935	119.9611	131.0000	142.3152 (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	146.9520	128.4731	132.5190	115.4864	110.7670	95.5447	88.5362	101.6378	102.8935	119.9611	131.0000	142.3152 (64)
Heat gains from water heating, kWh/month	48.7264	42.6034	43.9495	38.3045	36.7429	31.6966	29.3716	33.7146	34.1277	39.7847	43.4414	47.1890 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1416.0859 (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	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.3097	42.0201	34.1730	25.8712	19.3390	16.3268	17.6417	22.9313	30.7784	39.0803	45.6124	48.6246	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.8891	307.0425	299.0960	282.1788	260.8239	240.7533	227.3449	224.1915	232.1380	249.0552	270.4101	290.4807	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	(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)	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	(71)
Water heating gains (Table 5)	65.4925	63.3980	59.0719	53.2007	49.3856	44.0231	39.4779	45.3153	47.3996	53.4741	60.3353	63.4260	(72)
Total internal gains	517.0821	512.8513	492.7317	461.6414	429.9392	401.4939	384.8552	392.8289	410.7067	442.0002	476.7485	502.9221	(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	
North				0.7200	10.6334	0.6300	0.7000	0.7700			2.3398 (74)	
East				7.8200	19.6403	0.6300	0.7000	0.7700			46.9381 (76)	
West				3.1400	19.6403	0.6300	0.7000	0.7700			18.8473 (80)	
Solar gains	68.1252	133.1617	219.5326	321.2983	395.2467	405.3756	385.6100	330.1551	255.6240	158.0245	84.9131	56.0493 (83)
Total gains	585.2073	646.0130	712.2643	782.9398	825.1859	806.8695	770.4652	722.9840	666.3307	600.0247	561.6616	558.9714 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.1156	45.2403	45.3631	45.9492	46.0606	46.5861	46.5861	46.6847	46.3823	46.0606	45.8359	45.6033
alpha	4.0077	4.0160	4.0242	4.0633	4.0707	4.1057	4.1057	4.1123	4.0922	4.0707	4.0557	4.0402
util living area	0.9833	0.9737	0.9504	0.8913	0.7788	0.6112	0.4610	0.5072	0.7394	0.9195	0.9728	0.9859 (86)
MIT	19.6544	19.8252	20.1211	20.4959	20.7841	20.9417	20.9856	20.9788	20.8711	20.4935	20.0119	19.6228 (87)
Th 2	19.9399	19.9425	19.9451	19.9571	19.9594	19.9699	19.9699	19.9718	19.9658	19.9594	19.9548	19.9501 (88)
util rest of house	0.9792	0.9673	0.9381	0.8642	0.7263	0.5285	0.3585	0.4020	0.6632	0.8934	0.9650	0.9824 (89)
MIT 2	18.7336	18.9037	19.1941	19.5583	19.8130	19.9410	19.9655	19.9648	19.8930	19.5664	19.0992	18.7104 (90)
Living area fraction									fLA = Living area / (4) =			0.2448 (91)
MIT	18.9590	19.1293	19.4211	19.7878	20.0508	20.1860	20.2152	20.2131	20.1325	19.7934	19.3227	18.9338 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9590	19.1293	19.4211	19.7878	20.0508	20.1860	20.2152	20.2131	20.1325	19.7934	19.3227	18.9338 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9742	0.9611	0.9306	0.8592	0.7313	0.5467	0.3835	0.4275	0.6766	0.8885	0.9590	0.9780 (94)
Useful gains	570.1228	620.8968	662.8538	672.7025	603.4929	441.0985	295.4753	309.0662	450.8397	533.1011	538.6510	546.6667 (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												
	1253.0513	1212.9646	1098.4651	913.8040	699.1774	462.4196	299.2759	314.9844	501.5707	769.7241	1028.3756	1245.9735 (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												
	508.0988	397.8696	324.0948	173.5931	71.1893	0.0000	0.0000	0.0000	0.0000	176.0475	352.6017	520.2843 (98)
Space heating												2523.7790 (98)
Space heating per m2												34.6959 (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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2797.9812 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	508.0988	397.8696	324.0948	173.5931	71.1893	0.0000	0.0000	0.0000	0.0000	176.0475	352.6017	520.2843	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	563.3024	441.0971	359.3069	192.4536	78.9238	0.0000	0.0000	0.0000	0.0000	195.1746	390.9110	576.8118	(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	146.9520	128.4731	132.5190	115.4864	110.7670	95.5447	88.5362	101.6378	102.8935	119.9611	131.0000	142.3152	(64)
Efficiency of water heater (217)m	86.6294	86.3286	85.6339	84.0322	81.1264	76.2000	76.2000	76.2000	76.2000	83.9493	85.9237	76.2000	(216)
Fuel for water heating, kWh/month	169.6329	148.8187	154.7506	137.4312	136.5363	125.3867	116.1893	133.3830	135.0308	142.8970	152.4609	164.0035	(219)
Water heating fuel used												1716.5209	(219)
Annual totals kWh/year													
Space heating fuel - main system												2797.9812	(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)												334.2020	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.63 * 908 * 1.00) =										-457.5585		-457.5585	(233)
Total delivered energy for all uses												4466.1455	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2797.9812	3.4800	97.3697 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1716.5209	3.4800	59.7349 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	334.2020	13.1900	44.0812 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-457.5585	13.1900	-60.3520 (252)
Total energy cost			270.7264 (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] =	0.9657 (257)
SAP value		86.5281
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	2797.9812	0.2160	604.3639 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1716.5209	0.2160	370.7685 (264)
Space and water heating			975.1324 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	334.2020	0.5190	173.4508 (268)
Energy saving/generation technologies			
PV Unit	-457.5585	0.5190	-237.4729 (269)
Total kg/year			950.0354 (272)
CO2 emissions per m2			13.0600 (273)
EI value			89.1876
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	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8210 = 4.239$, stars = 4
Water heating environmental impact	$0.216 / 0.8210 = 0.2631$, 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	36.1500 (1b)	x 2.6700 (2b)	= 96.5205 (1b) - (3b)
First floor	36.5900 (1c)	x 2.3200 (2c)	= 84.8888 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.4093 (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) = 0.1654 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4154 (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) =	0.3531 (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	0.4502	0.4149	0.4060	0.3795	0.3795	0.3531	0.3531	0.3442	0.3531	0.3972	0.3884	0.4149 (22b)
Effective ac	0.6013	0.5861	0.5824	0.5720	0.5720	0.5623	0.5623	0.5593	0.5623	0.5789	0.5754	0.5861 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)
Ground Floor			36.1500	0.1200	4.3380	90.0000	3253.5000 (28a)
Brick and Block	87.3800	13.8000	73.5800	0.2400	17.6592	42.2200	3106.5476 (29a)
Pitched Roof	36.5900		36.5900	0.1000	3.6590	9.1000	332.9690 (30)
Total net area of external elements Aum(A, m ²)			160.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.3622		(33)
Party Wall 1			43.5600	0.0000	0.0000	110.0000	4791.6000 (32)
Ground Floor Stud			57.0500			9.0000	513.4500 (32c)
First Floor Stud			64.8700			9.0000	583.8300 (32c)
Internal Floor 1			36.1500			18.0000	650.7000 (32d)
Internal Ceiling 1			36.1500			18.0000	650.7000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13883.2966 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 190.8619 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1193 (36)
Total fabric heat loss (33) + (36) = 49.4816 (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	35.9982	35.0840	34.8671	34.2445	34.2445	33.6638	33.6638	33.4796	33.6638	34.6549	34.4474	35.0840 (38)
Heat transfer coeff	85.4798	84.5656	84.3487	83.7261	83.7261	83.1454	83.1454	82.9611	83.1454	84.1365	83.9289	84.5656 (39)
Average = Sum(39)m / 12 =												83.9062 (39)
HLP	1.1751	1.1626	1.1596	1.1510	1.1510	1.1430	1.1430	1.1405	1.1430	1.1567	1.1538	1.1626 (40)
HLP (average)												1.1535 (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												2.3108 (42)
Average daily hot water use (litres/day)												89.0807 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.9888	94.4255	90.8623	87.2991	83.7358	80.1726	80.1726	83.7358	87.2991	90.8623	94.4255	97.9888 (44)
Energy conte	145.3145	127.0930	131.1486	114.3385	109.7105	94.6718	87.7274	100.6684	101.8707	118.7205	129.5927	140.7293 (45)
Energy content (annual)										Total = Sum(45)m =		1401.5861 (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	21.7972	19.0639	19.6723	17.1508	16.4566	14.2008	13.1591	15.1003	15.2806	17.8081	19.4389	21.1094 (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	1.6375	1.3801	1.3704	1.1479	1.0565	0.8729	0.8088	0.9694	1.0227	1.2405	1.4072	1.5858 (61)
Total heat required for water heating calculated for each month	146.9520	128.4731	132.5190	115.4864	110.7670	95.5447	88.5362	101.6378	102.8935	119.9611	131.0000	142.3152 (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	146.9520	128.4731	132.5190	115.4864	110.7670	95.5447	88.5362	101.6378	102.8935	119.9611	131.0000	142.3152 (64)
Heat gains from water heating, kWh/month	48.7264	42.6034	43.9495	38.3045	36.7429	31.6966	29.3716	33.7146	34.1277	39.7847	43.4414	47.1890 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1416.0859 (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	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.3097	42.0201	34.1730	25.8712	19.3390	16.3268	17.6417	22.9313	30.7784	39.0803	45.6124	48.6246 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.8891	307.0425	299.0960	282.1788	260.8239	240.7533	227.3449	224.1915	232.1380	249.0552	270.4101	290.4807 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754 (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)	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306 (71)
Water heating gains (Table 5)	65.4925	63.3980	59.0719	53.2007	49.3856	44.0231	39.4779	45.3153	47.3996	53.4741	60.3353	63.4260 (72)
Total internal gains	517.0821	512.8513	492.7317	461.6414	429.9392	401.4939	384.8552	392.8289	410.7067	442.0002	476.7485	502.9221 (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
North			0.7200			13.8645	0.6300		0.7000		0.7700	3.0508 (74)
East			7.8200			25.9136	0.6300		0.7000		0.7700	61.9309 (76)
West			3.1400			25.9136	0.6300		0.7000		0.7700	24.8674 (80)
Solar gains	89.8490	150.0307	245.3036	363.8516	426.1112	472.3739	438.8148	384.6825	302.2979	188.1504	110.9699	70.5769 (83)
Total gains	606.9311	662.8820	738.0352	825.4931	856.0504	873.8678	823.6700	777.5114	713.0046	630.1506	587.7184	573.4990 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.1156	45.6033	45.7206	46.0606	46.0606	46.3823	46.3823	46.4853	46.3823	45.8359	45.9492	45.6033
alpha	4.0077	4.0402	4.0480	4.0707	4.0707	4.0922	4.0922	4.0990	4.0922	4.0557	4.0633	4.0402
util living area	0.9763	0.9661	0.9343	0.8564	0.7172	0.5131	0.3693	0.3895	0.6415	0.8751	0.9570	0.9797 (86)
MIT	19.8299	19.9652	20.2615	20.6070	20.8581	20.9726	20.9945	20.9934	20.9340	20.6470	20.2144	19.8140 (87)
Th 2	19.9399	19.9501	19.9525	19.9594	19.9594	19.9658	19.9658	19.9679	19.9658	19.9548	19.9571	19.9501 (88)
util rest of house	0.9702	0.9577	0.9179	0.8221	0.6546	0.4262	0.2682	0.2835	0.5513	0.8348	0.9441	0.9745 (89)
MIT 2	18.9071	19.0470	19.3348	19.6598	19.8708	19.9544	19.9646	19.9664	19.9343	19.7010	19.2985	18.8999 (90)
Living area fraction									fLA = Living area / (4) =			0.2448 (91)
MIT	19.1331	19.2718	19.5617	19.8917	20.1125	20.2037	20.2168	20.2179	20.1791	19.9326	19.5227	19.1237 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1331	19.2718	19.5617	19.8917	20.1125	20.2037	20.2168	20.2179	20.1791	19.9326	19.5227	19.1237 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9644	0.9509	0.9107	0.8196	0.6644	0.4468	0.2930	0.3095	0.5710	0.8338	0.9375	0.9691 (94)
Useful gains	585.2961	630.3570	672.1039	676.5930	568.8024	390.4342	241.3667	240.6706	407.1583	525.4103	550.9736	555.7771 (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	1173.8997	1147.7112	1034.2610	861.6831	628.9920	399.4052	242.5179	242.0696	430.6180	684.2493	933.5195	1152.0986 (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	437.9210	347.6620	269.4448	133.2649	44.7811	0.0000	0.0000	0.0000	0.0000	118.1762	275.4331	443.6632 (98)
Space heating												2070.3464 (98)
Space heating per m2										(98) / (4) =		28.4623 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												90.2000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2295.2843	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	437.9210	347.6620	269.4448	133.2649	44.7811	0.0000	0.0000	0.0000	0.0000	118.1762	275.4331	443.6632	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	485.5001	385.4346	298.7193	147.7438	49.6464	0.0000	0.0000	0.0000	0.0000	131.0157	305.3582	491.8661	(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	146.9520	128.4731	132.5190	115.4864	110.7670	95.5447	88.5362	101.6378	102.8935	119.9611	131.0000	142.3152	(64)
Efficiency of water heater (217)m	86.2199	85.9396	85.0485	83.1108	79.7642	76.2000	76.2000	76.2000	76.2000	82.5590	85.1571	86.3471	(216)
Fuel for water heating, kWh/month	170.4386	149.4923	155.8157	138.9547	138.8681	125.3867	116.1893	133.3830	135.0308	145.3034	153.8332	164.8176	(219)
Water heating fuel used												1727.5135	(219)
Annual totals kWh/year													
Space heating fuel - main system												2295.2843	(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)												334.2020	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.63 * 1054 * 1.00) =										-531.4391		-531.4391	(233)
Total delivered energy for all uses												3900.5606	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2295.2843	7.6100	174.6711 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1727.5135	7.6100	131.4638 (247)
Pumps and fans for heating	75.0000	31.0800	23.3100 (249)
Energy for lighting	334.2020	31.0800	103.8700 (250)
Additional standing charges			105.0000 (251)
Energy saving/generation technologies			
PV Unit	-531.4391	31.0800	-165.1713 (252)
Total energy cost			373.1436 (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	2295.2843	0.2160	495.7814 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1727.5135	0.2160	373.1429 (264)
Space and water heating			868.9243 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	334.2020	0.5190	173.4508 (268)
Energy saving/generation technologies			
PV Unit	-531.4391	0.5190	-275.8169 (269)
Total kg/year			805.4832 (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	2295.2843	1.2200	2800.2468 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1727.5135	1.2200	2107.5664 (264)
Space and water heating			4907.8133 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	334.2020	3.0700	1026.0000 (268)
Energy saving/generation technologies			
PV Unit	-531.4391	3.0700	-1631.5181 (269)
Primary energy kWh/year			4532.5451 (272)
Primary energy kWh/m2/year			62.3116 (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	+ 1.4	-£ 63	-197 kg (24.5%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£63 2.71 kg/m²	B 88	B 91
Total Savings	£63 2.71 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 536 TEST (31 Jan 2024)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£127	£143	-£16
Mains gas	£411	£333	£79
Space heating	£303	£303	£0
Water heating	£131	£68	£63
Lighting	£104	£104	£0
Generated (PV)	-£165	-£165	£0
Total cost of fuels	£373	£311	£63
Total cost of uses	£373	£310	£63
Delivered energy	54 kWh/m²	40 kWh/m²	14 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.6 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	8 kg/m²	3 kg/m²
Primary energy	62 kWh/m²	47 kWh/m²	15 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	36.1500 (1b)	x 2.6700 (2b)	= 96.5205 (1b) - (3b)
First floor	36.5900 (1c)	x 2.3200 (2c)	= 84.8888 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.4093 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1654 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4154 (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) =	0.3531 (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	0.4502	0.4413	0.4325	0.3884	0.3795	0.3354	0.3354	0.3266	0.3531	0.3795	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)
Ground Floor			36.1500	0.1200	4.3380	90.0000	3253.5000 (28a)
Brick and Block	87.3800	13.8000	73.5800	0.2400	17.6592	42.2200	3106.5476 (29a)
Pitched Roof	36.5900		36.5900	0.1000	3.6590	9.1000	332.9690 (30)
Total net area of external elements Aum(A, m ²)			160.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.3622		(33)
Party Wall 1			43.5600	0.0000	0.0000	110.0000	4791.6000 (32)
Ground Floor Stud			57.0500			9.0000	513.4500 (32c)
First Floor Stud			64.8700			9.0000	583.8300 (32c)
Internal Floor 1			36.1500			18.0000	650.7000 (32d)
Internal Ceiling 1			36.1500			18.0000	650.7000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13883.2966 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 190.8619 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1193 (36)
Total fabric heat loss (33) + (36) = 49.4816 (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	35.9982	35.7626	35.5318	34.4474	34.2445	33.3000	33.3000	33.1251	33.6638	34.2445	34.6549	35.0840 (38)
Heat transfer coeff	85.4798	85.2442	85.0133	83.9289	83.7261	82.7816	82.7816	82.6067	83.1454	83.7261	84.1365	84.5656 (39)
Average = Sum(39)m / 12 =												83.9280 (39)
HLP	1.1751	1.1719	1.1687	1.1538	1.1510	1.1380	1.1380	1.1356	1.1430	1.1510	1.1567	1.1626 (40)
HLP (average)												1.1538 (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												2.3108 (42)
Average daily hot water use (litres/day)												89.0807 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.9888	94.4255	90.8623	87.2991	83.7358	80.1726	80.1726	83.7358	87.2991	90.8623	94.4255	97.9888 (44)
Energy conte	145.3145	127.0930	131.1486	114.3385	109.7105	94.6718	87.7274	100.6684	101.8707	118.7205	129.5927	140.7293 (45)
Energy content (annual)										Total = Sum(45)m =		1401.5861 (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	21.7972	19.0639	19.6723	17.1508	16.4566	14.2008	13.1591	15.1003	15.2806	17.8081	19.4389	21.1094 (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	1.6375	1.3801	1.3704	1.1479	1.0565	0.8729	0.8088	0.9694	1.0227	1.2405	1.4072	1.5858 (61)
Total heat required for water heating calculated for each month	146.9520	128.4731	132.5190	115.4864	110.7670	95.5447	88.5362	101.6378	102.8935	119.9611	131.0000	142.3152 (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												1.2940 (H8)
Utilisation factor												0.5383 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												89.0807 (H14)
Volume ratio Veff/V												0.8419 (H15)
Solar storage volume factor												0.9656 (H16)
Solar input	-24.0355	-40.1083	-68.3090	-91.5476	-113.0993	-111.1947	-109.7252	-95.8674	-75.0834	-51.2731	-28.5095	-828.8667 (H17)
Solar input (sum of months) = Sum (63)m =												-828.8667 (63)
Output from w/h	122.9165	88.3648	64.2099	23.9388	0.0000	0.0000	0.0000	5.7704	27.8100	68.6879	102.4904	122.2016 (64)
Total per year (kWh/year) = Sum (64)m =												626.3904 (64)
Heat gains from water heating, kWh/month	48.7264	42.6034	43.9495	38.3045	36.7429	31.6966	29.3716	33.7146	34.1277	39.7847	43.4414	47.1890 (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	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.3097	42.0201	34.1730	25.8712	19.3390	16.3268	17.6417	22.9313	30.7784	39.0803	45.6124	48.6246	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.8891	307.0425	299.0960	282.1788	260.8239	240.7533	227.3449	224.1915	232.1380	249.0552	270.4101	290.4807	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	(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)	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	(71)
Water heating gains (Table 5)	65.4925	63.3980	59.0719	53.2007	49.3856	44.0231	39.4779	45.3153	47.3996	53.4741	60.3353	63.4260	(72)
Total internal gains	517.0821	512.8513	492.7317	461.6414	429.9392	401.4939	384.8552	392.8289	410.7067	442.0002	476.7485	502.9221	(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		
North				0.7200	10.6334	0.6300	0.7000	0.7700		2.3398 (74)		
East				7.8200	19.6403	0.6300	0.7000	0.7700		46.9381 (76)		
West				3.1400	19.6403	0.6300	0.7000	0.7700		18.8473 (80)		
Solar gains	68.1252	133.1617	219.5326	321.2983	395.2467	405.3756	385.6100	330.1551	255.6240	158.0245	84.9131	56.0493 (83)
Total gains	585.2073	646.0130	712.2643	782.9398	825.1859	806.8695	770.4652	722.9840	666.3307	600.0247	561.6616	558.9714 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.1156	45.2403	45.3631	45.9492	46.0606	46.5861	46.5861	46.6847	46.3823	46.0606	45.8359	45.6033	
alpha	4.0077	4.0160	4.0242	4.0633	4.0707	4.1057	4.1057	4.1123	4.0922	4.0707	4.0557	4.0402	
util living area	0.9833	0.9737	0.9504	0.8913	0.7788	0.6112	0.4610	0.5072	0.7394	0.9195	0.9728	0.9859 (86)	
MIT	19.6544	19.8252	20.1211	20.4959	20.7841	20.9417	20.9856	20.9788	20.8711	20.4935	20.0119	19.6228 (87)	
Th 2	19.9399	19.9425	19.9451	19.9571	19.9594	19.9699	19.9699	19.9718	19.9658	19.9594	19.9548	19.9501 (88)	
util rest of house	0.9792	0.9673	0.9381	0.8642	0.7263	0.5285	0.3585	0.4020	0.6632	0.8934	0.9650	0.9824 (89)	
MIT 2	18.7336	18.9037	19.1941	19.5583	19.8130	19.9410	19.9655	19.9648	19.8930	19.5664	19.0992	18.7104 (90)	
Living area fraction									fLA = Living area / (4) =				0.2448 (91)
MIT	18.9590	19.1293	19.4211	19.7878	20.0508	20.1860	20.2152	20.2131	20.1325	19.7934	19.3227	18.9338 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.9590	19.1293	19.4211	19.7878	20.0508	20.1860	20.2152	20.2131	20.1325	19.7934	19.3227	18.9338 (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	0.9742	0.9611	0.9306	0.8592	0.7313	0.5467	0.3835	0.4275	0.6766	0.8885	0.9590	0.9780	(94)
Useful gains	570.1228	620.8968	662.8538	672.7025	603.4929	441.0985	295.4753	309.0662	450.8397	533.1011	538.6510	546.6667	(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	1253.0513	1212.9646	1098.4651	913.8040	699.1774	462.4196	299.2759	314.9844	501.5707	769.7241	1028.3756	1245.9735	(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	508.0988	397.8696	324.0948	173.5931	71.1893	0.0000	0.0000	0.0000	0.0000	176.0475	352.6017	520.2843	(98)
Space heating												2523.7790	(98)
Space heating per m2												34.6959	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.2000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2797.9812	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	508.0988	397.8696	324.0948	173.5931	71.1893	0.0000	0.0000	0.0000	0.0000	176.0475	352.6017	520.2843	(98)	
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)	
Space heating fuel (main heating system)	563.3024	441.0971	359.3069	192.4536	78.9238	0.0000	0.0000	0.0000	0.0000	195.1746	390.9110	576.8118	(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	122.9165	88.3648	64.2099	23.9388	0.0000	0.0000	0.0000	5.7704	27.8100	68.6879	102.4904	122.2016	(64)	
Efficiency of water heater	87.0834	87.2856	87.5404	88.2354	90.2000	76.2000	76.2000	76.2000	76.2000	85.7769	86.6161	87.1544	(216)	
(217)m														
Fuel for water heating, kWh/month	141.1480	101.2364	73.3489	27.1306	0.0000	0.0000	0.0000	7.5727	36.4961	80.0774	118.3272	140.2128	(219)	
Water heating fuel used												725.5502	(219)	
Annual totals kWh/year														
Space heating fuel - main system												2797.9812	(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)													334.2020	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.63 * 908 * 1.00) =										-457.5585		-457.5585	(233)	
Total delivered energy for all uses												3525.1748	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2797.9812	3.4800	97.3697 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	725.5502	3.4800	25.2491 (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	334.2020	13.1900	44.0812 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-457.5585	13.1900	-60.3520 (252)
Total energy cost			242.8357 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200 (256)
Energy cost factor (ECF)		[(255) x (256)] / [(4) + 45.0] =	0.8662 (257)
SAP value			87.9160
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	2797.9812	0.2160	604.3639	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	725.5502	0.2160	156.7188	(264)
Space and water heating			761.0828	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	334.2020	0.5190	173.4508	(268)
Energy saving/generation technologies				
PV Unit	-457.5585	0.5190	-237.4729	(269)
Total kg/year			761.9357	(272)
CO2 emissions per m2			10.4700	(273)
EI value			91.3284	
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	36.1500 (1b)	x 2.6700 (2b)	= 96.5205 (1b) - (3b)
First floor	36.5900 (1c)	x 2.3200 (2c)	= 84.8888 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.4093 (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) = 0.1654 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4154 (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) =	0.3531 (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	0.4502	0.4149	0.4060	0.3795	0.3795	0.3531	0.3531	0.3442	0.3531	0.3972	0.3884	0.4149 (22b)
Effective ac	0.6013	0.5861	0.5824	0.5720	0.5720	0.5623	0.5623	0.5593	0.5623	0.5789	0.5754	0.5861 (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			2.1200	1.1000	2.3320		(26)
Windows (Uw = 1.20)			11.6800	1.1450	13.3740		(27)
Ground Floor			36.1500	0.1200	4.3380	90.0000	3253.5000 (28a)
Brick and Block	87.3800	13.8000	73.5800	0.2400	17.6592	42.2200	3106.5476 (29a)
Pitched Roof	36.5900		36.5900	0.1000	3.6590	9.1000	332.9690 (30)
Total net area of external elements Aum(A, m ²)			160.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.3622		(33)
Party Wall 1			43.5600	0.0000	0.0000	110.0000	4791.6000 (32)
Ground Floor Stud			57.0500			9.0000	513.4500 (32c)
First Floor Stud			64.8700			9.0000	583.8300 (32c)
Internal Floor 1			36.1500			18.0000	650.7000 (32d)
Internal Ceiling 1			36.1500			18.0000	650.7000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13883.2966 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 190.8619 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1193 (36)
Total fabric heat loss (33) + (36) = 49.4816 (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	35.9982	35.0840	34.8671	34.2445	34.2445	33.6638	33.6638	33.4796	33.6638	34.6549	34.4474	35.0840 (38)
Heat transfer coeff	85.4798	84.5656	84.3487	83.7261	83.7261	83.1454	83.1454	82.9611	83.1454	84.1365	83.9289	84.5656 (39)
Average = Sum(39)m / 12 =												83.9062 (39)
HLP	1.1751	1.1626	1.1596	1.1510	1.1510	1.1430	1.1430	1.1405	1.1430	1.1567	1.1538	1.1626 (40)
HLP (average)												1.1535 (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												2.3108 (42)
Average daily hot water use (litres/day)												89.0807 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.9888	94.4255	90.8623	87.2991	83.7358	80.1726	80.1726	83.7358	87.2991	90.8623	94.4255	97.9888 (44)
Energy conte	145.3145	127.0930	131.1486	114.3385	109.7105	94.6718	87.7274	100.6684	101.8707	118.7205	129.5927	140.7293 (45)
Energy content (annual)										Total = Sum(45)m =		1401.5861 (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	21.7972	19.0639	19.6723	17.1508	16.4566	14.2008	13.1591	15.1003	15.2806	17.8081	19.4389	21.1094 (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	1.6375	1.3801	1.3704	1.1479	1.0565	0.8729	0.8088	0.9694	1.0227	1.2405	1.4072	1.5858 (61)
Total heat required for water heating calculated for each month	146.9520	128.4731	132.5190	115.4864	110.7670	95.5447	88.5362	101.6378	102.8935	119.9611	131.0000	142.3152 (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												1.4797 (H8)
Utilisation factor												0.4913 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												89.0807 (H14)
Volume ratio Veff/V												0.8419 (H15)
Solar storage volume factor												0.9656 (H16)
Solar input	-28.3872	-40.5236	-68.6805	-93.7189	-110.6087	-117.7086	-113.3629	-101.1346	-80.0421	-54.8046	-33.3748	-865.0216 (H17)
Solar input (sum of months) = Sum (63)m =												-865.0216 (63)
Output from w/h	118.5648	87.9495	63.8384	21.7675	0.1583	0.0000	0.0000	0.5032	22.8514	65.1564	97.6252	119.6402 (64)
Total per year (kWh/year) = Sum (64)m =												598.0549 (64)
Heat gains from water heating, kWh/month	48.7264	42.6034	43.9495	38.3045	36.7429	31.6966	29.3716	33.7146	34.1277	39.7847	43.4414	47.1890 (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	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	138.6460	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	47.3097	42.0201	34.1730	25.8712	19.3390	16.3268	17.6417	22.9313	30.7784	39.0803	45.6124	48.6246	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.8891	307.0425	299.0960	282.1788	260.8239	240.7533	227.3449	224.1915	232.1380	249.0552	270.4101	290.4807	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	51.1754	(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)	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	-92.4306	(71)
Water heating gains (Table 5)	65.4925	63.3980	59.0719	53.2007	49.3856	44.0231	39.4779	45.3153	47.3996	53.4741	60.3353	63.4260	(72)
Total internal gains	517.0821	512.8513	492.7317	461.6414	429.9392	401.4939	384.8552	392.8289	410.7067	442.0002	476.7485	502.9221	(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
North					0.7200	13.8645		0.6300	0.7000	0.7700		3.0508 (74)
East					7.8200	25.9136		0.6300	0.7000	0.7700		61.9309 (76)
West					3.1400	25.9136		0.6300	0.7000	0.7700		24.8674 (80)

Solar gains	89.8490	150.0307	245.3036	363.8516	426.1112	472.3739	438.8148	384.6825	302.2979	188.1504	110.9699	70.5769 (83)
Total gains	606.9311	662.8820	738.0352	825.4931	856.0504	873.8678	823.6700	777.5114	713.0046	630.1506	587.7184	573.4990 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	45.1156	45.6033	45.7206	46.0606	46.0606	46.3823	46.3823	46.4853	46.3823	45.8359	45.9492	45.6033	
alpha	4.0077	4.0402	4.0480	4.0707	4.0707	4.0922	4.0922	4.0990	4.0922	4.0557	4.0633	4.0402	
util living area	0.9763	0.9661	0.9343	0.8564	0.7172	0.5131	0.3693	0.3895	0.6415	0.8751	0.9570	0.9797 (86)	
MIT	19.8299	19.9652	20.2615	20.6070	20.8581	20.9726	20.9945	20.9934	20.9340	20.6470	20.2144	19.8140 (87)	
Th 2	19.9399	19.9501	19.9525	19.9594	19.9594	19.9658	19.9658	19.9679	19.9658	19.9548	19.9571	19.9501 (88)	
util rest of house	0.9702	0.9577	0.9179	0.8221	0.6546	0.4262	0.2682	0.2835	0.5513	0.8348	0.9441	0.9745 (89)	
MIT 2	18.9071	19.0470	19.3348	19.6598	19.8708	19.9544	19.9646	19.9664	19.9343	19.7010	19.2985	18.8999 (90)	
Living area fraction									fLA = Living area / (4) =			0.2448 (91)	
MIT	19.1331	19.2718	19.5617	19.8917	20.1125	20.2037	20.2168	20.2179	20.1791	19.9326	19.5227	19.1237 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.1331	19.2718	19.5617	19.8917	20.1125	20.2037	20.2168	20.2179	20.1791	19.9326	19.5227	19.1237 (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	0.9644	0.9509	0.9107	0.8196	0.6644	0.4468	0.2930	0.3095	0.5710	0.8338	0.9375	0.9691	(94)
Useful gains	585.2961	630.3570	672.1039	676.5930	568.8024	390.4342	241.3667	240.6706	407.1583	525.4103	550.9736	555.7771	(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	1173.8997	1147.7112	1034.2610	861.6831	628.9920	399.4052	242.5179	242.0696	430.6180	684.2493	933.5195	1152.0986	(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	437.9210	347.6620	269.4448	133.2649	44.7811	0.0000	0.0000	0.0000	0.0000	118.1762	275.4331	443.6632	(98)
Space heating												2070.3464	(98)
Space heating per m2											(98) / (4) =	28.4623	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.2000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2295.2843	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	437.9210	347.6620	269.4448	133.2649	44.7811	0.0000	0.0000	0.0000	0.0000	118.1762	275.4331	443.6632	(98)	
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)	
Space heating fuel (main heating system)	485.5001	385.4346	298.7193	147.7438	49.6464	0.0000	0.0000	0.0000	0.0000	131.0157	305.3582	491.8661	(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	118.5648	87.9495	63.8384	21.7675	0.1583	0.0000	0.0000	0.5032	22.8514	65.1564	97.6252	119.6402	(64)	
Efficiency of water heater	86.8021	86.9738	87.1336	87.9317	90.1417	76.2000	76.2000	76.2000	76.2000	84.6713	86.0622	86.8124	(217)	
Fuel for water heating, kWh/month	136.5920	101.1219	73.2650	24.7551	0.1756	0.0000	0.0000	0.6604	29.9887	76.9522	113.4356	137.8146	(219)	
Water heating fuel used												694.7610	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2295.2843	(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)													334.2020	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.63 * 1054 * 1.00) =										-531.4391			-531.4391	(233)
Total delivered energy for all uses													2917.8081	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2295.2843	7.6100	174.6711	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	694.7610	7.6100	52.8713	(247)
Pumps and fans for heating	75.0000	31.0800	23.3100	(249)
Pump for solar water heating	50.0000	31.0800	15.5400	(249)
Energy for lighting	334.2020	31.0800	103.8700	(250)
Additional standing charges			105.0000	(251)
Energy saving/generation technologies				
PV Unit	-531.4391	31.0800	-165.1713	(252)
Total energy cost			310.0911	(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	2295.2843	0.2160	495.7814	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	694.7610	0.2160	150.0684	(264)
Space and water heating			645.8498	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	334.2020	0.5190	173.4508	(268)
Energy saving/generation technologies				
PV Unit	-531.4391	0.5190	-275.8169	(269)
Total kg/year			608.3587	(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	2295.2843	1.2200	2800.2468	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	694.7610	1.2200	847.6085	(264)
Space and water heating			3647.8553	(265)
Pumps and fans	125.0000	3.0700	383.7500	(267)
Energy for lighting	334.2020	3.0700	1026.0000	(268)
Energy saving/generation technologies				
PV Unit	-531.4391	3.0700	-1631.5181	(269)
Primary energy kWh/year			3426.0872	(272)
Primary energy kWh/m2/year			47.1005	(273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 48	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block L
Project	Plot 48		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.04	TER	19.39
Environmental	89 B	% DER<TER	22.44		
CO ₂ Emissions (t/year)	0.81	DFEE	46.20	TFEE	54.82
General Requirements Compliance	Pass	% DFEE<TFEE	15.71		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

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

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

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0931 Plot 48	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block L
Project	Plot 48		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.04	TER	19.39
Environmental	89 B	% DER<TER	22.44		
CO ₂ Emissions (t/year)	0.81	DFEE	46.20	TFEE	54.82
General Requirements Compliance	Pass	% DFEE<TFEE	15.71		

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 0931 Plot 48	Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block L
Project	Plot 48		
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	15.04	TER	19.39
Environmental	89 B	% DER<TER	22.44		
CO ₂ Emissions (t/year)	0.81	DFEE	46.20	TFEE	54.82
General Requirements Compliance	Pass	% DFEE<TFEE	15.71		

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

Floor 000003

Floor Type: Suspended Floor

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

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

Floor height above ground: h = 0.200 m

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

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

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

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

Unheated space: None

Total thickness: 385 mm

U-value: 0.12 W/m² K

Kappa: 90.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	SAP 0931 Plot 48			Issued on Date	08/02/2024
Assessment Reference	Rev B	Prop Type Ref	Block L		
Property	Plot 48				
SAP Rating	87 B	DER	15.04	TER	19.39
Environmental	89 B	% DER<TER	22.44		
CO ₂ Emissions (t/year)	0.81	DFEE	46.20	TFEE	54.82
General Requirements Compliance	Pass	% DFEE<TFEE	15.71		
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	West
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	17.86 m	36.15 m ²	2.67 m
	1st Storey:	17.11 m	36.59 m ²	2.32 m

7.0 Living Area	17.81	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	190.86	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	87.38	73.58

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	43.56

9.2 Internal Walls			Kappa (kJ/m ² K)	Area (m ²)
Description	Construction			
Ground Floor Stud	Plasterboard on timber frame		9.00	57.05
First Floor Stud	Plasterboard on timber frame		9.00	64.87

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	36.59	36.59

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	36.15

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Other	0.12	90.00	36.15

11.2 Internal Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	36.15

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	West							2.12	
Windows	Window	[1] Brick and Block	West	None	0.00					3.14	
Side Elevation	Window	[1] Brick and Block	North	None	0.00					0.72	
Rear Elevation	Window	[1] Brick and Block	East	None	0.00					7.82	

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)	9.75	0.043	No	Catnic Thermally Broken
Independently assessed	E3 Sill	7.16	0.021	No	Knauf P5
Independently assessed	E4 Jamb	24.60	0.016	No	Knauf P6
Table K1 - Approved	E5 Ground floor (normal)	17.86	0.160	No	
Table K1 - Default	E20 Exposed floor (normal)	1.27	0.320	No	
Table K1 - Default	E21 Exposed floor (inverted)	2.41	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	14.71	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	8.40	0.060	No	
Independently assessed	E12 Gable (insulation at ceiling level)	8.71	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	14.15	0.039	No	Knauf P23
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.16	-0.091	No	Knauf P24
Independently assessed	E18 Party wall between dwellings	10.00	0.036	No	Knauf P25 Halved
Table K1 - Default	P1 Party wall - Ground floor	8.72	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.72	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.72	0.035	No	Knauf P29 Halved

Y-value 0.051 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
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20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
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	16	
Total number of L.E.L. fittings	16	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	17959	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.2	
In Summer	76.2	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	
Combi boiler type	Standard Combi	
Combi keep hot type	None	

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
0.63	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	£63	B 88	