



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client: Foreman Homes

Project: Plot 152

Contact: Tobias Whiting
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Report Issue Date: 28/03/2023

EXCELLENCE
IN ENERGY
ASSESSMENT

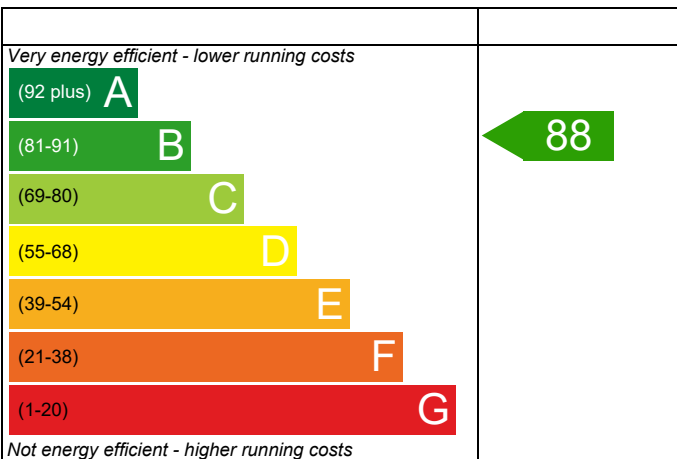
Plot 152

Dwelling type: House, Semi-Detached
 Date of assessment: 28/03/2023
 Produced by: Abacus Energy (UK) Ltd
 Total floor area: 87.8 m²
 DRRN: 3032-8798-7233

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

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

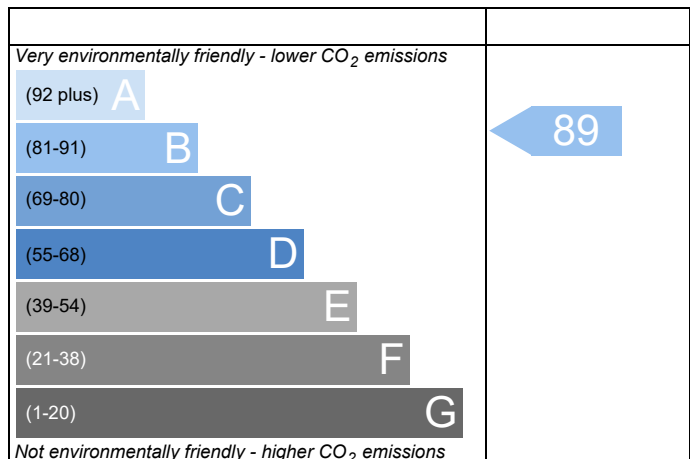
Energy Efficiency Rating



England EU Directive 2002/91/EC

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

Environmental Impact (CO₂) Rating



England EU Directive 2002/91/EC

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

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



BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 152	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Melbourne V3 (HA-SO)
Property	Plot 152		

SAP Rating	88 B	DER	13.89	TER	18.63
Environmental	89 B	% DER<TER	25.45		
CO ₂ Emissions (t/year)	0.88	DFEE	46.69	TFEE	55.25
General Requirements Compliance	Pass	% DFEE<TFEE	15.49		

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)	18.63	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.89	kgCO ₂ /m ²	Pass
	-4.74 (-25.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.25	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	46.69	kWh/m ² /yr	
	-8.5 (-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)	0.26 (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 East

7.63 m², No overhang

Windows facing South West

5.55 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

0.90

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	£81	B 89	B 91	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£81	B 89	B 91	

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 152	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Melbourne V3 (HA-SO)
Property	Plot 152		

SAP Rating	88 B	DER	13.89	TER	18.63
Environmental	89 B	% DER<TER	25.45		
CO ₂ Emissions (t/year)	0.88	DFEE	46.69	TFEE	55.25
General Requirements Compliance	Pass	% DFEE<TFEE	15.49		

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	0.110	0.46	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.077	0.69	0.05	Birtley Supatherm
External wall	E2 Other lintels (including other steel lintels)	Independently assessed	0.071	1.02	0.07	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	E2 Other lintels (including other steel lintels)	Independently assessed	0.064	3.62	0.23	Birtley Supatherm
External wall	E3 Sill	Independently assessed	0.021	8.50	0.18	Knauf P5
External wall	E4 Jamb	Independently assessed	0.016	24.32	0.39	Knauf P6
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	26.65	4.26	
External wall	E6 Intermediate floor within a dwelling	Independently assessed	0.000	18.83	0.00	CD0029
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	10.56	0.63	
External wall	E24 Eaves (insulation at ceiling level - inverted)	Independently assessed	0.120	8.05	0.97	Value Halved
External wall	E12 Gable (insulation at ceiling level)	Independently assessed	0.044	8.05	0.35	Knauf P21
External wall	E16 Corner (normal)	Independently assessed	0.039	11.20	0.44	Knauf P23
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	8.80	0.53	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	8.05	1.29	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	8.05	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	0.069	8.05	0.56	Knauf P29

Total: **10.35** W/mK:
Y-Value: **0.051** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 152		Issued on Date	28/03/2023	
Assessment Reference	Rev A	Prop Type Ref	Melbourne V3 (HA-SO)		
Property	Plot 152				
SAP Rating	88 B	DER	13.89	TER	18.63
Environmental	89 B	% DER<TER	25.45		
CO₂ Emissions (t/year)	0.88	DFEE	46.69	TFEE	55.25
General Requirements Compliance	Pass	% DFEE<TFEE	15.49		
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 88 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) 18.63 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.89 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.26 (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 East: 7.63 m², No overhang

Windows facing South West: 5.55 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 0.90 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	43.9000 (1b)	2.3900 (2b)	104.9210 (1b) - (3b)
First floor	43.9000 (1c)	2.4200 (2c)	106.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.8000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 211.1590 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1421 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3921 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3627 (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	0.4624	0.4533	0.4443	0.3989	0.3899	0.3445	0.3445	0.3355	0.3627	0.3899	0.4080	0.4261 (22b)
Effective ac	0.6069	0.6028	0.5987	0.5796	0.5760	0.5594	0.5594	0.5563	0.5658	0.5760	0.5832	0.5908 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows & Fully Glazed Do (Uw = 1.20)			13.1800	1.1450	15.0916		(27)
Ground Floor			43.9000	0.1200	5.2680	90.0000	3951.0000 (28a)
Brick and Block	109.2600	15.3000	93.9600	0.2400	22.5504	42.2200	3966.9912 (29a)
Party Wall Step	4.8300		4.8300	0.2600	1.2558	113.5000	548.2050 (29a)
External Roof 1	43.9000		43.9000	0.1000	4.3900	9.1000	399.4900 (30)
Total net area of external elements Aum(A, m2)			201.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.8878		(33)
Party Wall 1			35.3100	0.0000	0.0000	45.0000	1588.9500 (32)
GF Timber Stud			73.9800			9.0000	665.8200 (32c)
FF Timber Stud			90.5800			9.0000	815.2200 (32c)
Internal Floor 1			43.9000			18.0000	790.2000 (32d)
Internal Ceiling 1			43.9000			18.0000	790.2000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 13516.0762 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							153.9416 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3474 (36)
Total fabric heat loss							(33) + (36) = 61.2352 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.2908	42.0015	41.7180	40.3862	40.1370	38.9770	38.9770	38.7622	39.4238	40.1370	40.6411	41.1681 (38)
Average = Sum(39)m / 12 =	103.5260	103.2367	102.9532	101.6214	101.3722	100.2122	100.2122	99.9974	100.6590	101.3722	101.8763	102.4033 (39)
HLP	1.1791	1.1758	1.1726	1.1574	1.1546	1.1414	1.1414	1.1389	1.1465	1.1546	1.1603	1.1663 (40)
HLP (average)												1.1574 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.5944 (42)
Average daily hot water use (litres/day)												95.8169 (43)
Daily hot water use	105.3985	101.5659	97.7332	93.9005	90.0678	86.2352	86.2352	90.0678	93.9005	97.7332	101.5659	105.3985 (44)
Energy conte	156.3030	136.7036	141.0659	122.9846	118.0067	101.8308	94.3612	108.2809	109.5741	127.6980	139.3924	151.3711 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1507.5723 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.4454	20.5055	21.1599	18.4477	17.7010	15.2746	14.1542	16.2421	16.4361	19.1547	20.9089	22.7057	22.7057	(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	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	0.0000	(57)
Combi loss	25.3195	22.8681	25.2860	24.4219	25.2007	24.3472	25.1335	25.1771	24.3879	25.2507	24.4827	25.3067	25.3067	(61)
Total heat required for water heating calculated for each month	181.6225	159.5717	166.3519	147.4065	143.2074	126.1780	119.4947	133.4580	133.9620	152.9488	163.8750	176.6778	176.6778	(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	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)	
Output from w/h	181.6225	159.5717	166.3519	147.4065	143.2074	126.1780	119.4947	133.4580	133.9620	152.9488	163.8750	176.6778	176.6778	(64)
Total per year (kWh/year) = Sum(64)m =													1804.7544 (64)	
Heat gains from water heating, kWh/month	58.3006	51.1710	53.2259	46.9979	45.5374	39.9455	37.6585	42.2977	42.5304	48.7723	52.4686	56.6576	56.6576	(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	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1404	19.6649	15.9926	12.1074	9.0504	7.6408	8.2561	10.7316	14.4039	18.2891	21.3461	22.7558	22.7558	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.9716	237.4098	231.2655	218.1849	201.6729	186.1541	175.7865	173.3482	179.4926	192.5732	209.0851	224.6040	224.6040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	(71)
Water heating gains (Table 5)	78.3611	76.1473	71.5402	65.2748	61.2062	55.4799	50.6162	56.8517	59.0699	65.5541	72.8731	76.1527	76.1527	(72)
Total internal gains	400.3890	398.1380	383.7142	360.4830	336.8455	314.1906	299.5747	305.8474	317.8824	341.3324	368.2202	388.4283	388.4283	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast		7.6300	11.2829	0.6300	0.7000	0.7700	26.3099	(75)					
Southwest		5.5500	36.7938	0.6300	0.7000	0.7700	62.4079	(79)					
Solar gains	88.7178	159.8583	241.9377	338.6803	414.8634	427.4844	405.6398	346.4156	275.0634	182.9362	107.8550	74.8942	(83)
Total gains	489.1068	557.9963	625.6519	699.1633	751.7089	741.6750	705.2145	652.2630	592.9458	524.2685	476.0752	463.3225	(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	36.2659	36.3675	36.4677	36.9456	37.0364	37.4651	37.4651	37.5456	37.2989	37.0364	36.8532	36.6635	36.6635	
alpha	3.4177	3.4245	3.4312	3.4630	3.4691	3.4977	3.4977	3.5030	3.4866	3.4691	3.4569	3.4442	3.4442	
util living area	0.9904	0.9841	0.9700	0.9336	0.8549	0.7181	0.5737	0.6280	0.8341	0.9534	0.9846	0.9920	0.9920	(86)
MIT	19.1025	19.3015	19.6469	20.1154	20.5394	20.8326	20.9440	20.9224	20.6925	20.1492	19.5485	19.0713	19.0713	(87)
Th 2	19.9367	19.9394	19.9420	19.9542	19.9565	19.9672	19.9672	19.9692	19.9631	19.9565	19.9519	19.9470	19.9470	(88)
util rest of house	0.9883	0.9805	0.9629	0.9169	0.8160	0.6404	0.4588	0.5151	0.7753	0.9385	0.9805	0.9902	0.9902	(89)
MIT 2	18.2055	18.4050	18.7485	19.2147	19.6134	19.8704	19.9458	19.9369	19.7624	19.2560	18.6610	18.1821	18.1821	(90)
Living area fraction													fLA = Living area / (4) = 0.1682 (91)	
MIT	18.3564	18.5558	18.8997	19.3662	19.7692	20.0323	20.1138	20.1027	19.9189	19.4063	18.8103	18.3317	18.3317	(92)
Temperature adjustment													0.0000	
adjusted MIT	18.3564	18.5558	18.8997	19.3662	19.7692	20.0323	20.1138	20.1027	19.9189	19.4063	18.8103	18.3317	18.3317	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9839	0.9743	0.9539	0.9053	0.8078	0.6459	0.4763	0.5310	0.7723	0.9282	0.9745	0.9865	(94)
Useful gains	481.2243	543.6537	596.8148	632.9464	607.2558	479.0226	335.8736	346.3715	457.9494	486.6382	463.9236	457.0499	(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	1455.2058	1409.7831	1276.5835	1063.5927	817.9896	544.3789	352.1216	370.2607	585.7258	892.7134	1193.0018	1447.1272	(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	724.6423	582.0390	505.7480	310.0654	156.7860	0.0000	0.0000	0.0000	0.0000	302.1200	524.9363	736.6175	(98)
Space heating													3842.9543 (98)
Space heating per m2													(98) / (4) = 43.7694 (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													4236.9948 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	724.6423	582.0390	505.7480	310.0654	156.7860	0.0000	0.0000	0.0000	0.0000	302.1200	524.9363	736.6175	(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)	798.9441	641.7188	557.6053	341.8582	172.8622	0.0000	0.0000	0.0000	0.0000	333.0981	578.7611	812.1472	(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	181.6225	159.5717	166.3519	147.4065	143.2074	126.1780	119.4947	133.4580	133.9620	152.9488	163.8750	176.6778	(64)
Efficiency of water heater (217)m	89.9762	89.9234	89.8078	89.5419	88.9948	87.2000	87.2000	87.2000	87.2000	89.4927	89.8421	87.2000	(216)
Fuel for water heating, kWh/month	201.8561	177.4530	185.2310	164.6229	160.9166	144.6995	137.0352	153.0481	153.6261	170.9064	182.4034	196.3062	(219)
Water heating fuel used													2028.1045 (219)
Annual totals kWh/year													
Space heating fuel - main system													4236.9948 (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)													391.0067 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.90 * 1004 * 1.00) =													-722.8773 (233)
Total delivered energy for all uses													6008.2287 (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	4236.9948	0.2160	915.1909 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2028.1045	0.2160	438.0706 (264)
Space and water heating			1353.2615 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	391.0067	0.5190	202.9325 (268)
Energy saving/generation technologies			
PV Unit	-722.8773	0.5190	-375.1733 (269)
Total CO2, kg/year			1219.9456 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.8900 (273)

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

	TFA	N	EF
DER			13.8900 ZC1
Total Floor Area			87.8000
Assumed number of occupants			2.5944
CO2 emission factor in Table 12 for electricity displaced from grid			0.5190
CO2 emissions from appliances, equation (L14)			15.8587 ZC2
CO2 emissions from cooking, equation (L16)			2.0645 ZC3
Total CO2 emissions			31.8132 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			31.8132 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	43.9000 (1b)	2.3900 (2b)	104.9210 (1b) - (3b)
First floor	43.9000 (1c)	2.4200 (2c)	106.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.8000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 211.1590 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				3 * 10 =	30.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1421 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3921 (18)							
Number of sides sheltered				1	1 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3627 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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												
Effective ac	0.4624	0.4533	0.4443	0.3989	0.3899	0.3445	0.3445	0.3355	0.3627	0.3899	0.4080	0.4261 (22b)
	0.6069	0.6028	0.5987	0.5796	0.5760	0.5594	0.5594	0.5563	0.5658	0.5760	0.5832	0.5908 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			13.1800	1.3258	17.4735		(27)					
Ground Floor			43.9000	0.1300	5.7070		(28a)					
Brick and Block	109.2600	15.3000	93.9600	0.1800	16.9128		(29a)					
Party Wall Step	4.8300		4.8300	0.1800	0.8694		(29a)					
External Roof 1	43.9000		43.9000	0.1300	5.7070		(30)					
Total net area of external elements Aum(A, m2)			201.8900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	48.7897	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.6556 (36)					
Total fabric heat loss							(33) + (36) = 61.4453 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.2908	Feb 42.0015	Mar 41.7180	Apr 40.3862	May 40.1370	Jun 38.9770	Jul 38.9770	Aug 38.7622	Sep 39.4238	Oct 40.1370	Nov 40.6411	Dec 41.1681 (38)
Heat transfer coeff	103.7361	103.4468	103.1633	101.8315	101.5823	100.4223	100.4223	100.2075	100.8691	101.5823	102.0864	102.6134 (39)
Average = Sum(39)m / 12 =												101.8303 (39)
HLP	Jan 1.1815	Feb 1.1782	Mar 1.1750	Apr 1.1598	May 1.1570	Jun 1.1438	Jul 1.1438	Aug 1.1413	Sep 1.1489	Oct 1.1570	Nov 1.1627	Dec 1.1687 (40)
HLP (average)												1.1598 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.5944 (42)
Average daily hot water use (litres/day)												95.8169 (43)
Daily hot water use	105.3985	101.5659	97.7332	93.9005	90.0678	86.2352	86.2352	90.0678	93.9005	97.7332	101.5659	105.3985 (44)
Energy conte	156.3030	136.7036	141.0659	122.9846	118.0067	101.8308	94.3612	108.2809	109.5741	127.6980	139.3924	151.3711 (45)
Energy content (annual)												Total = Sum(45)m = 1507.5723 (45)
Distribution loss (46)m = 0.15 x (45)m	23.4454	20.5055	21.1599	18.4477	17.7010	15.2746	14.1542	16.2421	16.4361	19.1547	20.9089	22.7057 (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)

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												4011.5698 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	721.8393	576.4330	493.4010	288.0952	126.5041	0.0000	0.0000	0.0000	0.0000	286.6284	519.1697	734.7355 (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)	772.8472	617.1660	528.2666	308.4531	135.4433	0.0000	0.0000	0.0000	0.0000	306.8826	555.8562	786.6547 (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	207.2619	182.7310	190.8696	169.2918	163.9043	144.3577	138.3057	154.1785	155.8812	177.5018	188.7075	202.3300 (64)
Efficiency of water heater (217)m	87.9328	87.7436	87.3359	86.3787	84.4080	80.3000	80.3000	80.3000	80.3000	86.2511	87.4672	80.3000 (216)
Fuel for water heating, kWh/month	235.7050	208.2557	218.5467	195.9878	194.1809	179.7730	172.2363	192.0031	194.1235	205.7966	215.7465	229.8948 (219)
Water heating fuel used												2442.2499 (219)
Annual totals kWh/year												4011.5698 (211)
Space heating fuel - main system												0.0000 (215)
Space heating fuel - secondary												
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)												391.0067 (232)
Total delivered energy for all uses												6919.8263 (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	4011.5698	0.2160	866.4991 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2442.2499	0.2160	527.5260 (264)
Space and water heating			1394.0251 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	391.0067	0.5190	202.9325 (268)
Total CO2, kg/m2/year			1635.8825 (272)
Emissions per m2 for space and water heating			15.8773 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3113 (272b)
Emissions per m2 for pumps and fans			0.4433 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8773 * 1.00) + 2.3113 + 0.4433, rounded to 2 d.p.			18.6300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.9000 (1b)	x 2.3900 (2b)	= 104.9210 (1b) - (3b)
First floor	43.9000 (1c)	x 2.4200 (2c)	= 106.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.8000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 211.1590 (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) = 0.1421 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3921 (18)							
Number of sides sheltered					1 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3627 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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												
Effective ac	0.4624	0.4533	0.4443	0.3989	0.3899	0.3445	0.3445	0.3355	0.3627	0.3899	0.4080	0.4261 (22b)
	0.6069	0.6028	0.5987	0.5796	0.5760	0.5594	0.5594	0.5563	0.5658	0.5760	0.5832	0.5908 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows & Fully Glazed Do (Uw = 1.20)			13.1800	1.1450	15.0916		(27)
Ground Floor			43.9000	0.1200	5.2680	90.0000	3951.0000 (28a)
Brick and Block	109.2600	15.3000	93.9600	0.2400	22.5504	42.2200	3966.9912 (29a)
Party Wall Step	4.8300		4.8300	0.2600	1.2558	113.5000	548.2050 (29a)
External Roof 1	43.9000		43.9000	0.1000	4.3900	9.1000	399.4900 (30)
Total net area of external elements Aum(A, m ²)			201.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.8878		(33)
Party Wall 1			35.3100	0.0000	0.0000	45.0000	1588.9500 (32)
GF Timber Stud			73.9800			9.0000	665.8200 (32c)
FF Timber Stud			90.5800			9.0000	815.2200 (32c)
Internal Floor 1			43.9000			18.0000	790.2000 (32d)
Internal Ceiling 1			43.9000			9.0000	395.1000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13120.9762 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							149.4416 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3474 (36)
Total fabric heat loss						(33) + (36) =	61.2352 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.2908	42.0015	41.7180	40.3862	40.1370	38.9770	38.9770	38.7622	39.4238	40.1370	40.6411	41.1681 (38)
Average = Sum(39)m / 12 =	103.5260	103.2367	102.9532	101.6214	101.3722	100.2122	100.2122	99.9974	100.6590	101.3722	101.8763	102.4033 (39)
HLP	1.1791	1.1758	1.1726	1.1574	1.1546	1.1414	1.1414	1.1389	1.1465	1.1546	1.1603	1.1663 (40)
HLP (average)												1.1574 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.5944 (42)
Average daily hot water use (litres/day)												95.8169 (43)
Daily hot water use	105.3985	101.5659	97.7332	93.9005	90.0678	86.2352	86.2352	90.0678	93.9005	97.7332	101.5659	105.3985 (44)
Energy conte	156.3030	136.7036	141.0659	122.9846	118.0067	101.8308	94.3612	108.2809	109.5741	127.6980	139.3924	151.3711 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1507.5723 (45)					
Distribution loss (46)m = 0.15 x (45)m																			
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
If cylinder contains dedicated solar storage																			
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Heat gains from water heating, kWh/month	33.2144	29.0495	29.9765	26.1342	25.0764	21.6390	20.0518	23.0097	23.2845	27.1358	29.6209	32.1664	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
(66)m	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1404	19.6649	15.9926	12.1074	9.0504	7.6408	8.2561	10.7316	14.4039	18.2891	21.3461	22.7558	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.9716	237.4098	231.2655	218.1849	201.6729	186.1541	175.7865	173.3482	179.4926	192.5732	209.0851	224.6040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	(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)	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	(71)
Water heating gains (Table 5)	44.6430	43.2284	40.2910	36.2976	33.7049	30.0542	26.9513	30.9270	32.3396	36.4729	41.1401	43.2344	(72)
Total internal gains	363.6709	362.2191	349.4650	328.5057	306.3442	285.7650	272.9098	276.9227	288.1520	309.2511	333.4872	352.5100	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast	7.6300	11.2829	0.6300	0.7000	0.7700	26.3099 (75)						
Southwest	5.5500	36.7938	0.6300	0.7000	0.7700	62.4079 (79)						
Solar gains	88.7178	159.8583	241.9377	338.6803	414.8634	427.4844	405.6398	346.4156	275.0634	182.9362	107.8550	74.8942 (83)
Total gains	452.3887	522.0774	591.4027	667.1860	721.2075	713.2493	678.5496	623.3383	563.2154	492.1873	441.3422	427.4042 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	tau	35.2058	35.3044	35.4017	35.8656	35.9538	36.3700	36.3700	36.4481	36.2085	35.9538	35.7759	35.5918
alpha	3.3471	3.3536	3.3601	3.3910	3.3969	3.4247	3.4247	3.4299	3.4139	3.3969	3.3851	3.3728	3.3728
util living area	0.9917	0.9858	0.9726	0.9383	0.8633	0.7313	0.5888	0.6458	0.8468	0.9584	0.9866	0.9931 (86)	
MIT	19.0076	19.2127	19.5695	20.0552	20.4985	20.8117	20.9349	20.9096	20.6584	20.0875	19.4662	18.9764 (87)	
Th 2	19.9367	19.9394	19.9420	19.9542	19.9565	19.9672	19.9672	19.9692	19.9631	19.9565	19.9519	19.9470 (88)	
util rest of house	0.9899	0.9827	0.9663	0.9228	0.8263	0.6552	0.4733	0.5331	0.7912	0.9451	0.9832	0.9916 (89)	
MIT 2	18.1143	18.3201	18.6754	19.1595	19.5790	19.8563	19.9417	19.9305	19.7361	19.1994	18.5827	18.0908 (90)	
Living area fraction	18.2646	18.4703	18.8258	19.3102	19.7337	20.0170	20.1087	20.0952	19.8913	19.3488	18.7313	18.2397 (92)	
Temperature adjustment	18.2646	18.4703	18.8258	19.3102	19.7337	20.0170	20.1087	20.0952	19.8913	19.3488	18.7313	18.2397 (93)	
adjusted MIT	18.2646	18.4703	18.8258	19.3102	19.7337	20.0170	20.1087	20.0952	19.8913	19.3488	18.7313	18.2397 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9858	0.9768	0.9574	0.9109	0.8170	0.6593	0.4904	0.5482	0.7866	0.9349	0.9775	0.9882 (94)
Useful gains	445.9840	509.9568	566.2191	607.7136	589.2618	470.2329	332.7590	341.7353	443.0072	460.1463	431.4287	422.3589 (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	1445.6991	1400.9498	1268.9824	1057.8998	814.3888	542.8507	351.6183	369.5075	582.9430	886.8863	1184.9567	1437.7162 (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	743.7880	598.7473	522.8559	324.1341	167.4945	0.0000	0.0000	0.0000	0.0000	317.4945	542.5402	755.4259 (98)
Space heating												3972.4803 (98)
Space heating per m2												(98) / (4) = 45.2447 (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	941.9948	741.5704	759.9803	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7697	0.8385	0.8055	0.0000	0.0000	0.0000	0.0000 (101)

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Calculation Type: New Build (As Designed)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	725.0763	621.8118	612.2018	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	931.7037	889.1325	826.4347	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	148.7717	198.8866	159.3893	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												507.0476 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	37.1929	49.7216	39.8473	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												126.7619 (107)
Space cooling per m2												1.4438 (108)
Energy for space heating												45.2447 (99)
Energy for space cooling												1.4438 (108)
Total												46.6884 (109)
Dwelling Fabric Energy Efficiency (DFEE)												46.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	43.9000 (1b)	2.3900 (2b)	104.9210 (1b) - (3b)
First floor	43.9000 (1c)	2.4200 (2c)	106.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.8000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 211.1590 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1421 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3921 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3627 (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												
Effective ac	0.4624	0.4533	0.4443	0.3989	0.3899	0.3445	0.3445	0.3355	0.3627	0.3899	0.4080	0.4261 (22b)
	0.6069	0.6028	0.5987	0.5796	0.5760	0.5594	0.5594	0.5563	0.5658	0.5760	0.5832	0.5908 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.1200	1.0000	2.1200		(26)					
TER Opening Type (Uw = 1.40)			13.1800	1.3258	17.4735		(27)					
Ground Floor			43.9000	0.1300	5.7070		(28a)					
Brick and Block	109.2600	15.3000	93.9600	0.1800	16.9128		(29a)					
Party Wall Step	4.8300		4.8300	0.1800	0.8694		(29a)					
External Roof 1	43.9000		43.9000	0.1300	5.7070		(30)					
Total net area of external elements Aum(A, m2)			201.8900				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		48.7897 (33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.6556 (36)					
Total fabric heat loss							(33) + (36) = 61.4453 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	42.2908	42.0015	41.7180	40.3862	40.1370	38.9770	38.9770	38.7622	39.4238	40.1370	40.6411	41.1681 (38)
Heat transfer coeff	103.7361	103.4468	103.1633	101.8315	101.5823	100.4223	100.4223	100.2075	100.8691	101.5823	102.0864	102.6134 (39)
Average = Sum(39)m / 12 =												101.8303 (39)
HLP	1.1815	1.1782	1.1750	1.1598	1.1570	1.1438	1.1438	1.1413	1.1489	1.1570	1.1627	1.1687 (40)
HLP (average)												1.1598 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.5944 (42)
Average daily hot water use (litres/day)												95.8169 (43)
Daily hot water use	105.3985	101.5659	97.7332	93.9005	90.0678	86.2352	86.2352	90.0678	93.9005	97.7332	101.5659	105.3985 (44)
Energy conte	156.3030	136.7036	141.0659	122.9846	118.0067	101.8308	94.3612	108.2809	109.5741	127.6980	139.3924	151.3711 (45)
Energy content (annual)												Total = Sum(45)m = 1507.5723 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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	0.0000	(59)
Heat gains from water heating, kWh/month	33.2144	29.0495	29.9765	26.1342	25.0764	21.6390	20.0518	23.0097	23.2845	27.1358	29.6209	32.1664	(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	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	129.7197	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1404	19.6649	15.9926	12.1074	9.0504	7.6408	8.2561	10.7316	14.4039	18.2891	21.3461	22.7558	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.9716	237.4098	231.2655	218.1849	201.6729	186.1541	175.7865	173.3482	179.4926	192.5732	209.0851	224.6040	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	35.9720	(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)	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	(71)
Water heating gains (Table 5)	44.6430	43.2284	40.2910	36.2976	33.7049	30.0542	26.9513	30.9270	32.3396	36.4729	41.1401	43.2344	(72)
Total internal gains	363.6709	362.2191	349.4650	328.5057	306.3442	285.7650	272.9098	276.9227	288.1520	309.2511	333.4872	352.5100	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast	7.6300	11.2829	0.6300	0.7000	0.7700	26.3099	(75)						
Southwest	5.5500	36.7938	0.6300	0.7000	0.7700	62.4079	(79)						
Solar gains	88.7178	159.8583	241.9377	338.6803	414.8634	427.4844	405.6398	346.4156	275.0634	182.9362	107.8550	74.8942	(83)
Total gains	452.3887	522.0774	591.4027	667.1860	721.2075	713.2493	678.5496	623.3383	563.2154	492.1873	441.3422	427.4042	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains for living area, nil,m (see Table 9a)	58.7763	58.9406	59.1026	59.8756	60.0225	60.7158	60.7158	60.8460	60.4469	60.0225	59.7261	59.4194	21.0000	(85)
tau	4.9184	4.9294	4.9402	4.9917	5.0015	5.0477	5.0477	5.0564	5.0298	5.0015	4.9817	4.9613		
alpha	0.9990	0.9977	0.9938	0.9780	0.9236	0.7884	0.6230	0.6896	0.9088	0.9882	0.9979	0.9993	(86)	
util living area	19.6382	19.7819	20.0330	20.3811	20.7023	20.9139	20.9795	20.9667	20.8030	20.3910	19.9557	19.6176	(87)	
MIT	19.9348	19.9375	19.9401	19.9523	19.9546	19.9653	19.9653	19.9672	19.9611	19.9546	19.9499	19.9451	(88)	
Th 2	0.9986	0.9969	0.9914	0.9687	0.8894	0.7005	0.4905	0.5582	0.8537	0.9817	0.9971	0.9990	(89)	
util rest of house	18.6903	18.8359	19.0880	19.4407	19.7440	19.9233	19.9598	19.9571	19.8430	19.4556	19.0196	18.6779	(90)	
MIT 2	18.8498	18.9951	19.2470	19.5989	19.9052	20.0900	20.1313	20.1269	20.0045	19.6129	19.1771	18.8360	(92)	
Living area fraction	18.8498	18.9951	19.2470	19.5989	19.9052	20.0900	20.1313	20.1269	20.0045	19.6129	19.1771	18.8360	(91)	
MIT	18.8498	18.9951	19.2470	19.5989	19.9052	20.0900	20.1313	20.1269	20.0045	19.6129	19.1771	18.8360	(92)	
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
adjusted MIT	18.8498	18.9951	19.2470	19.5989	19.9052	20.0900	20.1313	20.1269	20.0045	19.6129	19.1771	18.8360	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	451.5426	519.9519	585.0674	643.5716	640.0284	508.0928	348.0966	361.7070	482.4279	481.7259	439.6415	426.8046	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(95)
Heat loss rate W	1509.3378	1458.0900	1315.0207	1089.4796	833.5072	551.3135	354.6247	373.4638	595.5835	915.5554	1232.9062	1501.8500	(96)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	786.9997	630.4288	543.0852	321.0538	143.9483	0.0000	0.0000	0.0000	0.0000	322.7691	571.1506	799.8337	(98)
Space heating per m2												4119.2692	(98)
										(98) / (4) =		46.9165	(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	943.9697	743.1251	761.5770	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8291	0.8997	0.8670	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	782.6853	668.5935	660.3123	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	931.7037	889.1325	826.4347	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	107.2932	164.0810	123.5950	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												394.9693	(104)

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Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	26.8233	41.0203	30.8988	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											98.7423 (107)	
Space cooling per m2											1.1246 (108)	
Energy for space heating											46.9165 (99)	
Energy for space cooling											1.1246 (108)	
Total											48.0411 (109)	
Target Fabric Energy Efficiency (TFEE)											55.2 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	43.9000 (1b)	2.3900 (2b)	104.9210 (1b) - (3b)
First floor	43.9000 (1c)	2.4200 (2c)	106.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.8000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 211.1590 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				3 * 10 =	30.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				30.0000 / (5) =	0.1421 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3921 (18)							
Number of sides sheltered				1	1 (19)							
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)							
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3627 (21)							
Wind speed	Jan 5.1000	Feb 4.7000	Mar 4.6000	Apr 4.3000	May 4.3000	Jun 4.0000	Jul 4.0000	Aug 3.9000	Sep 4.0000	Oct 4.5000	Nov 4.4000	Dec 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	0.4624	0.4261	0.4171	0.3899	0.3899	0.3627	0.3627	0.3536	0.3627	0.4080	0.3989	0.4261 (22b)
Effective ac	0.6069	0.5908	0.5870	0.5760	0.5760	0.5658	0.5658	0.5625	0.5658	0.5832	0.5796	0.5908 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows & Fully Glazed Do (Uw = 1.20)			13.1800	1.1450	15.0916		(27)
Ground Floor			43.9000	0.1200	5.2680	90.0000	3951.0000 (28a)
Brick and Block	109.2600	15.3000	93.9600	0.2400	22.5504	42.2200	3966.9912 (29a)
Party Wall Step	4.8300		4.8300	0.2600	1.2558	113.5000	548.2050 (29a)
External Roof 1	43.9000		43.9000	0.1000	4.3900	9.1000	399.4900 (30)
Total net area of external elements Aum(A, m2)			201.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.8878		(33)
Party Wall 1			35.3100	0.0000	0.0000	45.0000	1588.9500 (32)
GF Timber Stud			73.9800			9.0000	665.8200 (32c)
FF Timber Stud			90.5800			9.0000	815.2200 (32c)
Internal Floor 1			43.9000			18.0000	790.2000 (32d)
Internal Ceiling 1			43.9000			18.0000	790.2000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 13516.0762 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							153.9416 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3474 (36)
Total fabric heat loss							(33) + (36) = 61.2352 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.2908	41.1681	40.9017	40.1370	40.1370	39.4238	39.4238	39.1976	39.4238	40.6411	40.3862	41.1681 (38)
Average = Sum(39)m / 12 =	103.5260	102.4033	102.1369	101.3722	101.3722	100.6590	100.6590	100.4328	100.6590	101.8763	101.6214	102.4033 (39)
HLP	1.1791	1.1663	1.1633	1.1546	1.1546	1.1465	1.1465	1.1439	1.1465	1.1603	1.1574	1.1663 (40)
HLP (average)												1.1571 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.5944 (42)
Average daily hot water use (litres/day)												95.8169 (43)
Daily hot water use	105.3985	101.5659	97.7332	93.9005	90.0678	86.2352	86.2352	90.0678	93.9005	97.7332	101.5659	105.3985 (44)
Energy conte	156.3030	136.7036	141.0659	122.9846	118.0067	101.8308	94.3612	108.2809	109.5741	127.6980	139.3924	151.3711 (45)

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CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1507.5723 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.4454	20.5055	21.1599	18.4477	17.7010	15.2746	14.1542	16.2421	16.4361	19.1547	20.9089	22.7057	22.7057	(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	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	0.0000	(57)
Combi loss	25.3195	22.8681	25.2860	24.4219	25.2007	24.3472	25.1335	25.1771	24.3879	25.2507	24.4827	25.3067	25.3067	(61)
Total heat required for water heating calculated for each month	181.6225	159.5717	166.3519	147.4065	143.2074	126.1780	119.4947	133.4580	133.9620	152.9488	163.8750	176.6778	176.6778	(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	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)	
Output from w/h	181.6225	159.5717	166.3519	147.4065	143.2074	126.1780	119.4947	133.4580	133.9620	152.9488	163.8750	176.6778	176.6778	(64)
Total per year (kWh/year) = Sum(64)m =													1804.7544 (64)	
RHI water heating demand													1805 (64)	
Heat gains from water heating, kWh/month	58.3006	51.1710	53.2259	46.9979	45.5374	39.9455	37.6585	42.2977	42.5304	48.7723	52.4686	56.6576	56.6576	(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	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.3510	49.1623	39.9815	30.2685	22.6261	19.1019	20.6403	26.8290	36.0098	45.7228	53.3652	56.8894	56.8894	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	350.7038	354.3431	345.1724	325.6491	301.0044	277.8419	262.3679	258.7287	267.8994	287.4227	312.0673	335.2299	335.2299	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	(71)
Water heating gains (Table 5)	78.3611	76.1473	71.5402	65.2748	61.2062	55.4799	50.6162	56.8517	59.0699	65.5541	72.8731	76.1527	76.1527	(72)
Total internal gains	592.4646	587.7013	564.7427	529.2411	492.8853	460.4723	441.6730	450.4580	471.0278	506.7482	546.3543	576.3206	576.3206	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W							
Northeast		7.6300	15.0428	0.6300	0.7000	0.7700	35.0773 (75)							
Southwest		5.5500	46.3896	0.6300	0.7000	0.7700	78.6838 (79)							
Solar gains	113.7611	175.9085	266.5240	382.1615	448.3486	500.2294	463.2311	403.3756	322.1321	213.4086	137.1894	91.6076	91.6076	(83)
Total gains	706.2257	763.6098	831.2667	911.4026	941.2340	960.7018	904.9041	853.8337	793.1599	720.1568	683.5437	667.9282	667.9282	(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	36.2659	36.6635	36.7591	37.0364	37.0364	37.2989	37.2989	37.3829	37.2989	36.8532	36.9456	36.6635	36.6635	
alpha	3.4177	3.4442	3.4506	3.4691	3.4691	3.4866	3.4866	3.4922	3.4866	3.4569	3.4630	3.4442	3.4442	
util living area	0.9658	0.9550	0.9253	0.8582	0.7359	0.5452	0.4004	0.4214	0.6619	0.8652	0.9435	0.9700	0.9700	(86)
MIT	19.5776	19.7188	20.0354	20.4269	20.7562	20.9386	20.9845	20.9819	20.8786	20.5186	20.0256	19.5630	19.5630	(87)
Th 2	19.9367	19.9470	19.9495	19.9565	19.9565	19.9631	19.9631	19.9652	19.9631	19.9519	19.9542	19.9470	19.9470	(88)
util rest of house	0.9585	0.9457	0.9094	0.8277	0.6788	0.4583	0.2932	0.3097	0.5766	0.8274	0.9295	0.9635	0.9635	(89)
MIT 2	18.6743	18.8199	19.1288	19.5030	19.7926	19.9339	19.9589	19.9602	19.8982	19.5924	19.1281	18.6683	18.6683	(90)
Living area fraction	18.8263	18.9711	19.2813	19.6584	19.9547	20.1029	20.1314	20.1321	20.0631	19.7482	19.2791	18.8188	18.8188	(92)
Temperature adjustment													0.0000	
adjusted MIT	18.8263	18.9711	19.2813	19.6584	19.9547	20.1029	20.1314	20.1321	20.0631	19.7482	19.2791	18.8188	18.8188	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	670.0690	713.8284	745.7750	745.2005	638.8470	452.1411	281.5103	280.3220	464.4659	589.6257	627.6440	637.5028	637.5028	(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	5.5000	(96)
Heat loss rate W	1389.9679	1359.0039	1223.7370	1019.6450	745.5643	473.3879	285.0067	284.4335	509.6470	809.7318	1105.5451	1363.8893	1363.8893	(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	1.0000	(97a)
Space heating kWh	535.6048	433.5579	355.6037	197.6000	79.3976	0.0000	0.0000	0.0000	0.0000	163.7589	344.0888	540.4315	540.4315	(98)
Space heating													2650.0433 (98)	
RHI space heating demand													2650 (98)	

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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 (m2)	Storey height (m)	Volume (m3)
Ground floor	43.9000 (1b)	2.3900 (2b)	104.9210 (1b) - (3b)
First floor	43.9000 (1c)	2.4200 (2c)	106.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.8000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 211.1590 (5)
Dwelling volume			

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1421 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3921 (18)	
Number of sides sheltered				1 (19)	
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3627 (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												
Effective ac	0.4624	0.4533	0.4443	0.3989	0.3899	0.3445	0.3445	0.3355	0.3627	0.3899	0.4080	0.4261 (22b)
	0.6069	0.6028	0.5987	0.5796	0.5760	0.5594	0.5594	0.5563	0.5658	0.5760	0.5832	0.5908 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows & Fully Glazed Do (Uw = 1.20)			13.1800	1.1450	15.0916		(27)
Ground Floor			43.9000	0.1200	5.2680	90.0000	3951.0000 (28a)
Brick and Block	109.2600	15.3000	93.9600	0.2400	22.5504	42.2200	3966.9912 (29a)
Party Wall Step	4.8300		4.8300	0.2600	1.2558	113.5000	548.2050 (29a)
External Roof 1	43.9000		43.9000	0.1000	4.3900	9.1000	399.4900 (30)
Total net area of external elements Aum(A, m2)			201.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.8878		(33)
Party Wall 1			35.3100	0.0000	0.0000	45.0000	1588.9500 (32)
GF Timber Stud			73.9800			9.0000	665.8200 (32c)
FF Timber Stud			90.5800			9.0000	815.2200 (32c)
Internal Floor 1			43.9000			18.0000	790.2000 (32d)
Internal Ceiling 1			43.9000			18.0000	790.2000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 13516.0762 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							153.9416 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3474 (36)
Total fabric heat loss							(33) + (36) = 61.2352 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.2908	42.0015	41.7180	40.3862	40.1370	38.9770	38.9770	38.7622	39.4238	40.1370	40.6411	41.1681 (38)
Average = Sum(39)m / 12 =	103.5260	103.2367	102.9532	101.6214	101.3722	100.2122	100.2122	99.9974	100.6590	101.3722	101.8763	102.4033 (39)
												101.6202 (39)
HLP	1.1791	1.1758	1.1726	1.1574	1.1546	1.1414	1.1414	1.1389	1.1465	1.1546	1.1603	1.1663 (40)
HLP (average)												1.1574 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.5944 (42)
Average daily hot water use (litres/day)												95.8169 (43)
Daily hot water use	105.3985	101.5659	97.7332	93.9005	90.0678	86.2352	86.2352	90.0678	93.9005	97.7332	101.5659	105.3985 (44)
Energy conte	156.3030	136.7036	141.0659	122.9846	118.0067	101.8308	94.3612	108.2809	109.5741	127.6980	139.3924	151.3711 (45)

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Energy content (annual)													Total = Sum(45)m =	1507.5723 (45)			
Distribution loss (46)m = 0.15 x (45)m																	
	23.4454	20.5055	21.1599	18.4477	17.7010	15.2746	14.1542	16.2421	16.4361	19.1547	20.9089	22.7057	16.4361	19.1547	20.9089	22.7057	(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	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	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	25.3195	22.8681	25.2860	24.4219	25.2007	24.3472	25.1335	25.1771	24.3879	25.2507	24.4827	25.3067	24.3879	25.2507	24.4827	25.3067	(61)
Total heat required for water heating calculated for each month	181.6225	159.5717	166.3519	147.4065	143.2074	126.1780	119.4947	133.4580	133.9620	152.9488	163.8750	176.6778	133.9620	152.9488	163.8750	176.6778	(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	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	181.6225	159.5717	166.3519	147.4065	143.2074	126.1780	119.4947	133.4580	133.9620	152.9488	163.8750	176.6778	133.9620	152.9488	163.8750	176.6778	(64)
Heat gains from water heating, kWh/month	58.3006	51.1710	53.2259	46.9979	45.5374	39.9455	37.6585	42.2977	42.5304	48.7723	52.4686	56.6576	42.5304	48.7723	52.4686	56.6576	(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	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	(66)		
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.3510	49.1623	39.9815	30.2685	22.6261	19.1019	20.6403	26.8290	36.0098	45.7228	53.3652	56.8894	36.0098	45.7228	53.3652	56.8894	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	350.7038	354.3431	345.1724	325.6491	301.0044	277.8419	262.3679	258.7287	267.8994	287.4227	312.0673	335.2299	267.8994	287.4227	312.0673	335.2299	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	(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	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	(71)
Water heating gains (Table 5)	78.3611	76.1473	71.5402	65.2748	61.2062	55.4799	50.6162	56.8517	59.0699	65.5541	72.8731	76.1527	59.0699	65.5541	72.8731	76.1527	(72)
Total internal gains	592.4646	587.7013	564.7427	529.2411	492.8853	460.4723	441.6730	450.4580	471.0278	506.7482	546.3543	576.3206	471.0278	506.7482	546.3543	576.3206	(73)

6. Solar gains

[Jan]	Area	Solar flux	Specific data	Specific data	Access	Gains								
	m ²	Table 6a	g	FF	factor	W								
		W/m ²	or Table 6b	or Table 6c	Table 6d									
Northeast	7.6300	11.2829	0.6300	0.7000	0.7700	26.3099	(75)							
Southwest	5.5500	36.7938	0.6300	0.7000	0.7700	62.4079	(79)							
Solar gains	88.7178	159.8583	241.9377	338.6803	414.8634	427.4844	405.6398	346.4156	275.0634	182.9362	107.8550	74.8942	(83)	
Total gains	681.1824	747.5596	806.6804	867.9214	907.7487	887.9567	847.3128	796.8736	746.0912	689.6844	654.2093	651.2147	(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	36.2659	36.3675	36.4677	36.9456	37.0364	37.4651	37.4651	37.5456	37.2989	37.0364	36.8532	36.6635		
alpha	3.4177	3.4245	3.4312	3.4630	3.4691	3.4977	3.4977	3.5030	3.4866	3.4691	3.4569	3.4442		
util living area	0.9745	0.9633	0.9405	0.8884	0.7907	0.6386	0.4936	0.5384	0.7485	0.9067	0.9615	0.9778	(86)	
MIT	19.3760	19.5625	19.8787	20.2969	20.6547	20.8856	20.9650	20.9523	20.7907	20.3418	19.7941	19.3423	(87)	
Th 2	19.9367	19.9394	19.9420	19.9542	19.9565	19.9672	19.9672	19.9692	19.9631	19.9565	19.9519	19.9470	(88)	
util rest of house	0.9693	0.9558	0.9280	0.8639	0.7437	0.5595	0.3885	0.4326	0.6788	0.8810	0.9524	0.9733	(89)	
MIT 2	18.4752	18.6605	18.9716	19.3814	19.7082	19.9040	19.9545	19.9505	19.8344	19.4335	18.9004	18.4498	(90)	
Living area fraction													fLA = Living area / (4) =	0.1682 (91)
MIT	18.6268	18.8122	19.1242	19.5354	19.8674	20.0691	20.1245	20.1190	19.9952	19.5863	19.0508	18.5999	(92)	
Temperature adjustment													0.0000	
adjusted MIT	18.6268	18.8122	19.1242	19.5354	19.8674	20.0691	20.1245	20.1190	19.9952	19.5863	19.0508	18.5999	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9609	0.9457	0.9160	0.8524	0.7393	0.5679	0.4052	0.4489	0.6813	0.8700	0.9423	0.9656	(94)	
Useful gains	654.5464	706.9938	738.9323	739.8152	671.0690	504.2753	343.3531	357.6903	508.2749	600.0275	616.4838	628.8396	(95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	16.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Heat loss rate W	1483.1924	1436.2508	1299.7060	1080.7874	827.9470	548.0755	353.1968	371.8890	593.4098	910.9560	1217.4983	1474.5996	(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	616.5126	490.0607	417.2156	245.5000	116.7172	0.0000	0.0000	0.0000	0.0000	231.3308	432.7304	629.2454	(98)	
Space heating													3179.3127 (98)	
Space heating per m2													(98) / (4) =	36.2109 (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													3505.3062 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	616.5126	490.0607	417.2156	245.5000	116.7172	0.0000	0.0000	0.0000	0.0000	231.3308	432.7304	629.2454	(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)	679.7272	540.3095	459.9952	270.6725	128.6849	0.0000	0.0000	0.0000	0.0000	255.0505	477.1008	693.7656	(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	181.6225	159.5717	166.3519	147.4065	143.2074	126.1780	119.4947	133.4580	133.9620	152.9488	163.8750	176.6778	(64)
Efficiency of water heater (217)m	89.8791	89.8145	89.6740	89.3545	88.7376	87.2000	87.2000	87.2000	87.2000	89.2738	89.7109	87.2000	(216)
Fuel for water heating, kWh/month	202.0743	177.6681	185.5074	164.9683	161.3830	144.6995	137.0352	153.0481	153.6261	171.3254	182.6701	196.5077	(219)
Water heating fuel used													2030.5133 (219)
Annual totals kWh/year													
Space heating fuel - main system													3505.3062 (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)													391.0067 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.90 * 1004 * 1.00) =													-722.8773 (233)
Total delivered energy for all uses													5278.9489 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3505.3062	3.4800	121.9847 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2030.5133	3.4800	70.6619 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	391.0067	13.1900	51.5738 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-722.8773	13.1900	-95.3475 (252)
Total energy cost			278.7653 (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] =	0.8816 (257)
SAP value		87.7012
SAP rating (Section 12)		88 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3505.3062	0.2160	757.1461 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2030.5133	0.2160	438.5909 (264)
Space and water heating			1195.7370 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	391.0067	0.5190	202.9325 (268)
Energy saving/generation technologies			
PV Unit	-722.8773	0.5190	-375.1733 (269)
Total kg/year			1062.4212 (272)
CO2 emissions per m2			12.1000 (273)
EI value			89.2798
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	$3.48 / 0.8876 = 3.921$, stars = 4
Water heating environmental impact	$0.216 / 0.8876 = 0.2433$, 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	43.9000 (1b)	2.3900 (2b)	104.9210 (1b) - (3b)
First floor	43.9000 (1c)	2.4200 (2c)	106.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.8000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 211.1590 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				3 * 10 =	30.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1421 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate				0.3921 (18)								
Number of sides sheltered				1 (19)								
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3627 (21)							
Wind speed	Jan 5.1000	Feb 4.7000	Mar 4.6000	Apr 4.3000	May 4.3000	Jun 4.0000	Jul 4.0000	Aug 3.9000	Sep 4.0000	Oct 4.5000	Nov 4.4000	Dec 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												
Effective ac	0.4624	0.4261	0.4171	0.3899	0.3899	0.3627	0.3627	0.3536	0.3627	0.4080	0.3989	0.4261 (22b)
	0.6069	0.5908	0.5870	0.5760	0.5760	0.5658	0.5658	0.5625	0.5658	0.5832	0.5796	0.5908 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows & Fully Glazed Do (Uw = 1.20)			13.1800	1.1450	15.0916		(27)
Ground Floor			43.9000	0.1200	5.2680	90.0000	3951.0000 (28a)
Brick and Block	109.2600	15.3000	93.9600	0.2400	22.5504	42.2200	3966.9912 (29a)
Party Wall Step	4.8300		4.8300	0.2600	1.2558	113.5000	548.2050 (29a)
External Roof 1	43.9000		43.9000	0.1000	4.3900	9.1000	399.4900 (30)
Total net area of external elements Aum(A, m2)			201.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.8878		(33)
Party Wall 1			35.3100	0.0000	0.0000	45.0000	1588.9500 (32)
GF Timber Stud			73.9800			9.0000	665.8200 (32c)
FF Timber Stud			90.5800			9.0000	815.2200 (32c)
Internal Floor 1			43.9000			18.0000	790.2000 (32d)
Internal Ceiling 1			43.9000			18.0000	790.2000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 13516.0762 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							153.9416 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3474 (36)
Total fabric heat loss							(33) + (36) = 61.2352 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.2908	41.1681	40.9017	40.1370	40.1370	39.4238	39.4238	39.1976	39.4238	40.6411	40.3862	41.1681 (38)
Average = Sum(39)m / 12 =	103.5260	102.4033	102.1369	101.3722	101.3722	100.6590	100.6590	100.4328	100.6590	101.8763	101.6214	102.4033 (39)
												101.5934 (39)
HLP	1.1791	1.1663	1.1633	1.1546	1.1546	1.1465	1.1465	1.1439	1.1465	1.1603	1.1574	1.1663 (40)
HLP (average)												1.1571 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.5944 (42)
Average daily hot water use (litres/day)												95.8169 (43)
Daily hot water use	105.3985	101.5659	97.7332	93.9005	90.0678	86.2352	86.2352	90.0678	93.9005	97.7332	101.5659	105.3985 (44)
Energy conte	156.3030	136.7036	141.0659	122.9846	118.0067	101.8308	94.3612	108.2809	109.5741	127.6980	139.3924	151.3711 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Energy content (annual)													Total = Sum(45)m =	1507.5723 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.4454	20.5055	21.1599	18.4477	17.7010	15.2746	14.1542	16.2421	16.4361	19.1547	20.9089	22.7057	22.7057	(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	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	0.0000	(57)
Combi loss	25.3195	22.8681	25.2860	24.4219	25.2007	24.3472	25.1335	25.1771	24.3879	25.2507	24.4827	25.3067	25.3067	(61)
Total heat required for water heating calculated for each month	181.6225	159.5717	166.3519	147.4065	143.2074	126.1780	119.4947	133.4580	133.9620	152.9488	163.8750	176.6778	176.6778	(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	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)	
Output from w/h	181.6225	159.5717	166.3519	147.4065	143.2074	126.1780	119.4947	133.4580	133.9620	152.9488	163.8750	176.6778	176.6778	(64)
Total per year (kWh/year) = Sum(64)m =													1804.7544 (64)	
Heat gains from water heating, kWh/month	58.3006	51.1710	53.2259	46.9979	45.5374	39.9455	37.6585	42.2977	42.5304	48.7723	52.4686	56.6576	56.6576	(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	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.3510	49.1623	39.9815	30.2685	22.6261	19.1019	20.6403	26.8290	36.0098	45.7228	53.3652	56.8894	56.8894	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	350.7038	354.3431	345.1724	325.6491	301.0044	277.8419	262.3679	258.7287	267.8994	287.4227	312.0673	335.2299	335.2299	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	(71)
Water heating gains (Table 5)	78.3611	76.1473	71.5402	65.2748	61.2062	55.4799	50.6162	56.8517	59.0699	65.5541	72.8731	76.1527	76.1527	(72)
Total internal gains	592.4646	587.7013	564.7427	529.2411	492.8853	460.4723	441.6730	450.4580	471.0278	506.7482	546.3543	576.3206	576.3206	(73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W							
Northeast		7.6300	15.0428	0.6300	0.7000	0.7700	35.0773 (75)							
Southwest		5.5500	46.3896	0.6300	0.7000	0.7700	78.6838 (79)							
Solar gains	113.7611	175.9085	266.5240	382.1615	448.3486	500.2294	463.2311	403.3756	322.1321	213.4086	137.1894	91.6076	91.6076	(83)
Total gains	706.2257	763.6098	831.2667	911.4026	941.2340	960.7018	904.9041	853.8337	793.1599	720.1568	683.5437	667.9282	667.9282	(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	36.2659	36.6635	36.7591	37.0364	37.0364	37.2989	37.2989	37.3829	37.2989	36.8532	36.9456	36.6635	36.6635	
alpha	3.4177	3.4442	3.4506	3.4691	3.4691	3.4866	3.4866	3.4922	3.4866	3.4569	3.4630	3.4442	3.4442	
util living area	0.9658	0.9550	0.9253	0.8582	0.7359	0.5452	0.4004	0.4214	0.6619	0.8652	0.9435	0.9700	0.9700	(86)
MIT	19.5776	19.7188	20.0354	20.4269	20.7562	20.9386	20.9845	20.9819	20.8786	20.5186	20.0256	19.5630	19.5630	(87)
Th 2	19.9367	19.9470	19.9495	19.9565	19.9565	19.9631	19.9631	19.9652	19.9631	19.9519	19.9542	19.9470	19.9470	(88)
util rest of house	0.9585	0.9457	0.9094	0.8277	0.6788	0.4583	0.2932	0.3097	0.5766	0.8274	0.9295	0.9635	0.9635	(89)
MIT 2	18.6743	18.8199	19.1288	19.5030	19.7926	19.9339	19.9589	19.9602	19.8982	19.5924	19.1281	18.6683	18.6683	(90)
Living area fraction													fLA = Living area / (4) = 0.1682 (91)	
MIT	18.8263	18.9711	19.2813	19.6584	19.9547	20.1029	20.1314	20.1321	20.0631	19.7482	19.2791	18.8188	18.8188	(92)
Temperature adjustment													0.0000	
adjusted MIT	18.8263	18.9711	19.2813	19.6584	19.9547	20.1029	20.1314	20.1321	20.0631	19.7482	19.2791	18.8188	18.8188	(93)

8. Space heating requirement

Utilisation	0.9488	0.9348	0.8972	0.8176	0.6787	0.4706	0.3111	0.3283	0.5856	0.8187	0.9182	0.9544	0.9544	(94)
Useful gains	670.0690	713.8284	745.7750	745.2005	638.8470	452.1411	281.5103	280.3220	464.4659	589.6257	627.6440	637.5028	637.5028	(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	5.5000	(96)
Heat loss rate W	1389.9679	1359.0039	1223.7370	1019.6450	745.5643	473.3879	285.0067	284.4335	509.6470	809.7318	1105.5451	1363.8893	1363.8893	(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	1.0000	(97a)
Space heating kWh	535.6048	433.5579	355.6037	197.6000	79.3976	0.0000	0.0000	0.0000	0.0000	163.7589	344.0888	540.4315	540.4315	(98)
Space heating													2650.0433 (98)	
Space heating per m ²													(98) / (4) = 30.1827 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													2921.7676 (211)
Space heating requirement	535.6048	433.5579	355.6037	197.6000	79.3976	0.0000	0.0000	0.0000	0.0000	163.7589	344.0888	540.4315	(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)	590.5235	478.0131	392.0658	217.8611	87.5387	0.0000	0.0000	0.0000	0.0000	180.5500	379.3702	595.8451	(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	181.6225	159.5717	166.3519	147.4065	143.2074	126.1780	119.4947	133.4580	133.9620	152.9488	163.8750	176.6778	(64)
Efficiency of water heater (217)m	89.7874	89.7311	89.5544	89.1708	88.4169	87.2000	87.2000	87.2000	87.2000	88.9753	89.5406	87.2000	(216)
Fuel for water heating, kWh/month	202.2806	177.8333	185.7551	165.3081	161.9683	144.6995	137.0352	153.0481	153.6261	171.9002	183.0177	196.7199	(219)
Water heating fuel used													2033.1923 (219)
Annual totals kWh/year													
Space heating fuel - main system													2921.7676 (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)													391.0067 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.90 * 1146 * 1.00) =													-825.2989 (233)
Total delivered energy for all uses													4595.6677 (238)

10a. Fuel costs - using BEDF prices (513)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2921.7676	9.7400	284.5802 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2033.1923	9.7400	198.0329 (247)
Pumps and fans for heating	75.0000	36.8500	27.6375 (249)
Energy for lighting	391.0067	36.8500	144.0860 (250)
Additional standing charges			104.0000 (251)
Energy saving/generation technologies			
PV Unit	-825.2989	36.8500	-304.1227 (252)
Total energy cost			454.2139 (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	2921.7676	0.2160	631.1018 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2033.1923	0.2160	439.1695 (264)
Space and water heating			1070.2714 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	391.0067	0.5190	202.9325 (268)
Energy saving/generation technologies			
PV Unit	-825.2989	0.5190	-428.3301 (269)
Total kg/year			883.7987 (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	2921.7676	1.2200	3564.5565 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2033.1923	1.2200	2480.4947 (264)
Space and water heating			6045.0512 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	391.0067	3.0700	1200.3904 (268)
Energy saving/generation technologies			
PV Unit	-825.2989	3.0700	-2533.6677 (269)
Primary energy kWh/year			4942.0239 (272)
Primary energy kWh/m2/year			56.2873 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 88
 Current environmental impact rating: B 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	-£ 81	-194 kg (22.0%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£81 2.21 kg/m ²	B 89	B 91
Total Savings	£81 2.21 kg/m ²		

Potential energy efficiency rating: B 89
 Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 513 TEST (28 Feb 2023)
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£172	£190	-£18
Mains gas	£587	£487	£99
Space heating	£416	£416	£0
Water heating	£198	£117	£81
Lighting	£144	£144	£0
Generated (PV)	-£304	-£304	£0
Total cost of fuels	£455	£373	£81
Total cost of uses	£454	£373	£81
Delivered energy	52 kWh/m ²	41 kWh/m ²	11 kWh/m ²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m ²	10 kg/m ²	8 kg/m ²	2 kg/m ²
Primary energy	56 kWh/m ²	44 kWh/m ²	12 kWh/m ²

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	43.9000 (1b)	2.3900 (2b)	104.9210 (1b) - (3b)
First floor	43.9000 (1c)	2.4200 (2c)	106.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.8000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 211.1590 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1421 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate					0.3921 (18)
Number of sides sheltered				1	1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3627 (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												
Effective ac	0.4624	0.4533	0.4443	0.3989	0.3899	0.3445	0.3445	0.3355	0.3627	0.3899	0.4080	0.4261 (22b)
	0.6069	0.6028	0.5987	0.5796	0.5760	0.5594	0.5594	0.5563	0.5658	0.5760	0.5832	0.5908 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows & Fully Glazed Do (Uw = 1.20)			13.1800	1.1450	15.0916		(27)
Ground Floor			43.9000	0.1200	5.2680	90.0000	3951.0000 (28a)
Brick and Block	109.2600	15.3000	93.9600	0.2400	22.5504	42.2200	3966.9912 (29a)
Party Wall Step	4.8300		4.8300	0.2600	1.2558	113.5000	548.2050 (29a)
External Roof 1	43.9000		43.9000	0.1000	4.3900	9.1000	399.4900 (30)
Total net area of external elements Aum(A, m2)			201.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.8878		(33)
Party Wall 1			35.3100	0.0000	0.0000	45.0000	1588.9500 (32)
GF Timber Stud			73.9800			9.0000	665.8200 (32c)
FF Timber Stud			90.5800			9.0000	815.2200 (32c)
Internal Floor 1			43.9000			18.0000	790.2000 (32d)
Internal Ceiling 1			43.9000			18.0000	790.2000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 13516.0762 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							153.9416 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3474 (36)
Total fabric heat loss							(33) + (36) = 61.2352 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.2908	42.0015	41.7180	40.3862	40.1370	38.9770	38.9770	38.7622	39.4238	40.1370	40.6411	41.1681 (38)
Average = Sum(39)m / 12 =	103.5260	103.2367	102.9532	101.6214	101.3722	100.2122	100.2122	99.9974	100.6590	101.3722	101.8763	102.4033 (39)
												101.6202 (39)
HLP	1.1791	1.1758	1.1726	1.1574	1.1546	1.1414	1.1414	1.1389	1.1465	1.1546	1.1603	1.1663 (40)
HLP (average)												1.1574 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.5944 (42)
Average daily hot water use (litres/day)												95.8169 (43)
Daily hot water use	105.3985	101.5659	97.7332	93.9005	90.0678	86.2352	86.2352	90.0678	93.9005	97.7332	101.5659	105.3985 (44)
Energy conte	156.3030	136.7036	141.0659	122.9846	118.0067	101.8308	94.3612	108.2809	109.5741	127.6980	139.3924	151.3711 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)													Total = Sum(45)m =	1507.5723 (45)
Distribution loss (46)m = 0.15 x (45)m														
	23.4454	20.5055	21.1599	18.4477	17.7010	15.2746	14.1542	16.2421	16.4361	19.1547	20.9089	22.7057	23.4454	(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	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	0.0000	(57)
Combi loss	25.3195	22.8681	25.2860	24.4219	25.2007	24.3472	25.1335	25.1771	24.3879	25.2507	24.4827	25.3067	25.3195	(61)
Total heat required for water heating calculated for each month	181.6225	159.5717	166.3519	147.4065	143.2074	126.1780	119.4947	133.4580	133.9620	152.9488	163.8750	176.6778	181.6225	(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													1.2030 (H8)	
Utilisation factor													0.5645 (H9)	
Collector performance factor													0.8793 (H10)	
Dedicated solar storage volume													75.0000 (H11)	
Effective solar volume													75.0000 (H13)	
Daily hot water demand													95.8169 (H14)	
Volume ratio Veff/V													0.7827 (H15)	
Solar storage volume factor													0.9510 (H16)	
Solar input	-24.8252	-41.4261	-70.5533	-94.5554	-116.8152	-114.8480	-113.3302	-99.0172	-77.5503	-52.9577	-29.4462	-20.7744	-856.0993	(H17)
Solar input (sum of months) = Sum(63)m =													-856.0993 (63)	
Output from w/h	156.7974	118.1456	95.7985	52.8512	26.3922	11.3300	6.1645	34.4408	56.4117	99.9910	134.4288	155.9034	156.7974	(64)
Total per year (kWh/year) = Sum(64)m =													948.6552 (64)	
Heat gains from water heating, kWh/month	58.3006	51.1710	53.2259	46.9979	45.5374	39.9455	37.6585	42.2977	42.5304	48.7723	52.4686	56.6576	58.3006	(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	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.3510	49.1623	39.9815	30.2685	22.6261	19.1019	20.6403	26.8290	36.0098	45.7228	53.3652	56.8894	55.3510	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	350.7038	354.3431	345.1724	325.6491	301.0044	277.8419	262.3679	258.7287	267.8994	287.4227	312.0673	335.2299	350.7038	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	(71)
Water heating gains (Table 5)	78.3611	76.1473	71.5402	65.2748	61.2062	55.4799	50.6162	56.8517	59.0699	65.5541	72.8731	76.1527	78.3611	(72)
Total internal gains	592.4646	587.7013	564.7427	529.2411	492.8853	460.4723	441.6730	450.4580	471.0278	506.7482	546.3543	576.3206	592.4646	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Northeast		7.6300	11.2829	0.6300		0.7000		0.7700	26.3099 (75)					
Southwest		5.5500	36.7938	0.6300		0.7000		0.7700	62.4079 (79)					
Solar gains	88.7178	159.8583	241.9377	338.6803	414.8634	427.4844	405.6398	346.4156	275.0634	182.9362	107.8550	74.8942	88.7178	(83)
Total gains	681.1824	747.5596	806.6804	867.9214	907.7487	887.9567	847.3128	796.8736	746.0912	689.6844	654.2093	651.2147	681.1824	(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	36.2659	36.3675	36.4677	36.9456	37.0364	37.4651	37.4651	37.5456	37.2989	37.0364	36.8532	36.6635	36.2659	(86)
alpha	3.4177	3.4245	3.4312	3.4630	3.4691	3.4977	3.4977	3.5030	3.4866	3.4691	3.4569	3.4442	3.4177	(87)
util living area	0.9745	0.9633	0.9405	0.8884	0.7907	0.6386	0.4936	0.5384	0.7485	0.9067	0.9615	0.9778	0.9745	(88)
MIT	19.3760	19.5625	19.8787	20.2969	20.6547	20.8856	20.9650	20.9523	20.7907	20.3418	19.7941	19.3423	19.3760	(89)
Th 2	19.9367	19.9394	19.9420	19.9542	19.9565	19.9672	19.9672	19.9692	19.9631	19.9565	19.9519	19.9470	19.9367	(90)
util rest of house	0.9693	0.9558	0.9280	0.8639	0.7437	0.5595	0.3885	0.4326	0.6788	0.8810	0.9524	0.9733	0.9693	(91)
MIT 2	18.4752	18.6605	18.9716	19.3814	19.7082	19.9040	19.9545	19.9505	19.8344	19.4335	18.9004	18.4498	18.4752	(92)
Living area fraction													fLA = Living area / (4) =	
MIT	18.6268	18.8122	19.1242	19.5354	19.8674	20.0691	20.1245	20.1190	19.9952	19.5863	19.0508	18.5999	18.6268	(93)
Temperature adjustment													0.0000	
adjusted MIT	18.6268	18.8122	19.1242	19.5354	19.8674	20.0691	20.1245	20.1190	19.9952	19.5863	19.0508	18.5999	18.6268	(94)

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	0.9609	0.9457	0.9160	0.8524	0.7393	0.5679	0.4052	0.4489	0.6813	0.8700	0.9423	0.9656	(94)
Useful gains	654.5464	706.9938	738.9323	739.8152	671.0690	504.2753	343.3531	357.6903	508.2749	600.0275	616.4838	628.8396	(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													
	1483.1924	1436.2508	1299.7060	1080.7874	827.9470	548.0755	353.1968	371.8890	593.4098	910.9560	1217.4983	1474.5996	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	616.5126	490.0607	417.2156	245.5000	116.7172	0.0000	0.0000	0.0000	0.0000	231.3308	432.7304	629.2454	(98)
Space heating												3179.3127	(98)
Space heating per m2												(98) / (4) =	36.2109 (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													3505.3062 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	616.5126	490.0607	417.2156	245.5000	116.7172	0.0000	0.0000	0.0000	0.0000	231.3308	432.7304	629.2454	(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)	679.7272	540.3095	459.9952	270.6725	128.6849	0.0000	0.0000	0.0000	0.0000	255.0505	477.1008	693.7656	(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	156.7974	118.1456	95.7985	52.8512	26.3922	11.3300	6.1645	34.4408	56.4117	99.9910	134.4288	155.9034	(64)
Efficiency of water heater	89.9678	89.9983	90.0252	90.0597	90.0336	87.2000	87.2000	87.2000	87.2000	89.6145	89.8453	89.9828	(216)
(217)m													(217)
Fuel for water heating, kWh/month	174.2816	131.2754	106.4130	58.6846	29.3138	12.9932	7.0694	39.4963	64.6923	111.5791	149.6226	173.2590	(219)
Water heating fuel used													1058.6803 (219)
Annual totals kWh/year													
Space heating fuel - main system													3505.3062 (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)													391.0067 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.90 * 1004 * 1.00) =										-722.8773			-722.8773 (233)
Total delivered energy for all uses													4357.1158 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3505.3062	3.4800	121.9847	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1058.6803	3.4800	36.8421	(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	391.0067	13.1900	51.5738	(250)
Additional standing charges			120.0000	(251)
Energy saving/generation technologies				
PV Unit	-722.8773	13.1900	-95.3475	(252)
Total energy cost			251.5405	(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] =	0.7955 (257)
SAP value		88.9023
SAP rating (Section 12)		89 (258)
SAP band		B

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

Energy Emission factor Emissions

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	3505.3062	0.2160	757.1461 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1058.6803	0.2160	228.6749 (264)
Space and water heating			985.8211 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	391.0067	0.5190	202.9325 (268)
Energy saving/generation technologies			
PV Unit	-722.8773	0.5190	-375.1733 (269)
Total kg/year			878.4552 (272)
CO2 emissions per m2			10.0100 (273)
EI value			91.1361
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 (m2)	Storey height (m)	Volume (m3)
Ground floor	43.9000 (1b)	2.3900 (2b)	104.9210 (1b) - (3b)
First floor	43.9000 (1c)	2.4200 (2c)	106.2380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.8000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 211.1590 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)							
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)							
Number of intermittent fans				3 * 10 =	30.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1421 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3921 (18)							
Number of sides sheltered				1	1 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3627 (21)							
Wind speed	Jan 5.1000	Feb 4.7000	Mar 4.6000	Apr 4.3000	May 4.3000	Jun 4.0000	Jul 4.0000	Aug 3.9000	Sep 4.0000	Oct 4.5000	Nov 4.4000	Dec 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	0.4624	0.4261	0.4171	0.3899	0.3899	0.3627	0.3627	0.3536	0.3627	0.4080	0.3989	0.4261 (22b)
Effective ac	0.6069	0.5908	0.5870	0.5760	0.5760	0.5658	0.5658	0.5625	0.5658	0.5832	0.5796	0.5908 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Front Door			2.1200	1.1000	2.3320		(26)
Windows & Fully Glazed Do (Uw = 1.20)			13.1800	1.1450	15.0916		(27)
Ground Floor			43.9000	0.1200	5.2680	90.0000	3951.0000 (28a)
Brick and Block	109.2600	15.3000	93.9600	0.2400	22.5504	42.2200	3966.9912 (29a)
Party Wall Step	4.8300		4.8300	0.2600	1.2558	113.5000	548.2050 (29a)
External Roof 1	43.9000		43.9000	0.1000	4.3900	9.1000	399.4900 (30)
Total net area of external elements Aum(A, m2)			201.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.8878		(33)
Party Wall 1			35.3100	0.0000	0.0000	45.0000	1588.9500 (32)
GF Timber Stud			73.9800			9.0000	665.8200 (32c)
FF Timber Stud			90.5800			9.0000	815.2200 (32c)
Internal Floor 1			43.9000			18.0000	790.2000 (32d)
Internal Ceiling 1			43.9000			18.0000	790.2000 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 13516.0762 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							153.9416 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3474 (36)
Total fabric heat loss							(33) + (36) = 61.2352 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	42.2908	41.1681	40.9017	40.1370	40.1370	39.4238	39.4238	39.1976	39.4238	40.6411	40.3862	41.1681 (38)
Average = Sum(39)m / 12 =	103.5260	102.4033	102.1369	101.3722	101.3722	100.6590	100.6590	100.4328	100.6590	101.8763	101.6214	102.4033 (39)
HLP	1.1791	1.1663	1.1633	1.1546	1.1546	1.1465	1.1465	1.1439	1.1465	1.1603	1.1574	1.1663 (40)
HLP (average)												1.1571 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.5944 (42)
Average daily hot water use (litres/day)												95.8169 (43)
Daily hot water use	105.3985	101.5659	97.7332	93.9005	90.0678	86.2352	86.2352	90.0678	93.9005	97.7332	101.5659	105.3985 (44)
Energy conte	156.3030	136.7036	141.0659	122.9846	118.0067	101.8308	94.3612	108.2809	109.5741	127.6980	139.3924	151.3711 (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

Energy content (annual)												Total = Sum(45)m =	1507.5723 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.4454	20.5055	21.1599	18.4477	17.7010	15.2746	14.1542	16.2421	16.4361	19.1547	20.9089	22.7057	(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	25.3195	22.8681	25.2860	24.4219	25.2007	24.3472	25.1335	25.1771	24.3879	25.2507	24.4827	25.3067	(61)
Total heat required for water heating calculated for each month	181.6225	159.5717	166.3519	147.4065	143.2074	126.1780	119.4947	133.4580	133.9620	152.9488	163.8750	176.6778	(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												1.3757 (H8)	
Utilisation factor												0.5166 (H9)	
Collector performance factor												0.8793 (H10)	
Dedicated solar storage volume												75.0000 (H11)	
Effective solar volume												75.0000 (H13)	
Daily hot water demand												95.8169 (H14)	
Volume ratio Veff/V												0.7827 (H15)	
Solar storage volume factor												0.9510 (H16)	
Solar input	-29.4011	-41.9709	-71.1335	-97.0661	-114.5592	-121.9126	-117.4117	-104.7467	-82.9009	-56.7620	-34.5668	-895.9162	(H17)
Solar input (sum of months) = Sum(63)m =												-895.9162 (63)	
Output from w/h	152.2215	117.6008	95.2184	50.3405	28.6483	4.2654	2.0830	28.7113	51.0611	96.1868	129.3082	153.1930	(64)
Total per year (kWh/year) = Sum(64)m =												908.8382 (64)	
Heat gains from water heating, kWh/month	58.3006	51.1710	53.2259	46.9979	45.5374	39.9455	37.6585	42.2977	42.5304	48.7723	52.4686	56.6576	(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	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	155.6636	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	55.3510	49.1623	39.9815	30.2685	22.6261	19.1019	20.6403	26.8290	36.0098	45.7228	53.3652	56.8894	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	350.7038	354.3431	345.1724	325.6491	301.0044	277.8419	262.3679	258.7287	267.8994	287.4227	312.0673	335.2299	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	53.1608	(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)	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	-103.7758	(71)
Water heating gains (Table 5)	78.3611	76.1473	71.5402	65.2748	61.2062	55.4799	50.6162	56.8517	59.0699	65.5541	72.8731	76.1527	(72)
Total internal gains	592.4646	587.7013	564.7427	529.2411	492.8853	460.4723	441.6730	450.4580	471.0278	506.7482	546.3543	576.3206	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W							
Northeast	7.6300	15.0428	0.6300	0.7000	0.7700	35.0773 (75)							
Southwest	5.5500	46.3896	0.6300	0.7000	0.7700	78.6838 (79)							
Solar gains	113.7611	175.9085	266.5240	382.1615	448.3486	500.2294	463.2311	403.3756	322.1321	213.4086	137.1894	91.6076	(83)
Total gains	706.2257	763.6098	831.2667	911.4026	941.2340	960.7018	904.9041	853.8337	793.1599	720.1568	683.5437	667.9282	(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	36.2659	36.6635	36.7591	37.0364	37.0364	37.2989	37.2989	37.3829	37.2989	36.8532	36.9456	36.6635	
alpha	3.4177	3.4442	3.4506	3.4691	3.4691	3.4866	3.4866	3.4922	3.4866	3.4569	3.4630	3.4442	
util living area	0.9658	0.9550	0.9253	0.8582	0.7359	0.5452	0.4004	0.4214	0.6619	0.8652	0.9435	0.9700	(86)
MIT	19.5776	19.7188	20.0354	20.4269	20.7562	20.9386	20.9845	20.9819	20.8786	20.5186	20.0256	19.5630	(87)
Th 2	19.9367	19.9470	19.9495	19.9565	19.9565	19.9631	19.9631	19.9652	19.9631	19.9519	19.9542	19.9470	(88)
util rest of house	0.9585	0.9457	0.9094	0.8277	0.6788	0.4583	0.2932	0.3097	0.5766	0.8274	0.9295	0.9635	(89)
MIT 2	18.6743	18.8199	19.1288	19.5030	19.7926	19.9339	19.9589	19.9602	19.8982	19.5924	19.1281	18.6683	(90)
Living area fraction												fLA = Living area / (4) =	
MIT	18.8263	18.9711	19.2813	19.6584	19.9547	20.1029	20.1314	20.1321	20.0631	19.7482	19.2791	18.8188	(91)
Temperature adjustment												0.0000	
adjusted MIT	18.8263	18.9711	19.2813	19.6584	19.9547	20.1029	20.1314	20.1321	20.0631	19.7482	19.2791	18.8188	(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	0.9488	0.9348	0.8972	0.8176	0.6787	0.4706	0.3111	0.3283	0.5856	0.8187	0.9182	0.9544	(94)	
Useful gains	670.0690	713.8284	745.7750	745.2005	638.8470	452.1411	281.5103	280.3220	464.4659	589.6257	627.6440	637.5028	(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	1389.9679	1359.0039	1223.7370	1019.6450	745.5643	473.3879	285.0067	284.4335	509.6470	809.7318	1105.5451	1363.8893	(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	535.6048	433.5579	355.6037	197.6000	79.3976	0.0000	0.0000	0.0000	0.0000	163.7589	344.0888	540.4315	(98)	
Space heating												2650.0433	(98)	
Space heating per m2												(98) / (4) =	30.1827	(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														2921.7676	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Space heating requirement	535.6048	433.5579	355.6037	197.6000	79.3976	0.0000	0.0000	0.0000	0.0000	163.7589	344.0888	540.4315	(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)	590.5235	478.0131	392.0658	217.8611	87.5387	0.0000	0.0000	0.0000	0.0000	180.5500	379.3702	595.8451	(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	152.2215	117.6008	95.2184	50.3405	28.6483	4.2654	2.0830	28.7113	51.0611	96.1868	129.3082	153.1930	(64)		
Efficiency of water heater	89.9014	89.9298	89.9376	89.9668	89.7449	87.2000	87.2000	87.2000	87.2000	89.3726	89.7164	89.9030	(217)		
Fuel for water heating, kWh/month	169.3204	130.7696	105.8717	55.9545	31.9219	4.8915	2.3887	32.9258	58.5563	107.6244	144.1300	170.3980	(219)		
Water heating fuel used												1014.7528	(219)		
Annual totals kWh/year															
Space heating fuel - main system													2921.7676	(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)														391.0067	(232)
Energy saving/generation technologies (Appendices M ,N and Q)															
PV Unit 0 (0.80 * 0.90 * 1146 * 1.00) =										-825.2989				-825.2989	(233)
Total delivered energy for all uses														3627.2281	(238)

10a. Fuel costs - using BEDF prices (513)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2921.7676	9.7400	284.5802	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1014.7528	9.7400	98.8369	(247)
Pumps and fans for heating	75.0000	36.8500	27.6375	(249)
Pump for solar water heating	50.0000	36.8500	18.4250	(249)
Energy for lighting	391.0067	36.8500	144.0860	(250)
Additional standing charges			104.0000	(251)
Energy saving/generation technologies				
PV Unit	-825.2989	36.8500	-304.1227	(252)
Total energy cost			373.4429	(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	2921.7676	0.2160	631.1018	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1014.7528	0.2160	219.1866	(264)
Space and water heating			850.2884	(265)
Pumps and fans	125.0000	0.5190	64.8750	(267)
Energy for lighting	391.0067	0.5190	202.9325	(268)
Energy saving/generation technologies				
PV Unit	-825.2989	0.5190	-428.3301	(269)
Total kg/year			689.7657	(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	2921.7676	1.2200	3564.5565 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1014.7528	1.2200	1237.9984 (264)
Space and water heating			4802.5549 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	391.0067	3.0700	1200.3904 (268)
Energy saving/generation technologies			
PV Unit	-825.2989	3.0700	-2533.6677 (269)
Primary energy kWh/year			3853.0276 (272)
Primary energy kWh/m2/year			43.8841 (273)

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 152		Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Melbourne V3 (HA-SO)	
Project	Plot 152			
Calculation Type	New Build (As Designed)			

SAP Rating	88 B	DER	13.89	TER	18.63
Environmental	89 B	% DER<TER	25.45		
CO ₂ Emissions (t/year)	0.88	DFEE	46.69	TREE	55.25
General Requirements Compliance	Pass	% DFEE<TFEE	15.49		

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	Earthwool Loft Roll 40 Main construction Corrections - Air Gap: Level 1, Fasteners: None or plastic	150	0.0400	3.7500	100.00		
Layer 2	Earthwool Loft Roll 40 Main construction Corrections - Air Gap: Level 1, Fasteners: None or plastic	200	0.0400	5.0000	100.00		
Layer 3	Earthwool Loft Roll 40 Main construction Main construction Corrections - Air Gap: Level 1, Fasteners: None or plastic	100	0.0400	2.5000	87.50		
		100	0.1300	0.7692	12.50		
Layer 4	Plasterboard, standard Main construction	12.5	0.2100	0.0595	100.00	700	1000
Int surface				0.1000			

Total resistance: Upper limit = 11.200 m² K/W Lower limit = 10.901 m² K/W Average = 11.050 m² K/W
Total correction = 0.0065 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 0879 Plot 152	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Melbourne V3 (HA-SO)
Project	Plot 152		
Calculation Type	New Build (As Designed)		

SAP Rating	88 B	DER	13.89	TER	18.63
Environmental	89 B	% DER<TER	25.45		
CO ₂ Emissions (t/year)	0.88	DFEE	46.69	TFEE	55.25
General Requirements Compliance	Pass	% DFEE<TFEE	15.49		

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 0879 Plot 152	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Melbourne V3 (HA-SO)
Project	Plot 152		
Calculation Type	New Build (As Designed)		

SAP Rating	88 B	DER	13.89	TER	18.63
Environmental	89 B	% DER<TER	25.45		
CO ₂ Emissions (t/year)	0.88	DFEE	46.69	TFEE	55.25
General Requirements Compliance	Pass	% DFEE<TFEE	15.49		

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 000004

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	Supabloc *7						
	Main construction	100	0.1900	0.5263	94.04		
	Main construction	100	0.8803	0.1136	5.96		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 2	Supafil Party Wall						
	Main construction	100	0.0400	2.5000	100.00		
	Corrections - Air Gap: Level 1, Fasteners: None or plastic						
Layer 3	Supabloc *7						
	Main construction	100	0.1900	0.5263	94.04	1450	1000
	Main construction	100	0.8803	0.1136	5.96	1450	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 = 3.898 m² K/W Lower limit = 3.765 m² K/W Average = 3.831 m² K/W
 Total correction = 0.0045 m² K/W U-value (unrounded) = 0.26 W/m² K

Unheated space: None

Total thickness: 328 mm

U-value: 0.26 W/m² K

Kappa: 113.50 kJ/m² K

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0879 Plot 152	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Melbourne V3 (HA-SO)
Project	Plot 152		
Calculation Type	New Build (As Designed)		

SAP Rating	88 B	DER	13.89	TER	18.63
Environmental	89 B	% DER<TER	25.45		
CO ₂ Emissions (t/year)	0.88	DFEE	46.69	TFEE	55.25
General Requirements Compliance	Pass	% DFEE<TFEE	15.49		

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

Floor 000003

Floor Type: Suspended Floor

Area = 43.90 m², Perimeter = 18.83 m, Wall thickness = 275.00 mm, Soil: Unknown

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

Floor height above ground: h = 0.200 m

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

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

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

Total resistance: Upper limit = 9.271 m² K/W Lower limit = 6.052 m² K/W Average = 7.661 m² K/W
 Total correction = 0.0046 m² K/W U-value (unrounded) = 0.12 W/m² K

Unheated space: None

Total thickness: 385 mm

U-value: 0.12 W/m² K

Kappa: 90.00 kJ/m² K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	SAP 0879 Plot 152	Issued on Date	28/03/2023
Assessment Reference	Rev A	Prop Type Ref	Melbourne V3 (HA-SO)
Property	Plot 152		

SAP Rating	88 B	DER	13.89	TER	18.63
Environmental	89 B	% DER<TER	25.45		
CO ₂ Emissions (t/year)	0.88	DFEE	46.69	TFEE	55.25
General Requirements Compliance	Pass	% DFEE<TFEE	15.49		

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

Orientation	South West
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2020
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	26.65 m	43.90 m ²	2.39 m
1st Storey:	18.83 m	43.90 m ²	2.42 m

7.0 Living Area	14.77	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	153.94	kJ/m ² K

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	109.26	93.96
Party Wall Step	Cavity Wall	Other	0.26	113.50	4.83	4.83

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	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	35.31

9.2 Internal Walls

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
GF Timber Stud	Plasterboard on timber frame	9.00	73.98
FF Timber Stud	Plasterboard on timber frame	9.00	90.58

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)
External Roof 1	External Plane Roof	Other	0.10	9.10	43.90	43.90

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

10.2 Internal Ceilings

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor	9.00	43.90

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Other	0.12	90.00	43.90

11.2 Internal Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	43.90

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	South West							2.12	
Front Elevation	Window	[1] Brick and Block	South West	None	0.00					5.55	
Rear Elevation	Window	[1] Brick and Block	North East	None	0.00					7.63	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	0.46	0.110	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	0.69	0.077	No	Birtley Supatherm
Independently assessed	E2 Other lintels (including other steel lintels)	1.02	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	E2 Other lintels (including other steel lintels)	3.62	0.064	No	Birtley Supatherm
Independently assessed	E3 Sill	8.50	0.021	No	Knauf P5
Independently assessed	E4 Jamb	24.32	0.016	No	Knauf P6
Table K1 - Approved	E5 Ground floor (normal)	26.65	0.160	No	
Independently assessed	E6 Intermediate floor within a dwelling	18.83	0.000	No	CD0029
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	10.56	0.060	No	
Independently assessed	E24 Eaves (insulation at ceiling level - inverted)	8.05	0.120	No	Value Halved
Independently assessed	E12 Gable (insulation at ceiling level)	8.05	0.044	No	Knauf P21
Independently assessed	E16 Corner (normal)	11.20	0.039	No	Knauf P23
Table K1 - Approved	E18 Party wall between dwellings	8.80	0.060	No	
Table K1 - Default	P1 Party wall - Ground floor	8.05	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	8.05	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	8.05	0.069	No	Knauf P29

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Tested ?
 As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

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

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				3
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

22.0 Lighting

Internal

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

External

External lights fitted
 Light and motion sensor

23.0 Electricity Tariff

24.0 Main Heating 1

Description
 Percentage of Heat %
 Database Ref. No.
 Fuel Type
 Main Heating
 SAP Code
 In Winter
 In Summer
 Controls
 PCDF Controls
 Delayed Start Stat
 Sap Code
 Flue Type
 Fan Assisted Flue
 Is MHS Pumped
 Heat Emitter
 Flow Temperature
 Combi boiler type

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Combi keep hot type	Gas/Oil, time clock			
25.0 Main Heating 2	None			
Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
29.0 Hot Water Cylinder	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.90	South West	45°	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	£81	B 89	