



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project:

Contact: Tobias Whiting
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Report Issue Date: 29/11/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

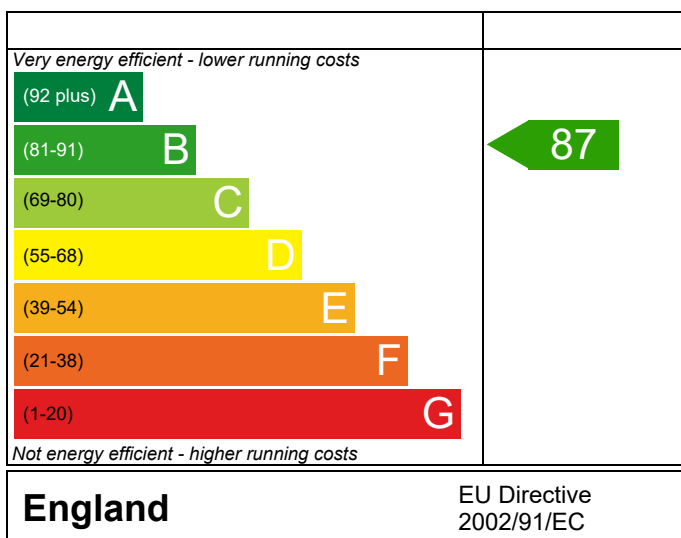
PREDICTED ENERGY ASSESSMENT

Dwelling type: House, Semi-Detached
Date of assessment: 29/11/2023
Produced by: Abacus Energy (UK) Ltd
Total floor area: 84.54 m²
DRRN: 9451-2099-2870

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.

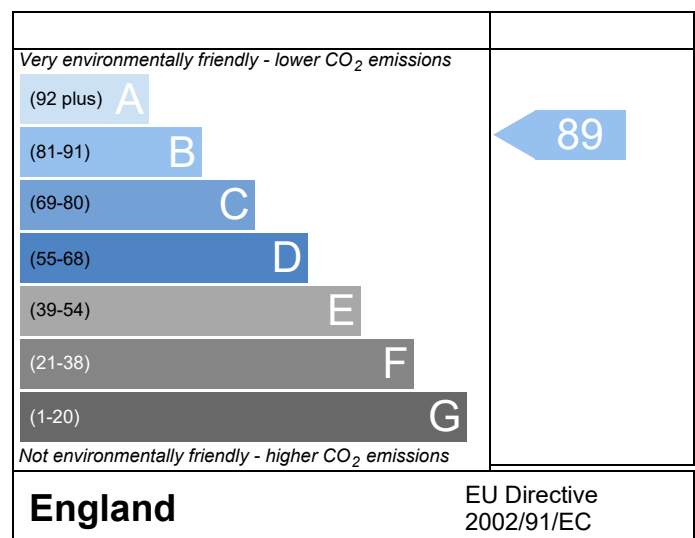
The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

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 0906 Plot 30	Issued on Date	29/11/2023
Assessment Reference	Rev B	Prop Type Ref	Block F
Property			
SAP Rating	87 B	DER	14.45
Environmental	89 B	TER	18.15
CO ₂ Emissions (t/year)	0.90	% DER<TER	20.39
General Requirements Compliance	Pass	DfEE	43.87
		TfEE	51.85
		% DfEE<TfEE	15.40
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com		Assessor ID
			E477-0001
Client	Foreman Homes, FORE		

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TfEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.15	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.45	kgCO ₂ /m ²	Pass
	-3.70 (-20.4%)	kgCO ₂ /m ²	

1b TfEE and DfEE

Target Fabric Energy Efficiency (TfEE)	51.85	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DfEE)	43.87	kWh/m ² /yr	
	-8.0 (-15.4%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 32CDi Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

0.72 m², No overhang

Windows facing East

3.73 m², No overhang

Windows facing West

8.50 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Floor U-value

0.12

W/m²K

Door U-value

1.10

W/m²K

Photovoltaic array

0.75

kW

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RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating	£4,000 - £6,000	£85	B 88	B 91	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£85	B 88	B 91	

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0906 Plot 30	Issued on Date	29/11/2023
Assessment Reference	Rev B	Prop Type Ref	Block F
Property			

SAP Rating	87 B	DER	14.45	TER	18.15
Environmental	89 B	% DER<TER	20.39		
CO ₂ Emissions (t/year)	0.90	DFEE	43.87	TFEE	51.85
General Requirements Compliance	Pass	% DFEE<TFEE	15.40		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com	Assessor ID	E477-0001
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Client	Foreman Homes, FORE
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	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.093	0.46	0.04	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	1.37	0.11	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	3.75	0.27	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	3.74	0.24	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.067	1.59	0.11	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	8.83	0.19	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	27.00	0.43	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	18.37	2.94	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.73	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Independently assessed	0.071	9.66	0.69	Knauf P16
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	8.86	0.39	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	10.00	0.39	Knauf P23
External wall	E18 Party wall between dwellings	Independently assessed	0.036	10.00	0.36	Knauf P25 Halved
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.86	1.42	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.86	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.035	8.86	0.31	Knauf P29 Halved

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

FULL SAP CALCULATION PRINTOUT

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CO ₂ Emissions (t/year)	0.90	DFEE	43.87	TFEE	51.85	
General Requirements Compliance	Pass	% DFEE<TFEE	15.40			
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Semi-Detached House, total floor area 85 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.15 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.45 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.9 kWh/m²/yrOK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 32CDi Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading:
Average
Windows facing North: 0.72 m², No overhang
Windows facing East: 3.73 m², No overhang
Windows facing West: 8.50 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Door U-value 1.10 W/m²K
Photovoltaic array 0.75 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1893 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4393 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3734 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4760	0.4667	0.4574	0.4107	0.4014	0.3547	0.3547	0.3454	0.3734	0.4014	0.4200	0.4387 (22b)
Effective ac	0.6133	0.6089	0.6046	0.5843	0.5806	0.5629	0.5629	0.5596	0.5697	0.5806	0.5882	0.5962 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			18.0000	760.8600 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 15069.9280 (34)
178.2580 (35)
7.8704 (36)
(33) + (36) = 53.2151 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.7757	42.4688	42.1680	40.7551	40.4908	39.2602	39.2602	39.0323	39.7342	40.4908	41.0255	41.5846 (38)
Heat transfer coeff	95.9907	95.6839	95.3831	93.9702	93.7059	92.4753	92.4753	92.2474	92.9493	93.7059	94.2406	94.7997 (39)
Average = Sum(39)m / 12 =												93.9689 (39)
HLP	1.1354	1.1318	1.1283	1.1115	1.1084	1.0939	1.0939	1.0912	1.0995	1.1084	1.1147	1.1214 (40)
HLP (average)												1.1115 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	25.3185	22.8670	25.2767	24.4141	25.1935	24.3412	25.1280	25.1705	24.3809	25.2423	24.4815	25.3057 (61)
Total heat required for water heating calculated for each month	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (64)
Heat gains from water heating, kWh/month	57.6433	50.5960	52.6305	46.4789	45.0395	39.5159	37.2604	41.8408	42.0680	48.2333	51.8823	56.0209 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1785.6304 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4560	19.0570	15.4982	11.7331	8.7707	7.4046	8.0009	10.3998	13.9587	17.7237	20.6862	22.0523 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.6671	231.0400	225.0605	212.3308	196.2619	181.1594	171.0700	168.6972	174.6767	187.4063	203.4752	218.5777 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353 (71)
Water heating gains (Table 5)	77.4775	75.2916	70.7399	64.5540	60.5370	54.8833	50.0812	56.2376	58.4277	64.8297	72.0588	75.2970 (72)
Total internal gains	391.7513	389.5394	375.4493	352.7687	329.7203	307.5980	293.3028	299.4854	311.2138	334.1105	360.3709	380.0777 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				0.7200	10.6334	0.6300	0.7000	0.7700	2.3398 (74)			
East				3.7300	19.6403	0.6300	0.7000	0.7700	22.3887 (76)			
West				8.5000	19.6403	0.6300	0.7000	0.7700	51.0197 (80)			

Solar gains	75.7482	148.0738	244.0907	357.1149	439.1412	450.3094	428.3888	366.9015	284.1861	175.7190	94.4180	62.3180 (83)
Total gains	467.4995	537.6131	619.5401	709.8835	768.8614	757.9074	721.6916	666.3869	595.3998	509.8295	454.7890	442.3958 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	43.6093	43.7492	43.8872	44.5470	44.6727	45.2671	45.2671	45.3790	45.0363	44.6727	44.4192	44.1572
alpha	3.9073	3.9166	3.9258	3.9698	3.9782	4.0178	4.0178	4.0253	4.0024	3.9782	3.9613	3.9438
util living area	0.9942	0.9894	0.9759	0.9359	0.8458	0.6918	0.5377	0.5948	0.8287	0.9623	0.9901	0.9954 (86)
MIT	19.3589	19.5445	19.8758	20.3147	20.6791	20.9017	20.9726	20.9593	20.7848	20.2978	19.7544	19.3331 (87)
Th 2	19.9720	19.9749	19.9778	19.9914	19.9940	20.0058	20.0058	20.0081	20.0013	19.9940	19.9888	19.9834 (88)
util rest of house	0.9928	0.9868	0.9697	0.9185	0.8034	0.6114	0.4275	0.4837	0.7660	0.9487	0.9871	0.9942 (89)
MIT 2	18.4722	18.6590	18.9888	19.4256	19.7625	19.9527	19.9965	19.9927	19.8669	19.4185	18.8794	18.4552 (90)
Living area fraction									fLA = Living area / (4) =			0.2126 (91)
MIT	18.6607	18.8472	19.1773	19.6145	19.9574	20.1544	20.2040	20.1982	20.0620	19.6054	19.0654	18.6418 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6607	18.8472	19.1773	19.6145	19.9574	20.1544	20.2040	20.1982	20.0620	19.6054	19.0654	18.6418 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9903	0.9828	0.9633	0.9106	0.8017	0.6244	0.4504	0.5063	0.7704	0.9420	0.9835	0.9921 (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	1378.4895	1334.5218	1209.2007	1006.8484	773.7635	513.6466	333.2767	350.3733	554.1623	843.8559	1127.6232	1369.0756 (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	681.1546	541.7231	455.6118	259.5076	117.1072	0.0000	0.0000	0.0000	0.0000	270.5338	489.8552	692.0476 (98)
Space heating												3507.5409 (98)
Space heating per m2												(98) / (4) = 41.4897 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3867.1896 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	681.1546	541.7231	455.6118	259.5076	117.1072	0.0000	0.0000	0.0000	0.0000	270.5338	489.8552	692.0476	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	750.9974	597.2691	502.3283	286.1164	129.1149	0.0000	0.0000	0.0000	0.0000	298.2732	540.0830	763.0073	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629	(64)
Efficiency of water heater (217)m	89.9466	89.8860	89.7442	89.4088	88.7496	87.2000	87.2000	87.2000	87.2000	89.4127	89.8037	87.2000	(216)
Fuel for water heating, kWh/month	199.7244	175.6026	183.3644	163.1200	159.6719	143.2162	135.6606	151.4705	152.0293	169.2442	180.5174	194.2416	(219)
Water heating fuel used												2007.8630	(219)
Annual totals kWh/year													
Space heating fuel - main system												3867.1896	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												378.9191	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.75 * 908 * 1.00) =										-544.7125		-544.7125	(233)
Total delivered energy for all uses												5784.2592	(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	3867.1896	0.2160	835.3129 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2007.8630	0.2160	433.6984 (264)
Space and water heating			1269.0114 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.9191	0.5190	196.6590 (268)
Energy saving/generation technologies			
PV Unit	-544.7125	0.5190	-282.7058 (269)
Total CO2, kg/year			1221.8896 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.4500 (273)

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

DER		14.4500	ZC1
Total Floor Area		84.5400	
Assumed number of occupants	TFA	2.5434	N
CO2 emission factor in Table 12 for electricity displaced from grid	N	0.5190	EF
CO2 emissions from appliances, equation (L14)		16.0283	ZC2
CO2 emissions from cooking, equation (L16)		2.1297	ZC3
Total CO2 emissions		32.6080	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		32.6080	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1419 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3919 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3332 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4248	0.4164	0.4081	0.3665	0.3581	0.3165	0.3165	0.3082	0.3332	0.3581	0.3748	0.3915 (22b)
Effective ac	0.5902	0.5867	0.5833	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686		(27)
Ground Floor			42.2700	0.1300	5.4951		(28a)
Brick and Block	93.6500	15.1000	78.5500	0.1800	14.1390		(29a)
Pitched Roof	42.2700		42.2700	0.1300	5.4951		(30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.4478		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.6594 (36)
Total fabric heat loss						(33) + (36) =	54.1072 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	41.1648	40.9205	40.6810	39.5561	39.3457	38.3659	38.3659	38.1845	38.7433	39.3457	39.7714	40.2165 (38)
Heat transfer coeff	95.2720	95.0277	94.7882	93.6633	93.4528	92.4731	92.4731	92.2917	92.8505	93.4528	93.8786	94.3237 (39)
Average = Sum(39)m / 12 =												93.6623 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1269	1.1241	1.1212	1.1079	1.1054	1.0938	1.0938	1.0917	1.0983	1.1054	1.1105	1.1157 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	49.1740	45.7216	45.3173	41.9892	43.3889	45.3173	45.7216	49.1740	49.3151	50.9589 (61)
Solar input	205.2856	181.0025	188.4563	167.1512	161.8319	142.5325	136.5570	152.2290	153.9102	175.2575	186.9450	200.4161 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	205.2856	181.0025	188.4563	167.1512	161.8319	142.5325	136.5570	152.2290	153.9102	175.2575	186.9450	200.4161 (64)
Heat gains from water heating, kWh/month	64.0534	56.3861	58.6049	51.8058	50.0704	43.9279	41.8256	46.8775	47.4031	54.2162	58.0907	62.4342 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4560	19.0570	15.4982	11.7331	8.7707	7.4046	8.0009	10.3998	13.9587	17.7237	20.6862	22.0523	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.6671	231.0400	225.0605	212.3308	196.2619	181.1594	171.0700	168.6972	174.6767	187.4063	203.4752	218.5777	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	(71)
Water heating gains (Table 5)	86.0932	83.9079	78.7700	71.9524	67.2990	61.0110	56.2172	63.0074	65.8377	72.8713	80.6815	83.9170	(72)
Total internal gains	400.3671	398.1556	383.4794	360.1671	336.4823	313.7257	299.4389	306.2551	318.6237	342.1521	368.9937	388.6978	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North				0.7200	10.6334	0.6300	0.7000			0.7700			2.3398 (74)
East				3.7300	19.6403	0.6300	0.7000			0.7700			22.3887 (76)
West				8.5000	19.6403	0.6300	0.7000			0.7700			51.0197 (80)
Solar gains	75.7482	148.0738	244.0907	357.1149	439.1412	450.3094	428.3888	366.9015	284.1861	175.7190	94.4180	62.3180	(83)
Total gains	476.1152	546.2294	627.5701	717.2820	775.6234	764.0351	727.8277	673.1567	602.8098	517.8711	463.4118	451.0158	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.6218	61.7803	61.9364	62.6802	62.8214	63.4869	63.4869	63.6117	63.2289	62.8214	62.5364	62.2413	
alpha	5.1081	5.1187	5.1291	5.1787	5.1881	5.2325	5.2325	5.2408	5.2153	5.1881	5.1691	5.1494	
util living area	0.9985	0.9967	0.9902	0.9635	0.8821	0.7170	0.5470	0.6086	0.8635	0.9818	0.9969	0.9989	(86)
MIT	19.7554	19.9000	20.1591	20.5049	20.7929	20.9506	20.9901	20.9833	20.8653	20.4809	20.0568	19.7322	(87)
Th 2	19.9789	19.9812	19.9835	19.9944	19.9964	20.0059	20.0059	20.0076	20.0022	19.9964	19.9923	19.9880	(88)
util rest of house	0.9980	0.9955	0.9866	0.9495	0.8382	0.6278	0.4296	0.4883	0.7966	0.9725	0.9957	0.9985	(89)
MIT 2	18.3146	18.5273	18.9057	19.4072	19.7911	19.9726	20.0022	20.0006	19.8908	19.3820	18.7649	18.2871	(90)
Living area fraction									fLA = Living area / (4) =			0.2126	(91)
MIT	18.6208	18.8191	19.1722	19.6405	20.0040	20.1805	20.2122	20.2095	20.0980	19.6156	19.0395	18.5943	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6208	18.8191	19.1722	19.6405	20.0040	20.1805	20.2122	20.2095	20.0980	19.6156	19.0395	18.5943	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9970	0.9936	0.9826	0.9432	0.8386	0.6446	0.4547	0.5139	0.8041	0.9676	0.9939	0.9977	(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	1364.3748	1322.7005	1201.1700	1005.9938	776.0344	516.0476	334.0296	351.5861	556.9147	842.5357	1120.8662	1357.7218	(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	661.9319	524.1292	434.8929	237.2122	93.4316	0.0000	0.0000	0.0000	0.0000	254.0521	475.4122	675.3589	(98)
Space heating												3356.4210	(98)
Space heating per m2												39.7022	(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												3593.5985 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	661.9319	524.1292	434.8929	237.2122	93.4316	0.0000	0.0000	0.0000	0.0000	254.0521	475.4122	675.3589 (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)	708.7065	561.1662	465.6240	253.9745	100.0338	0.0000	0.0000	0.0000	0.0000	272.0044	509.0066	723.0824 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	205.2856	181.0025	188.4563	167.1512	161.8319	142.5325	136.5570	152.2290	153.9102	175.2575	186.9450	200.4161 (64)
Efficiency of water heater (217)m	87.7863	87.5726	87.0883	85.9321	83.7238	80.3000	80.3000	80.3000	80.3000	85.9850	87.3008	80.3000 (216)
Fuel for water heating, kWh/month	233.8471	206.6885	216.3967	194.5154	193.2926	177.5000	170.0585	189.5754	191.6690	203.8234	214.1388	228.0805 (219)
Water heating fuel used												2419.5859 (219)
Annual totals kWh/year												
Space heating fuel - main system												3593.5985 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												378.9191 (232)
Total delivered energy for all uses												6467.1035 (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	3593.5985	0.2160	776.2173 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2419.5859	0.2160	522.6306 (264)
Space and water heating			1298.8478 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.9191	0.5190	196.6590 (268)
Total CO2, kg/m2/year			1534.4318 (272)
Emissions per m2 for space and water heating			15.3637 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3262 (272b)
Emissions per m2 for pumps and fans			0.4604 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3637 * 1.00) + 2.3262 + 0.4604, rounded to 2 d.p.			18.1500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1419 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3919 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3332 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4248	0.4164	0.4081	0.3665	0.3581	0.3165	0.3165	0.3082	0.3332	0.3581	0.3748	0.3915 (22b)
Effective ac	0.5902	0.5867	0.5833	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			9.0000	380.4300 (32e)

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

$$(28)...(30) + (32) + (32a)...(32e) = 14689.4980 (34)$$

$$173.7580 (35)$$

$$7.8704 (36)$$

$$(33) + (36) = 53.2151 (37)$$

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	41.1648	40.9205	40.6810	39.5561	39.3457	38.3659	38.3659	38.1845	38.7433	39.3457	39.7714	40.2165 (38)
Heat transfer coeff	94.3799	94.1356	93.8961	92.7712	92.5607	91.5810	91.5810	91.3996	91.9584	92.5607	92.9865	93.4316 (39)
Average = Sum(39)m / 12 =												92.7702 (39)
HLP	1.1164	1.1135	1.1107	1.0974	1.0949	1.0833	1.0833	1.0811	1.0878	1.0949	1.0999	1.1052 (40)
HLP (average)												1.0974 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (45)

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Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	32.7944	28.6822	29.5975	25.8038	24.7594	21.3654	19.7982	22.7188	22.9901	26.7927	29.2464	31.7596 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4560	19.0570	15.4982	11.7331	8.7707	7.4046	8.0009	10.3998	13.9587	17.7237	20.6862	22.0523	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.6671	231.0400	225.0605	212.3308	196.2619	181.1594	171.0700	168.6972	174.6767	187.4063	203.4752	218.5777	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	(71)
Water heating gains (Table 5)	44.0785	42.6819	39.7816	35.8386	33.2787	29.6742	26.6105	30.5360	31.9307	36.0117	40.6199	42.6877	(72)
Total internal gains	355.3524	353.9296	341.4910	321.0533	299.4620	279.3889	266.8322	270.7837	281.7167	302.2925	325.9321	344.4685	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					0.7200	10.6334	0.6300	0.7000			0.7700			2.3398 (74)
East					3.7300	19.6403	0.6300	0.7000			0.7700			22.3887 (76)
West					8.5000	19.6403	0.6300	0.7000			0.7700			51.0197 (80)
Solar gains	75.7482	148.0738	244.0907	357.1149	439.1412	450.3094	428.3888	366.9015	284.1861	175.7190	94.4180			62.3180 (83)
Total gains	431.1005	502.0034	585.5817	678.1682	738.6032	729.6983	695.2210	637.6852	565.9028	478.0115	420.3501			406.7865 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.2339	43.3462	43.4567	43.9836	44.0837	44.5553	44.5553	44.6437	44.3724	44.0837	43.8818	43.6728	
alpha	3.8823	3.8897	3.8971	3.9322	3.9389	3.9704	3.9704	3.9762	3.9582	3.9389	3.9255	3.9115	
util living area	0.9953	0.9909	0.9784	0.9405	0.8536	0.7034	0.5497	0.6103	0.8412	0.9670	0.9918	0.9962	(86)
MIT	19.3072	19.4964	19.8347	20.2814	20.6583	20.8917	20.9690	20.9535	20.7645	20.2577	19.7026	19.2770	(87)
Th 2	19.9875	19.9898	19.9921	20.0030	20.0050	20.0145	20.0145	20.0163	20.0108	20.0050	20.0009	19.9966	(88)
util rest of house	0.9941	0.9886	0.9728	0.9243	0.8131	0.6245	0.4392	0.4993	0.7819	0.9552	0.9893	0.9953	(89)
MIT 2	18.4350	18.6250	18.9618	19.4053	19.7556	19.9548	20.0036	19.9982	19.8607	19.3909	18.8397	18.4118	(90)
Living area fraction	18.6204	18.8102	19.1474	19.5915	19.9475	20.1539	20.2088	20.2013	20.0528	19.5752	19.0231	18.5957	(92)
Temperature adjustment	18.6204	18.8102	19.1474	19.5915	19.9475	20.1539	20.2088	20.2013	20.0528	19.5752	19.0231	18.5957	(93)
adjusted MIT	18.6204	18.8102	19.1474	19.5915	19.9475	20.1539	20.2088	20.2013	20.0528	19.5752	19.0231	18.5957	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	427.6108	494.5022	566.0971	621.3602	598.6181	464.5289	321.2142	332.5722	444.1420	453.3933	414.5039	404.1399	(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	1351.5559	1309.4483	1187.5377	991.8615	763.3938	508.6325	330.4970	347.4333	547.4095	830.7492	1108.6902	1345.0125	(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	687.4152	547.6438	462.3518	266.7609	122.5931	0.0000	0.0000	0.0000	0.0000	280.7528	499.8141	700.0092	(98)
Space heating												3567.3410	(98)
Space heating per m2												42.1971	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	860.8615	677.6995	694.6368	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8356	0.8959	0.8674	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	719.3280	607.1630	602.5150	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	948.5798	906.3267	840.8397	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	165.0613	222.5778	177.3136	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												564.9526 (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	41.2653	55.6444	44.3284	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												141.2382 (107)
Space cooling per m2												1.6707 (108)
Energy for space heating												42.1971 (99)
Energy for space cooling												1.6707 (108)
Total												43.8677 (109)
Dwelling Fabric Energy Efficiency (DFEE)												43.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1419 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3919 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3332 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4248	0.4164	0.4081	0.3665	0.3581	0.3165	0.3165	0.3082	0.3332	0.3581	0.3748	0.3915 (22b)
Effective ac	0.5902	0.5867	0.5833	0.5671	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.1500	1.0000	2.1500		(26)
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686		(27)
Ground Floor			42.2700	0.1300	5.4951		(28a)
Brick and Block	93.6500	15.1000	78.5500	0.1800	14.1390		(29a)
Pitched Roof	42.2700		42.2700	0.1300	5.4951		(30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.4478		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.6594 (36)
Total fabric heat loss						(33) + (36) =	54.1072 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	41.1648	40.9205	40.6810	39.5561	39.3457	38.3659	38.3659	38.1845	38.7433	39.3457	39.7714	40.2165 (38)
Heat transfer coeff	95.2720	95.0277	94.7882	93.6633	93.4528	92.4731	92.4731	92.2917	92.8505	93.4528	93.8786	94.3237 (39)
Average = Sum(39)m / 12 =												93.6623 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1269	1.1241	1.1212	1.1079	1.1054	1.0938	1.0938	1.0917	1.0983	1.1054	1.1105	1.1157 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Calculation Type: New Build (As Designed)

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	32.7944	28.6822	29.5975	25.8038	24.7594	21.3654	19.7982	22.7188	22.9901	26.7927	29.2464	31.7596 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692	127.1692 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4560	19.0570	15.4982	11.7331	8.7707	7.4046	8.0009	10.3998	13.9587	17.7237	20.6862	22.0523 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.6671	231.0400	225.0605	212.3308	196.2619	181.1594	171.0700	168.6972	174.6767	187.4063	203.4752	218.5777 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169	35.7169 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353 (71)
Water heating gains (Table 5)	44.0785	42.6819	39.7816	35.8386	33.2787	29.6742	26.6105	30.5360	31.9307	36.0117	40.6199	42.6877 (72)
Total internal gains	355.3524	353.9296	341.4910	321.0533	299.4620	279.3889	266.8322	270.7837	281.7167	302.2925	325.9321	344.4685 (73)

6. Solar gains												

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d			Gains W
North				0.7200	10.6334	0.6300	0.7000		0.7700			2.3398 (74)
East				3.7300	19.6403	0.6300	0.7000		0.7700			22.3887 (76)
West				8.5000	19.6403	0.6300	0.7000		0.7700			51.0197 (80)

Solar gains	75.7482	148.0738	244.0907	357.1149	439.1412	450.3094	428.3888	366.9015	284.1861	175.7190	94.4180	62.3180 (83)
Total gains	431.1005	502.0034	585.5817	678.1682	738.6032	729.6983	695.2210	637.6852	565.9028	478.0115	420.3501	406.7865 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6218	61.7803	61.9364	62.6802	62.8214	63.4869	63.4869	63.6117	63.2289	62.8214	62.5364	62.2413
alpha	5.1081	5.1187	5.1291	5.1787	5.1881	5.2325	5.2325	5.2408	5.2153	5.1881	5.1691	5.1494
util living area	0.9991	0.9978	0.9927	0.9707	0.8983	0.7408	0.5700	0.6371	0.8863	0.9870	0.9981	0.9993 (86)
MIT	19.7055	19.8514	20.1143	20.4682	20.7697	20.9424	20.9881	20.9795	20.8440	20.4399	20.0093	19.6830 (87)
Th 2	19.9789	19.9812	19.9835	19.9944	19.9964	20.0059	20.0059	20.0076	20.0022	19.9964	19.9923	19.9880 (88)
util rest of house	0.9988	0.9970	0.9900	0.9590	0.8580	0.6521	0.4491	0.5137	0.8253	0.9801	0.9972	0.9991 (89)
MIT 2	18.7928	18.9402	19.2037	19.5591	19.8378	19.9789	20.0028	20.0016	19.9114	19.5376	19.1071	18.7776 (90)
Living area fraction									fLA = Living area / (4) =			0.2126 (91)
MIT	18.9868	19.1339	19.3972	19.7523	20.0359	20.1837	20.2122	20.2095	20.1097	19.7294	19.2988	18.9701 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9868	19.1339	19.3972	19.7523	20.0359	20.1837	20.2122	20.2095	20.1097	19.7294	19.2988	18.9701 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9983	0.9961	0.9879	0.9554	0.8599	0.6693	0.4750	0.5401	0.8331	0.9776	0.9964	0.9987 (94)
Ext temp.	430.3709	500.0226	578.5081	647.9310	635.1057	488.3901	330.2463	344.4445	471.4804	467.3080	418.8508	406.2777 (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	1399.2416	1352.6145	1222.5047	1016.4664	779.0144	516.3427	334.0330	351.5809	557.9997	853.1703	1145.2099	1393.1659 (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	720.8398	572.9418	479.1335	265.3455	107.0681	0.0000	0.0000	0.0000	0.0000	287.0815	522.9786	734.2448 (98)
Space heating												3689.6336 (98)
Space heating per m2										(98) / (4) =		43.6436 (99)

8c. Space cooling requirement												

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	869.2470	684.3009	701.4166	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8738	0.9319	0.9054	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	759.5897	637.6792	635.0291	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	948.5798	906.3267	840.8397	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	136.0729	199.8737	153.1231	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												489.0696 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	34.0182	49.9684	38.2808	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												122.2674 (107)
Space cooling per m2												1.4463 (108)
Energy for space heating												43.6436 (99)
Energy for space cooling												1.4463 (108)
Total												45.0899 (109)
Target Fabric Energy Efficiency (TFEE)												51.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1893 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4393 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3734 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.4760	0.4387	0.4294	0.4014	0.4014	0.3734	0.3734	0.3640	0.3734	0.4200	0.4107	0.4387 (22b)
Effective ac	0.6133	0.5962	0.5922	0.5806	0.5806	0.5697	0.5697	0.5663	0.5697	0.5882	0.5843	0.5962 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			18.0000	760.8600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15069.9280 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 178.2580 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8704 (36)
Total fabric heat loss (33) + (36) = 53.2151 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.7757	41.5846	41.3020	40.4908	40.4908	39.7342	39.7342	39.4942	39.7342	41.0255	40.7551	41.5846 (38)
Heat transfer coeff	95.9907	94.7997	94.5171	93.7059	93.7059	92.9493	92.9493	92.7093	92.9493	94.2406	93.9702	94.7997 (39)
Average = Sum(39)m / 12 =												93.9406 (39)
HLP	1.1354	1.1214	1.1180	1.1084	1.1084	1.0995	1.0995	1.0966	1.0995	1.1147	1.1115	1.1214 (40)
HLP (average)												1.1112 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	25.3185	22.8670	25.2767	24.4141	25.1935	24.3412	25.1280	25.1705	24.3809	25.2423	24.4815	25.3057 (61)
Total heat required for water heating calculated for each month	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (64)
RHI water heating demand												
Heat gains from water heating, kWh/month	57.6433	50.5960	52.6305	46.4789	45.0395	39.5159	37.2604	41.8408	42.0680	48.2333	51.8823	56.0209 (65)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Total per year (kWh/year) = Sum(64)m =												1785.6304 (64)
												1786 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6399	47.6425	38.7455	29.3328	21.9266	18.5114	20.0022	25.9996	34.8966	44.3093	51.7155	55.1307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.2942	344.8358	335.9112	316.9117	292.9282	270.3872	255.3284	251.7868	260.7114	279.7109	303.6944	326.2354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	(71)
Water heating gains (Table 5)	77.4775	75.2916	70.7399	64.5540	60.5370	54.8833	50.0812	56.2376	58.4277	64.8297	72.0588	75.2970	(72)
Total internal gains	579.0830	574.4413	552.0679	517.4698	482.0632	450.4532	432.0831	440.6954	460.7071	495.5213	534.1400	563.3345	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				0.7200	13.8645		0.6300		0.7000		0.7700		3.0508 (74)
East				3.7300	25.9136		0.6300		0.7000		0.7700		29.5399 (76)
West				8.5000	25.9136		0.6300		0.7000		0.7700		67.3161 (80)
Solar gains	99.9068	166.8315	272.7281	404.3701	473.3790	524.6748	487.4402	427.4506	336.0480	209.2129	123.3950		78.4747 (83)
Total gains	678.9898	741.2727	824.7960	921.8400	955.4422	975.1279	919.5233	868.1459	796.7551	704.7342	657.5350		641.8091 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.6093	44.1572	44.2892	44.6727	44.6727	45.0363	45.0363	45.1529	45.0363	44.4192	44.5470	44.1572	
alpha	3.9073	3.9438	3.9526	3.9782	3.9782	4.0024	4.0024	4.0102	4.0024	3.9613	3.9698	3.9438	
util living area	0.9746	0.9641	0.9316	0.8533	0.7154	0.5127	0.3694	0.3893	0.6394	0.8718	0.9545	0.9782 (86)	
MIT	19.7951	19.9356	20.2378	20.5914	20.8496	20.9701	20.9938	20.9926	20.9299	20.6339	20.1932	19.7825 (87)	
Th 2	19.9720	19.9834	19.9861	19.9940	19.9940	20.0013	20.0013	20.0036	20.0013	19.9888	19.9914	19.9834 (88)	
util rest of house	0.9685	0.9557	0.9156	0.8205	0.6556	0.4294	0.2720	0.2873	0.5533	0.8330	0.9418	0.9728 (89)	
MIT 2	18.9034	19.0494	19.3436	19.6782	19.8975	19.9882	19.9998	20.0018	19.9663	19.7212	19.3100	18.9004 (90)	
Living area fraction	19.0929	19.2378	19.5336	19.8723	20.0999	20.1969	20.2111	20.2124	20.1711	19.9152	19.4977	0.2126 (91)	
MIT	19.0929	19.2378	19.5336	19.8723	20.0999	20.1969	20.2111	20.2124	20.1711	19.9152	19.4977	19.0879 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.0929	19.2378	19.5336	19.8723	20.0999	20.1969	20.2111	20.2124	20.1711	19.9152	19.4977	19.0879 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	653.1280	702.7794	748.2212	752.2388	632.8587	435.0943	269.1530	268.2829	453.2406	584.7179	614.2228	620.4898 (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	1314.3944	1283.3785	1156.2882	962.5735	702.7858	445.8668	270.5837	270.0079	480.6530	764.7832	1042.8536	1288.1289 (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	491.9823	390.1626	303.6019	151.4410	52.0258	0.0000	0.0000	0.0000	0.0000	133.9686	308.6142	496.7235 (98)	
Space heating												2328.5198 (98)	
RHI space heating demand												2329 (98)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1893 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4393 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3734 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4760	0.4667	0.4574	0.4107	0.4014	0.3547	0.3547	0.3454	0.3734	0.4014	0.4200	0.4387 (22b)
Effective ac	0.6133	0.6089	0.6046	0.5843	0.5806	0.5629	0.5629	0.5596	0.5697	0.5806	0.5882	0.5962 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			18.0000	760.8600 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
(28)...(30) + (32) + (32a)...(32e) = 15069.9280 (34)
178.2580 (35)
7.8704 (36)
(33) + (36) = 53.2151 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.7757	42.4688	42.1680	40.7551	40.4908	39.2602	39.2602	39.0323	39.7342	40.4908	41.0255	41.5846 (38)
Heat transfer coeff	95.9907	95.6839	95.3831	93.9702	93.7059	92.4753	92.4753	92.2474	92.9493	93.7059	94.2406	94.7997 (39)
Average = Sum(39)m / 12 =												93.9689 (39)
HLP	1.1354	1.1318	1.1283	1.1115	1.1084	1.0939	1.0939	1.0912	1.0995	1.1084	1.1147	1.1214 (40)
HLP (average)												1.1115 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	25.3185	22.8670	25.2767	24.4141	25.1935	24.3412	25.1280	25.1705	24.3809	25.2423	24.4815	25.3057 (61)
Total heat required for water heating calculated for each month	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (64)
Heat gains from water heating, kWh/month	57.6433	50.5960	52.6305	46.4789	45.0395	39.5159	37.2604	41.8408	42.0680	48.2333	51.8823	56.0209 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1785.6304 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6399	47.6425	38.7455	29.3328	21.9266	18.5114	20.0022	25.9996	34.8966	44.3093	51.7155	55.1307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.2942	344.8358	335.9112	316.9117	292.9282	270.3872	255.3284	251.7868	260.7114	279.7109	303.6944	326.2354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	(71)
Water heating gains (Table 5)	77.4775	75.2916	70.7399	64.5540	60.5370	54.8833	50.0812	56.2376	58.4277	64.8297	72.0588	75.2970	(72)
Total internal gains	579.0830	574.4413	552.0679	517.4698	482.0632	450.4532	432.0831	440.6954	460.7071	495.5213	534.1400	563.3345	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North			0.7200		10.6334		0.6300		0.7000		0.7700		2.3398 (74)
East			3.7300		19.6403		0.6300		0.7000		0.7700		22.3887 (76)
West			8.5000		19.6403		0.6300		0.7000		0.7700		51.0197 (80)
Solar gains	75.7482	148.0738	244.0907	357.1149	439.1412	450.3094	428.3888	366.9015	284.1861	175.7190	94.4180	62.3180	(83)
Total gains	654.8311	722.5151	796.1586	874.5847	921.2043	900.7626	860.4719	807.5969	744.8932	671.2403	628.5580	625.6525	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.6093	43.7492	43.8872	44.5470	44.6727	45.2671	45.2671	45.3790	45.0363	44.6727	44.4192	44.1572	
alpha	3.9073	3.9166	3.9258	3.9698	3.9782	4.0178	4.0178	4.0253	4.0024	3.9782	3.9613	3.9438	
util living area	0.9819	0.9720	0.9480	0.8882	0.7764	0.6096	0.4603	0.5060	0.7362	0.9163	0.9709	0.9846	(86)
MIT	19.6157	19.7903	20.0926	20.4777	20.7732	20.9378	20.9842	20.9771	20.8649	20.4784	19.9862	19.5872	(87)
Th 2	19.9720	19.9749	19.9778	19.9914	19.9940	20.0058	20.0058	20.0081	20.0013	19.9940	19.9888	19.9834	(88)
util rest of house	0.9777	0.9656	0.9359	0.8622	0.7262	0.5305	0.3619	0.4052	0.6636	0.8910	0.9631	0.9811	(89)
MIT 2	18.7261	18.9002	19.1973	19.5735	19.8369	19.9738	20.0007	19.9999	19.9224	19.5844	19.1060	18.7068	(90)
Living area fraction									fLA = Living area / (4) =			0.2126	(91)
MIT	18.9152	19.0894	19.3876	19.7657	20.0360	20.1787	20.2097	20.2076	20.1228	19.7744	19.2931	18.8940	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9152	19.0894	19.3876	19.7657	20.0360	20.1787	20.2097	20.2076	20.1228	19.7744	19.2931	18.8940	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	636.6106	692.5955	738.3827	748.1815	671.0947	490.8815	329.2228	344.1820	501.5006	593.6104	601.0860	610.6959	(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	1402.9230	1357.6944	1229.2608	1021.0507	781.1286	515.8895	333.8127	351.2437	559.8105	859.6994	1149.0858	1392.9832	(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	570.1365	446.9464	365.2133	196.4659	81.8652	0.0000	0.0000	0.0000	0.0000	197.9702	394.5598	582.0218	(98)
Space heating												2835.1791	(98)
Space heating per m2												(98) / (4) =	33.5365 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3125.8866 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	570.1365	446.9464	365.2133	196.4659	81.8652	0.0000	0.0000	0.0000	0.0000	197.9702	394.5598	582.0218	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	628.5959	492.7745	402.6607	216.6107	90.2593	0.0000	0.0000	0.0000	0.0000	218.2693	435.0164	641.6999	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629	(64)
Efficiency of water heater (217)m	89.8361	89.7597	89.5831	89.1750	88.4498	87.2000	87.2000	87.2000	87.2000	89.1498	89.6521	87.2000	(216)
Fuel for water heating, kWh/month	199.9701	175.8496	183.6941	163.5477	160.2131	143.2162	135.6606	151.4705	152.0293	169.7432	180.8228	194.4683	(219)
Water heating fuel used												2010.6854	(219)
Annual totals kWh/year													
Space heating fuel - main system												3125.8866	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												378.9191	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.75 * 908 * 1.00) =										-544.7125		-544.7125	(233)
Total delivered energy for all uses												5045.7785	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3125.8866	3.4800	108.7809 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2010.6854	3.4800	69.9719 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	378.9191	13.1900	49.9794 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-544.7125	13.1900	-71.8476 (252)
Total energy cost			286.7770 (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] =	0.9298 (257)
SAP value		87.0293
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	3125.8866	0.2160	675.1915 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2010.6854	0.2160	434.3080 (264)
Space and water heating			1109.4995 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.9191	0.5190	196.6590 (268)
Energy saving/generation technologies			
PV Unit	-544.7125	0.5190	-282.7058 (269)
Total kg/year			1062.3777 (272)
CO2 emissions per m2			12.5700 (273)
EI value			89.0105
EI rating			89 (274)
EI band			B

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9070 = 3.837$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9070 = 0.2381$, stars = 4
Water heating energy efficiency	$3.48 / 0.8869 = 3.924$, stars = 4
Water heating environmental impact	$0.216 / 0.8869 = 0.2435$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1893 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4393 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3734 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.4760	0.4387	0.4294	0.4014	0.4014	0.3734	0.3734	0.3640	0.3734	0.4200	0.4107	0.4387 (22b)
Effective ac	0.6133	0.5962	0.5922	0.5806	0.5806	0.5697	0.5697	0.5663	0.5697	0.5882	0.5843	0.5962 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			18.0000	760.8600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15069.9280 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 178.2580 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8704 (36)
Total fabric heat loss (33) + (36) = 53.2151 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.7757	41.5846	41.3020	40.4908	40.4908	39.7342	39.7342	39.4942	39.7342	41.0255	40.7551	41.5846 (38)
Heat transfer coeff	95.9907	94.7997	94.5171	93.7059	93.7059	92.9493	92.9493	92.7093	92.9493	94.2406	93.9702	94.7997 (39)
Average = Sum(39)m / 12 =												93.9406 (39)
HLP	1.1354	1.1214	1.1180	1.1084	1.1084	1.0995	1.0995	1.0966	1.0995	1.1147	1.1115	1.1214 (40)
HLP (average)												1.1112 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day) 2.5434 (42)
94.6054 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	25.3185	22.8670	25.2767	24.4141	25.1935	24.3412	25.1280	25.1705	24.3809	25.2423	24.4815	25.3057 (61)
Total heat required for water heating calculated for each month	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (64)
Heat gains from water heating, kWh/month	57.6433	50.5960	52.6305	46.4789	45.0395	39.5159	37.2604	41.8408	42.0680	48.2333	51.8823	56.0209 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1785.6304 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6399	47.6425	38.7455	29.3328	21.9266	18.5114	20.0022	25.9996	34.8966	44.3093	51.7155	55.1307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.2942	344.8358	335.9112	316.9117	292.9282	270.3872	255.3284	251.7868	260.7114	279.7109	303.6944	326.2354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	(71)
Water heating gains (Table 5)	77.4775	75.2916	70.7399	64.5540	60.5370	54.8833	50.0812	56.2376	58.4277	64.8297	72.0588	75.2970	(72)
Total internal gains	579.0830	574.4413	552.0679	517.4698	482.0632	450.4532	432.0831	440.6954	460.7071	495.5213	534.1400	563.3345	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North				0.7200	13.8645	0.6300	0.7000			0.7700			3.0508 (74)
East				3.7300	25.9136	0.6300	0.7000			0.7700			29.5399 (76)
West				8.5000	25.9136	0.6300	0.7000			0.7700			67.3161 (80)
Solar gains	99.9068	166.8315	272.7281	404.3701	473.3790	524.6748	487.4402	427.4506	336.0480	209.2129	123.3950		78.4747 (83)
Total gains	678.9898	741.2727	824.7960	921.8400	955.4422	975.1279	919.5233	868.1459	796.7551	704.7342	657.5350		641.8091 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.6093	44.1572	44.2892	44.6727	44.6727	45.0363	45.0363	45.1529	45.0363	44.4192	44.5470	44.1572	
alpha	3.9073	3.9438	3.9526	3.9782	3.9782	4.0024	4.0024	4.0102	4.0024	3.9613	3.9698	3.9438	
util living area	0.9746	0.9641	0.9316	0.8533	0.7154	0.5127	0.3694	0.3893	0.6394	0.8718	0.9545	0.9782 (86)	
MIT	19.7951	19.9356	20.2378	20.5914	20.8496	20.9701	20.9938	20.9926	20.9299	20.6339	20.1932	19.7825 (87)	
Th 2	19.9720	19.9834	19.9861	19.9940	19.9940	20.0013	20.0013	20.0036	20.0013	19.9888	19.9914	19.9834 (88)	
util rest of house	0.9685	0.9557	0.9156	0.8205	0.6556	0.4294	0.2720	0.2873	0.5533	0.8330	0.9418	0.9728 (89)	
MIT 2	18.9034	19.0494	19.3436	19.6782	19.8975	19.9882	19.9998	20.0018	19.9663	19.7212	19.3100	18.9004 (90)	
Living area fraction									fLA = Living area / (4) =			0.2126 (91)	
MIT	19.0929	19.2378	19.5336	19.8723	20.0999	20.1969	20.2111	20.2124	20.1711	19.9152	19.4977	19.0879 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.0929	19.2378	19.5336	19.8723	20.0999	20.1969	20.2111	20.2124	20.1711	19.9152	19.4977	19.0879 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	653.1280	702.7794	748.2212	752.2388	632.8587	435.0943	269.1530	268.2829	453.2406	584.7179	614.2228	620.4898 (94)	
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000 (96)	
Heat loss rate W	1314.3944	1283.3785	1156.2882	962.5735	702.7858	445.8668	270.5837	270.0079	480.6530	764.7832	1042.8536	1288.1289 (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	491.9823	390.1626	303.6019	151.4410	52.0258	0.0000	0.0000	0.0000	0.0000	133.9686	308.6142	496.7235 (98)	
Space heating												2328.5198 (98)	
Space heating per m2												(98) / (4) = 27.5434 (99)	

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												90.7000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2567.2766 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	491.9823	390.1626	303.6019	151.4410	52.0258	0.0000	0.0000	0.0000	0.0000	133.9686	308.6142	496.7235 (98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000 (210)
Space heating fuel (main heating system)	542.4281	430.1683	334.7319	166.9692	57.3603	0.0000	0.0000	0.0000	0.0000	147.7051	340.2582	547.6555 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (64)
Efficiency of water heater (217)m	89.7366	89.6634	89.4382	88.9485	88.1131	87.2000	87.2000	87.2000	87.2000	88.8093	89.4634	87.2000 (216)
Fuel for water heating, kWh/month	200.1917	176.0385	183.9918	163.9642	160.8253	143.2162	135.6606	151.4705	152.0293	170.3940	181.2042	194.6952 (219)
Water heating fuel used												2013.6814 (219)
Annual totals kWh/year												
Space heating fuel - main system												2567.2766 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												378.9191 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.75 * 1054 * 1.00) =										-632.6656		-632.6656 (233)
Total delivered energy for all uses												4402.2115 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2567.2766	10.2300	262.6324 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2013.6814	10.2300	205.9996 (247)
Pumps and fans for heating	75.0000	36.7200	27.5400 (249)
Energy for lighting	378.9191	36.7200	139.1391 (250)
Additional standing charges			103.0000 (251)
Energy saving/generation technologies			
PV Unit	-632.6656	36.7200	-232.3148 (252)
Total energy cost			505.9963 (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	2567.2766	0.2160	554.5317 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2013.6814	0.2160	434.9552 (264)
Space and water heating			989.4869 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.9191	0.5190	196.6590 (268)
Energy saving/generation technologies			
PV Unit	-632.6656	0.5190	-328.3535 (269)
Total kg/year			896.7175 (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	2567.2766	1.2200	3132.0774 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2013.6814	1.2200	2456.6914 (264)
Space and water heating			5588.7688 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	378.9191	3.0700	1163.2817 (268)
Energy saving/generation technologies			
PV Unit	-632.6656	3.0700	-1942.2834 (269)
Primary energy kWh/year			5040.0170 (272)
Primary energy kWh/m2/year			59.6170 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 87
Current environmental impact rating: B 89

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.2	-£ 85	-193 kg (21.5%)

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

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

Fuel prices for cost data on this page from database revision number 531 TEST (31 Oct 2023)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£167	£185	-£18
Mains gas	£572	£468	£104
Space heating	£393	£393	£0
Water heating	£206	£121	£85
Lighting	£139	£139	£0
Generated (PV)	-£232	-£232	£0
Total cost of fuels	£507	£421	£86
Total cost of uses	£506	£421	£85
Delivered energy	52 kWh/m²	41 kWh/m²	11 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	11 kg/m²	8 kg/m²	2 kg/m²
Primary energy	60 kWh/m²	47 kWh/m²	13 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1893 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4393 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3734 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4760	0.4667	0.4574	0.4107	0.4014	0.3547	0.3547	0.3454	0.3734	0.4014	0.4200	0.4387 (22b)
Effective ac	0.6133	0.6089	0.6046	0.5843	0.5806	0.5629	0.5629	0.5596	0.5697	0.5806	0.5882	0.5962 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			18.0000	760.8600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15069.9280 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 178.2580 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8704 (36)
Total fabric heat loss (33) + (36) = 53.2151 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.7757	42.4688	42.1680	40.7551	40.4908	39.2602	39.2602	39.0323	39.7342	40.4908	41.0255	41.5846 (38)
Heat transfer coeff	95.9907	95.6839	95.3831	93.9702	93.7059	92.4753	92.4753	92.2474	92.9493	93.7059	94.2406	94.7997 (39)
Average = Sum(39)m / 12 =												93.9689 (39)
HLP	1.1354	1.1318	1.1283	1.1115	1.1084	1.0939	1.0939	1.0912	1.0995	1.1084	1.1147	1.1214 (40)
HLP (average)												1.1115 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5434 (42)
Average daily hot water use (litres/day)												94.6054 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	25.3185	22.8670	25.2767	24.4141	25.1935	24.3412	25.1280	25.1705	24.3809	25.2423	24.4815	25.3057 (61)
Total heat required for water heating calculated for each month	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1079.5246 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1813.6014 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.2184 (H8)
Utilisation factor												0.5599 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.6054 (H14)
Volume ratio Veff/V												0.7928 (H15)
Solar storage volume factor												0.9536 (H16)
Solar input												-851.3931 (H17)
Solar input	-24.6887	-41.1983	-70.1655	-94.0356	-116.1731	-114.2166	-112.7072	-98.4729	-77.1240	-52.6666	-29.2844	-20.6602 (63)
Solar input (sum of months) = Sum (63)m =												-851.3931 (63)
Output from w/h	154.9565	116.6437	94.3934	51.8081	25.5351	10.6679	5.5888	33.6094	55.4456	98.6591	132.8270	154.1027 (64)
Total per year (kWh/year) = Sum (64)m =												934.2373 (64)
Heat gains from water heating, kWh/month	57.6433	50.5960	52.6305	46.4789	45.0395	39.5159	37.2604	41.8408	42.0680	48.2333	51.8823	56.0209 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6399	47.6425	38.7455	29.3328	21.9266	18.5114	20.0022	25.9996	34.8966	44.3093	51.7155	55.1307 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.2942	344.8358	335.9112	316.9117	292.9282	270.3872	255.3284	251.7868	260.7114	279.7109	303.6944	326.2354 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353 (71)
Water heating gains (Table 5)	77.4775	75.2916	70.7399	64.5540	60.5370	54.8833	50.0812	56.2376	58.4277	64.8297	72.0588	75.2970 (72)
Total internal gains	579.0830	574.4413	552.0679	517.4698	482.0632	450.4532	432.0831	440.6954	460.7071	495.5213	534.1400	563.3345 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				0.7200	10.6334	0.6300	0.7000	0.7700		2.3398 (74)		
East				3.7300	19.6403	0.6300	0.7000	0.7700		22.3887 (76)		
West				8.5000	19.6403	0.6300	0.7000	0.7700		51.0197 (80)		
Solar gains	75.7482	148.0738	244.0907	357.1149	439.1412	450.3094	428.3888	366.9015	284.1861	175.7190	94.4180	62.3180 (83)
Total gains	654.8311	722.5151	796.1586	874.5847	921.2043	900.7626	860.4719	807.5969	744.8932	671.2403	628.5580	625.6525 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	43.6093	43.7492	43.8872	44.5470	44.6727	45.2671	45.2671	45.3790	45.0363	44.6727	44.4192	44.1572
alpha	3.9073	3.9166	3.9258	3.9698	3.9782	4.0178	4.0178	4.0253	4.0024	3.9782	3.9613	3.9438
util living area	0.9819	0.9720	0.9480	0.8882	0.7764	0.6096	0.4603	0.5060	0.7362	0.9163	0.9709	0.9846 (86)
MIT	19.6157	19.7903	20.0926	20.4777	20.7732	20.9378	20.9842	20.9771	20.8649	20.4784	19.9862	19.5872 (87)
Th 2	19.9720	19.9749	19.9778	19.9914	19.9940	20.0058	20.0058	20.0081	20.0013	19.9940	19.9888	19.9834 (88)
util rest of house	0.9777	0.9656	0.9359	0.8622	0.7262	0.5305	0.3619	0.4052	0.6636	0.8910	0.9631	0.9811 (89)
MIT 2	18.7261	18.9002	19.1973	19.5735	19.8369	19.9738	20.0007	19.9999	19.9224	19.5844	19.1060	18.7068 (90)
Living area fraction									fLA = Living area / (4) =			0.2126 (91)
MIT	18.9152	19.0894	19.3876	19.7657	20.0360	20.1787	20.2097	20.2076	20.1228	19.7744	19.2931	18.8940 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9152	19.0894	19.3876	19.7657	20.0360	20.1787	20.2097	20.2076	20.1228	19.7744	19.2931	18.8940 (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	0.9722	0.9586	0.9274	0.8555	0.7285	0.5450	0.3826	0.4262	0.6733	0.8843	0.9563	0.9761	(94)
Useful gains	636.6106	692.5955	738.3827	748.1815	671.0947	490.8815	329.2228	344.1820	501.5006	593.6104	601.0860	610.6959	(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	1402.9230	1357.6944	1229.2608	1021.0507	781.1286	515.8895	333.8127	351.2437	559.8105	859.6994	1149.0858	1392.9832	(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	570.1365	446.9464	365.2133	196.4659	81.8652	0.0000	0.0000	0.0000	0.0000	197.9702	394.5598	582.0218	(98)
Space heating												2835.1791	(98)
Space heating per m2												33.5365	(99)

(98) / (4) = 33.5365 (99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3125.8866 (211)
Space heating requirement	570.1365	446.9464	365.2133	196.4659	81.8652	0.0000	0.0000	0.0000	0.0000	197.9702	394.5598	582.0218	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	628.5959	492.7745	402.6607	216.6107	90.2593	0.0000	0.0000	0.0000	0.0000	218.2693	435.0164	641.6999	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	154.9565	116.6437	94.3934	51.8081	25.5351	10.6679	5.5888	33.6094	55.4456	98.6591	132.8270	154.1027	(64)
Efficiency of water heater	89.9286	89.9528	89.9584	89.9466	89.8426	87.2000	87.2000	87.2000	87.2000	89.5051	89.7923	89.9442	(216)
Fuel for water heating, kWh/month	172.3106	129.6722	104.9300	57.5987	28.4220	12.2338	6.4092	38.5429	63.5844	110.2273	147.9270	171.3314	(219)
Water heating fuel used												1043.1894	(219)
Annual totals kWh/year													
Space heating fuel - main system													3125.8866 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													125.0000 (231)
Electricity for lighting (calculated in Appendix L)													378.9191 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.75 * 908 * 1.00) =										-544.7125		-544.7125	(233)
Total delivered energy for all uses													4128.2825 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3125.8866	3.4800	108.7809	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1043.1894	3.4800	36.3030	(247)
Pumps and fans for heating	75.0000	13.1900	9.8925	(249)
Pump for solar water heating	50.0000	13.1900	6.5950	(249)
Energy for lighting	378.9191	13.1900	49.9794	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-544.7125	13.1900	-71.8476	(252)
Total energy cost			259.7032	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):			0.4200 (256)
Energy cost factor (ECF)			0.8420 (257)
SAP value			88.2538
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	3125.8866	0.2160	675.1915 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1043.1894	0.2160	225.3289 (264)
Space and water heating			900.5204 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	378.9191	0.5190	196.6590 (268)
Energy saving/generation technologies			
PV Unit	-544.7125	0.5190	-282.7058 (269)
Total kg/year			879.3486 (272)
CO2 emissions per m2			10.4000 (273)
EI value			90.9038
EI rating			91 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	42.2700 (1b)	x 2.3900 (2b)	= 101.0253 (1b) - (3b)
First floor	42.2700 (1c)	x 2.6100 (2c)	= 110.3247 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.5400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 211.3500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1893 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4393 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3734 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.4760	0.4387	0.4294	0.4014	0.4014	0.3734	0.3734	0.3640	0.3734	0.4200	0.4107	0.4387 (22b)
Effective ac	0.6133	0.5962	0.5922	0.5806	0.5806	0.5697	0.5697	0.5663	0.5697	0.5882	0.5843	0.5962 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1500	1.1000	2.3650		(26)
Windows (Uw = 1.20)			12.9500	1.1450	14.8282		(27)
Ground Floor			42.2700	0.1200	5.0724	84.0000	3550.6800 (28a)
Brick and Block	93.6500	15.1000	78.5500	0.2400	18.8520	42.2200	3316.3810 (29a)
Pitched Roof	42.2700		42.2700	0.1000	4.2270	9.1000	384.6570 (30)
Total net area of external elements Aum(A, m ²)			178.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3446		(33)
Party Wall 1			44.2800	0.0000	0.0000	110.0000	4870.8000 (32)
Ground Floor Stud			69.1600			9.0000	622.4400 (32c)
First Floor Stud			89.2500			9.0000	803.2500 (32c)
Internal Floor 1			42.2700			18.0000	760.8600 (32d)
Internal Ceiling 1			42.2700			18.0000	760.8600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15069.9280 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 178.2580 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8704 (36)
Total fabric heat loss (33) + (36) = 53.2151 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	42.7757	41.5846	41.3020	40.4908	40.4908	39.7342	39.7342	39.4942	39.7342	41.0255	40.7551	41.5846 (38)
Heat transfer coeff	95.9907	94.7997	94.5171	93.7059	93.7059	92.9493	92.9493	92.7093	92.9493	94.2406	93.9702	94.7997 (39)
Average = Sum(39)m / 12 =												93.9406 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1354	1.1214	1.1180	1.1084	1.1084	1.0995	1.0995	1.0966	1.0995	1.1147	1.1115	1.1214 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Average daily hot water use (litres/day)												2.5434 (42)
												94.6054 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	104.0659	100.2817	96.4975	92.7132	88.9290	85.1448	85.1448	88.9290	92.7132	96.4975	100.2817	104.0659 (44)
Energy conte	154.3267	134.9751	139.2822	121.4296	116.5146	100.5433	93.1681	106.9118	108.1886	126.0834	137.6299	149.4572 (45)
Energy content (annual)										Total = Sum(45)m =		1488.5106 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	23.1490	20.2463	20.8923	18.2144	17.4772	15.0815	13.9752	16.0368	16.2283	18.9125	20.6445	22.4186 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	25.3185	22.8670	25.2767	24.4141	25.1935	24.3412	25.1280	25.1705	24.3809	25.2423	24.4815	25.3057 (61)
Total heat required for water heating calculated for each month	179.6452	157.8421	164.5589	145.8437	141.7081	124.8845	118.2961	132.0822	132.5696	151.3257	162.1114	174.7629 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1234.4649 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2073.9010 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3933 (H8)
Utilisation factor												0.5121 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.6054 (H14)
Volume ratio Veff/V												0.7928 (H15)
Solar storage volume factor												0.9536 (H16)
Solar input	-29.2250	-41.7196	-70.7076	-96.4849	-113.8733	-121.1827	-116.7087	-104.1196	-82.4045	-56.4222	-34.3598	-890.5523 (H17)
Solar input (sum of months) = Sum (63)m =												-890.5523 (63)
Output from w/h	150.4202	116.1225	93.8513	49.3588	27.8348	3.7018	1.5873	27.9627	50.1650	94.9035	127.7515	151.4187 (64)
Total per year (kWh/year) = Sum (64)m =												895.0781 (64)
Heat gains from water heating, kWh/month	57.6433	50.5960	52.6305	46.4789	45.0395	39.5159	37.2604	41.8408	42.0680	48.2333	51.8823	56.0209 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	152.6030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.6399	47.6425	38.7455	29.3328	21.9266	18.5114	20.0022	25.9996	34.8966	44.3093	51.7155	55.1307	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.2942	344.8358	335.9112	316.9117	292.9282	270.3872	255.3284	251.7868	260.7114	279.7109	303.6944	326.2354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	52.8037	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	-101.7353	(71)
Water heating gains (Table 5)	77.4775	75.2916	70.7399	64.5540	60.5370	54.8833	50.0812	56.2376	58.4277	64.8297	72.0588	75.2970	(72)
Total internal gains	579.0830	574.4413	552.0679	517.4698	482.0632	450.4532	432.0831	440.6954	460.7071	495.5213	534.1400	563.3345	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				0.7200	13.8645	0.6300	0.7000	0.7700	3.0508 (74)			
East				3.7300	25.9136	0.6300	0.7000	0.7700	29.5399 (76)			
West				8.5000	25.9136	0.6300	0.7000	0.7700	67.3161 (80)			
Solar gains	99.9068	166.8315	272.7281	404.3701	473.3790	524.6748	487.4402	427.4506	336.0480	209.2129	123.3950	78.4747 (83)
Total gains	678.9898	741.2727	824.7960	921.8400	955.4422	975.1279	919.5233	868.1459	796.7551	704.7342	657.5350	641.8091 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	43.6093	44.1572	44.2892	44.6727	44.6727	45.0363	45.0363	45.1529	45.0363	44.4192	44.5470	44.1572	
alpha	3.9073	3.9438	3.9526	3.9782	3.9782	4.0024	4.0024	4.0102	4.0024	3.9613	3.9698	3.9438	
util living area	0.9746	0.9641	0.9316	0.8533	0.7154	0.5127	0.3694	0.3893	0.6394	0.8718	0.9545	0.9782	(86)
MIT	19.7951	19.9356	20.2378	20.5914	20.8496	20.9701	20.9938	20.9926	20.9299	20.6339	20.1932	19.7825	(87)
Th 2	19.9720	19.9834	19.9861	19.9940	19.9940	20.0013	20.0013	20.0036	20.0013	19.9888	19.9914	19.9834	(88)
util rest of house	0.9685	0.9557	0.9156	0.8205	0.6556	0.4294	0.2720	0.2873	0.5533	0.8330	0.9418	0.9728	(89)
MIT 2	18.9034	19.0494	19.3436	19.6782	19.8975	19.9882	19.9998	20.0018	19.9663	19.7212	19.3100	18.9004	(90)
Living area fraction													(91)
MIT	19.0929	19.2378	19.5336	19.8723	20.0999	20.1969	20.2111	20.2124	20.1711	19.9152	19.4977	19.0879	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0929	19.2378	19.5336	19.8723	20.0999	20.1969	20.2111	20.2124	20.1711	19.9152	19.4977	19.0879	(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	0.9619	0.9481	0.9072	0.8160	0.6624	0.4462	0.2927	0.3090	0.5689	0.8297	0.9341	0.9668	(94)
Useful gains	653.1280	702.7794	748.2212	752.2388	632.8587	435.0943	269.1530	268.2829	453.2406	584.7179	614.2228	620.4898	(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	1314.3944	1283.3785	1156.2882	962.5735	702.7858	445.8668	270.5837	270.0079	480.6530	764.7832	1042.8536	1288.1289	(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	491.9823	390.1626	303.6019	151.4410	52.0258	0.0000	0.0000	0.0000	0.0000	133.9686	308.6142	496.7235	(98)
Space heating												2328.5198	(98)
Space heating per m2												27.5434	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													90.7000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													2567.2766	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	491.9823	390.1626	303.6019	151.4410	52.0258	0.0000	0.0000	0.0000	0.0000	133.9686	308.6142	496.7235	(98)	
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)	
Space heating fuel (main heating system)	542.4281	430.1683	334.7319	166.9692	57.3603	0.0000	0.0000	0.0000	0.0000	147.7051	340.2582	547.6555	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	150.4202	116.1225	93.8513	49.3588	27.8348	3.7018	1.5873	27.9627	50.1650	94.9035	127.7515	151.4187	(64)	
Efficiency of water heater	89.8555	89.8726	89.8484	89.8139	89.4486	87.2000	87.2000	87.2000	87.2000	89.2152	89.6466	89.8574	(217)	
Fuel for water heating, kWh/month	167.4023	129.2079	104.4551	54.9567	31.1182	4.2452	1.8203	32.0673	57.5287	106.3760	142.5058	168.5099	(219)	
Water heating fuel used												1000.1933	(219)	
Annual totals kWh/year														
Space heating fuel - main system													2567.2766	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
pump for solar water heating													50.0000	(230g)
Total electricity for the above, kWh/year													125.0000	(231)
Electricity for lighting (calculated in Appendix L)													378.9191	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV Unit 0 (0.80 * 0.75 * 1054 * 1.00) =										-632.6656			-632.6656	(233)
Total delivered energy for all uses													3438.7234	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2567.2766	10.2300	262.6324	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1000.1933	10.2300	102.3198	(247)
Pumps and fans for heating	75.0000	36.7200	27.5400	(249)
Pump for solar water heating	50.0000	36.7200	18.3600	(249)
Energy for lighting	378.9191	36.7200	139.1391	(250)
Additional standing charges			103.0000	(251)
Energy saving/generation technologies				
PV Unit	-632.6656	36.7200	-232.3148	(252)
Total energy cost			420.6765	(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	2567.2766	0.2160	554.5317	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1000.1933	0.2160	216.0418	(264)
Space and water heating			770.5735	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	378.9191	0.5190	196.6590	(268)
Energy saving/generation technologies				
PV Unit	-632.6656	0.5190	-328.3535	(269)
Total kg/year			703.7541	(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	2567.2766	1.2200	3132.0774	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1000.1933	1.2200	1220.2359	(264)
Space and water heating			4352.3133	(265)
Pumps and fans	125.0000	3.0700	383.7500	(267)
Energy for lighting	378.9191	3.0700	1163.2817	(268)
Energy saving/generation technologies				
PV Unit	-632.6656	3.0700	-1942.2834	(269)
Primary energy kWh/year			3957.0615	(272)
Primary energy kWh/m2/year			46.8070	(273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0906 Plot 30	Issued on Date	29/11/2023
Assessment Reference	Rev B	Prop Type Ref	Block F
Project			
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	14.45	TER	18.15
Environmental	89 B	% DER<TER	20.39		
CO ₂ Emissions (t/year)	0.90	DFEE	43.87	TFEE	51.85
General Requirements Compliance	Pass	% DFEE<TFEE	15.40		

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

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

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

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

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: 9.10 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0906 Plot 30	Issued on Date	29/11/2023
Assessment Reference	Rev B	Prop Type Ref	Block F
Project			
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	14.45	TER	18.15
Environmental	89 B	% DER<TER	20.39		
CO ₂ Emissions (t/year)	0.90	DFEE	43.87	TFEE	51.85
General Requirements Compliance	Pass	% DFEE<TFEE	15.40		

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

Wall 000001

Wall Type: Standard Wall

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

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

Unheated space: None		
Total thickness: 330 mm	U-value: 0.24 W/m² K	Kappa: 42.22 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0906 Plot 30	Issued on Date	29/11/2023
Assessment Reference	Rev B	Prop Type Ref	Block F
Project			
Calculation Type	New Build (As Designed)		

SAP Rating	87 B	DER	14.45	TER	18.15
Environmental	89 B	% DER<TER	20.39		
CO ₂ Emissions (t/year)	0.90	DFEE	43.87	TFEE	51.85
General Requirements Compliance	Pass	% DFEE<TFEE	15.40		

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 - Worst Case Slab

Floor Type: Slab On Ground Floor

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

Horizontal edge insulation: none

Vertical edge insulation: none

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)	Density (kg/m ³)	Heat Cap. (J/kgK)
Ext surface				0.0400			
Layer 1	Concrete, medium density						
	Main construction	100	1.3500	0.0741	100.00		
Layer 2	Polythene, 1000 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 3	Celotex XR4000						
	Main construction	150	0.0220	6.8182	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 4	Polythene, 500 gauge						
	Main construction	0.5	0.0000	0.0000	100.00		
Layer 5	Screed						
	Main construction	70	1.1500	0.0609	100.00	1200	1000
Int surface				0.1700			

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

Total correction = 0.0096 m² K/W

U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 321 mm

U-value: 0.12 W/m² K

Kappa: 84.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	SAP 0906 Plot 30				Issued on Date	29/11/2023
Assessment Reference	Rev B	Prop Type Ref		Block F		
Property						
SAP Rating	87 B	DER	14.45	TER	18.15	
Environmental	89 B	% DER<TER	20.39			
CO ₂ Emissions (t/year)	0.90	DFEE	43.87	TFEE	51.85	
General Requirements Compliance	Pass	% DFEE<TFEE	15.40			
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 07798936079, toby@abacusenergyuk.com				Assessor ID	E477-0001
Client	Foreman Homes, FORE					

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

Orientation	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Urban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2022
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	18.73 m	42.27 m ²	2.39 m
1st Storey:	18.73 m	42.27 m ²	2.61 m

7.0 Living Area 17.97 m²

8.0 Thermal Mass Parameter
Thermal Mass 178.26 kJ/m²K

9.0 External Walls

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

9.1 Party Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	44.28

9.2 Internal Walls

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

10.0 External Roofs

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

10.2 Internal Ceilings

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

11.0 Heat Loss Floors

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

11.2 Internal Floors

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

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door							1.10
Windows	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	East							2.15	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					3.73	
Side Elevation	Window	[1] Brick and Block	North	None	0.00					0.72	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					8.50	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

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

Y-value 0.044 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

Property Tested ?

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

As Built AP₅₀

m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather

Windows half open

Cross ventilation possible

Yes

Night Ventilation

Yes

Air change rate

4.00

Mechanical Ventilation

Mechanical Ventilation System Present

No

20.0 Fans, Open Fireplaces, Flues

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

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings

19

Total number of L.E.L. fittings

19

Percentage of L.E.L. fittings

100.00

%

External

External lights fitted

Yes

Light and motion sensor

Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Description

Database

Percentage of Heat

100

%

Database Ref. No.

17513

Fuel Type

Mains gas

Main Heating

BGW

SAP Code

104

In Winter

90.7

In Summer

87.2

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

Gas/Oil, time clock

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

25.0 Main Heating 2

Community Heating

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

SAP Code

29.0 Hot Water Cylinder

32.0 Photovoltaic Unit

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.75	West	30°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£85	B 88	