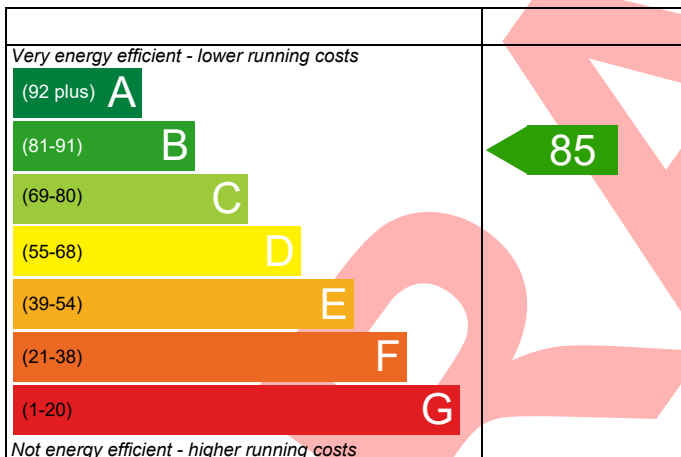


Dwelling type: House, Semi-Detached
 Date of assessment: 09/11/2022
 Produced by: S J Roberts Construction Limited
 Total floor area: 84.6 m²

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.

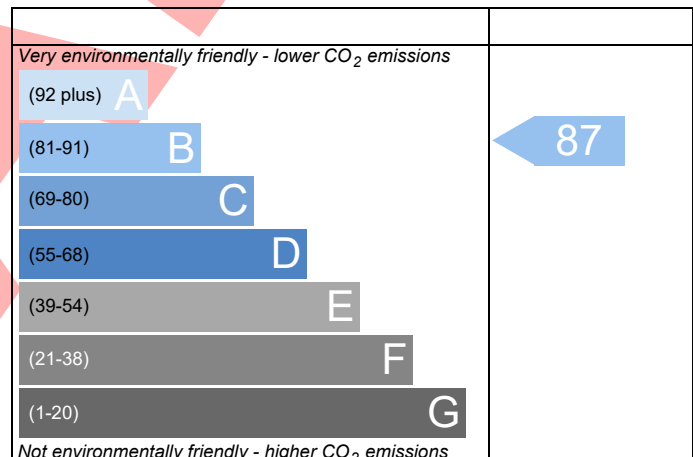
Energy Efficiency Rating



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 not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Property Reference	HOUSE TYPE B4	Issued on Date	09/11/2022
Assessment Reference	GRANT ASHP	Prop Type Ref	
Property			

SAP Rating	85 B	DER	16.19	TER	25.77
Environmental	87 B	% DER<TER	37.17		
CO ₂ Emissions (t/year)	1.26	DFEE	45.02	TFEE	50.05
General Requirements Compliance	Pass	% DFEE<TFEE	10.06		

Assessor Details	Mr. Neil Jones, S J Roberts Construction Limited, Tel: 01743 891858, neil.jones@sjroberts.com	Assessor ID	K559-0001
------------------	---	-------------	-----------

Client	
--------	--

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	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	25.77	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.19	kgCO ₂ /m ²	Pass
	-9.58 (-37.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.05	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.02	kWh/m ² /yr	
	-5.1 (-10.2%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.23 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.16 (max. 0.25)	0.16 (max. 0.70)	Pass
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	Pass
Openings	1.37 (max. 2.00)	1.40 (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	4.50 (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

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Main heating system	Heat pump with radiators or underfloor - Electric Grant AERONA3 HPID6R32	
---------------------	---	--

Secondary heating system	None	
--------------------------	------	--

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 2.02 kWh/day Permitted by DBSCG 2.56	Pass
-------------------	---	------

Primary pipework insulated	Yes	Pass
----------------------------	-----	------

6 Controls

Space heating controls	Time and temperature zone control	Pass
------------------------	-----------------------------------	------

Hot water controls	Cylinderstat	Pass
--------------------	--------------	------

	Independent timer for DHW	Pass
--	---------------------------	------

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100	%	
---	-----	---	--

Minimum	75	%	Pass
---------	----	---	------

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power	0.1300 0.1600	

Maximum	0.7	Pass
---------	-----	------

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Midlands)	Not significant	Pass
-----------------------------	-----------------	------

Based on:

Overshading	Average
-------------	---------

Windows facing North	4.90 m ² , No overhang
----------------------	-----------------------------------

Windows facing East	1.44 m ² , No overhang
---------------------	-----------------------------------

Windows facing South	7.80 m ² , No overhang
----------------------	-----------------------------------

Air change rate	5.00 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/m ² K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.50 (design value)	m ³ /(h.m ²) @ 50 Pa	
--------------------------------	---------------------	---	--

Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass
---------	------	---	------

10 Key features

Party wall U-value	0.00	W/m ² K
--------------------	------	--------------------

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	HOUSE TYPE B4			Issued on Date	09/11/2022
Assessment Reference	GRANT ASHP	Prop Type Ref			
Property					
SAP Rating	85 B	DER	16.19	TER	25.77
Environmental	87 B	% DER<TER	37.17		
CO ₂ Emissions (t/year)	1.26	DFEE	45.02	TFEE	50.05
General Requirements Compliance	Pass	% DFEE<TFEE	10.06		
Assessor Details	Mr. Neil Jones, S J Roberts Construction Limited, Tel: 01743 891858, neil.jones@sjroberts.com			Assessor ID	K559-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Semi-Detached House, total floor area 85 m²

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

1a TER and DER

Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 25.77 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.19 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 45.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.23 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.16 (max. 0.25)	0.16 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.37 (max. 2.00)	1.40 (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: 4.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Grant AERONA3 HPID6R32

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 2.02 kWh/day
Permitted by DBSCG 2.56 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)
Specific fan power: 0.1300 0.1600
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Midlands): Not significant OK

Based on:

Overshading: Average
Windows facing North: 4.90 m², No overhang
Windows facing East: 1.44 m², No overhang
Windows facing South: 7.80 m², No overhang
Air change rate: 5.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

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	42.3000 (1b)	2.3900 (2b)	101.0970 (1b) - (3b)
First floor	42.3000 (1c)	2.7100 (2c)	114.6330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 215.7300 (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				0 * 10 =	0.0000 (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) =				0.0000 / (5) =	0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.5000
Infiltration rate					0.2250 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1913 (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	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
upvc window (Uw = 1.40)			10.3400	1.3258	13.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
BRICK TF	93.8400	16.3000	77.5400	0.2300	17.8342		(29a)
CEILING	42.3000		42.3000	0.1400	5.9220		(30)
Total net area of external elements Aum(A, m2)			178.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 51.8624		(33)
Party Wall 1			45.9000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7107 (36)
Total fabric heat loss							(33) + (36) = 62.5732 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955 (38)
Average = Sum(39)m / 12 =	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686 (39)
HLP	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604 (40)
HLP (average)												1.1604 (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												2.5444 (42)
Average daily hot water use (litres/day)												94.6289 (43)
Daily hot water use	104.0917	100.3066	96.5214	92.7363	88.9511	85.1660	85.1660	88.9511	92.7363	96.5214	100.3066	104.0917 (44)
Energy conte	154.3650	135.0087	139.3168	121.4598	116.5436	100.5682	93.1913	106.9383	108.2155	126.1147	137.6641	149.4943 (45)
Energy content (annual)												Total = Sum(45)m = 1488.8803 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:	23.1548	20.2513	20.8975	18.2190	17.4815	15.0852	13.9787	16.0407	16.2323	18.9172	20.6496	22.4241 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0908 (55)
Total storage loss	33.8148	30.5424	33.8148	32.7240	33.8148	32.7240	33.8148	33.8148	32.7240	33.8148	32.7240	33.8148 (56)
If cylinder contains dedicated solar storage	33.8148	30.5424	33.8148	32.7240	33.8148	32.7240	33.8148	33.8148	32.7240	33.8148	32.7240	33.8148 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	211.4422	186.5623	196.3940	176.6958	173.6208	155.8042	150.2685	164.0155	163.4515	183.1919	192.9001	206.5715 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	211.4422	186.5623	196.3940	176.6958	173.6208	155.8042	150.2685	164.0155	163.4515	183.1919	192.9001	206.5715 (64)
Heat gains from water heating, kWh/month	96.9881	86.1333	91.9846	84.5742	84.4125	77.6277	76.6479	81.2188	80.1705	87.5949	89.9621	95.3686 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.1017	18.7423	15.2423	11.5394	8.6258	7.2823	7.8688	10.2281	13.7282	17.4311	20.3446	21.6882 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.7856	231.1596	225.1770	212.4408	196.3636	181.2532	171.1586	168.7845	174.7671	187.5034	203.5806	218.6909 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749 (71)
Water heating gains (Table 5)	130.3604	128.1745	123.6352	117.4641	113.4577	107.8163	103.0213	109.1650	111.3479	117.7351	124.9474	128.1836 (72)
Total internal gains	441.4133	439.2421	425.2202	402.6099	379.6127	357.5174	343.2143	349.3433	361.0088	383.8352	410.0382	429.7283 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	Specific data	FF	Access	Gains				
		m2	Table 6a	W/m2	or Table 6b	or Table 6c	factor	W				
							Table 6d					
North		4.9000	10.6334	0.7200		0.7000	0.7700	18.1983 (74)				
East		1.4400	19.6403	0.7200		0.7000	0.7700	9.8781 (76)				
South		4.0000	46.7521	0.7200		0.7000	0.7700	65.3167 (78)				
South		3.8000	46.7521	0.7200		0.7000	0.7700	62.0509 (78)				
Solar gains	155.4441	262.6970	356.6331	441.6501	497.6969	496.2843	477.4976	434.7799	385.6338	289.3175	185.7409	133.3517 (83)
Total gains	596.8574	701.9391	781.8533	844.2601	877.3095	853.8017	820.7119	784.1232	746.6426	673.1526	595.7792	563.0800 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384
alpha	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959
util living area	0.9526	0.9285	0.8924	0.8314	0.7361	0.6046	0.4740	0.5083	0.6859	0.8512	0.9309	0.9587 (86)
Tweekday	18.7490	18.8562	19.0086	19.1859	19.3420	19.4445	19.4833	19.4788	19.4133	19.2173	18.9479	18.7198
Tweekend	20.4355	20.4839	20.5529	20.6344	20.7088	20.7616	20.7851	20.7817	20.7435	20.6473	20.5243	20.4224
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.1288	20.2016	20.3099	20.4292	20.5506	20.6338	20.6683	20.6630	20.5995	20.4557	20.2572	20.1086 (87)
Th 2	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518 (88)
util rest of house	0.9457	0.9184	0.8766	0.8053	0.6926	0.5341	0.3777	0.4128	0.6222	0.8227	0.9193	0.9526 (89)
Tweekday	18.7490	18.8562	19.0086	19.1859	19.3420	19.4445	19.4833	19.4788	19.4133	19.2173	18.9479	18.7198
Tweekend	18.7490	18.8562	19.0086	19.1859	19.3420	19.4445	19.4833	19.4788	19.4133	19.2173	18.9479	18.7198
MIT 2	18.7490	18.8562	19.0086	19.1859	19.3420	19.4445	19.4833	19.4788	19.4133	19.2173	18.9479	18.7198 (90)
Living area fraction									fLA = Living area / (4) =			0.2204 (91)
MIT	19.0532	19.1528	19.2955	19.4600	19.6084	19.7067	19.7445	19.7398	19.6748	19.4903	19.2365	19.0260 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0532	19.1528	19.2955	19.4600	19.6084	19.7067	19.7445	19.7398	19.6748	19.4903	19.2365	19.0260 (93)

8. Space heating requirement

Utilisation	0.9386	0.9093	0.8652	0.7914	0.6765	0.5158	0.3570	0.3917	0.6031	0.8080	0.9098	0.9461 (94)
Useful gains	560.2066	638.2428	676.4758	668.1074	593.4959	440.3837	293.0140	307.1269	450.2909	543.8875	542.0517	532.7395 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Month fracti	1448.3001	1399.1761	1256.1161	1036.6602	776.3597	501.3179	308.6939	327.8662	547.2720	872.7527	1191.4270	1455.4460 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	660.7416	511.3472	431.2524	265.3580	136.0507	0.0000	0.0000	0.0000	0.0000	244.6757	467.5502	686.4936 (98)
Space heating per m2												3403.4693 (98)
												(98) / (4) = 40.2301 (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 %)												299.0378 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												1138.1401 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	660.7416	511.3472	431.2524	265.3580	136.0507	0.0000	0.0000	0.0000	0.0000	244.6757	467.5502	686.4936 (98)
Space heating efficiency (main heating system 1)	299.0378	299.0378	299.0378	299.0378	299.0378	0.0000	0.0000	0.0000	0.0000	299.0378	299.0378	299.0378 (210)
Space heating fuel (main heating system)	220.9559	170.9975	144.2133	88.7373	45.4961	0.0000	0.0000	0.0000	0.0000	81.8210	156.3515	229.5675 (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	211.4422	186.5623	196.3940	176.6958	173.6208	155.8042	150.2685	164.0155	163.4515	183.1919	192.9001	206.5715 (64)
Efficiency of water heater	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400 (216)
(217)m	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400 (217)
Fuel for water heating, kWh/month	106.0180	93.5430	98.4727	88.5960	87.0541	78.1209	75.3452	82.2380	81.9552	91.8532	96.7209	103.5758 (219)
Water heating fuel used												1083.4930 (219)
Annual totals kWh/year												
Space heating fuel - main system												1138.1401 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEVD)decentralised, Database: total watage = 4.8875, total flow = 29.0000, SFP = 0.1685)												
mechanical ventilation fans (SFP = 0.1685)												44.3567 (230a)
Total electricity for the above, kWh/year												44.3567 (231)
Electricity for lighting (calculated in Appendix L)												372.6627 (232)
Total delivered energy for all uses												2638.6525 (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	1138.1401	0.5190	590.6947 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1083.4930	0.5190	562.3328 (264)
Space and water heating			1153.0276 (265)
Pumps and fans	44.3567	0.5190	23.0211 (267)
Energy for lighting	372.6627	0.5190	193.4120 (268)
Total CO2, kg/year			1369.4606 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.1900 (273)

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

DER		16.1900 ZC1
Total Floor Area	TFA	84.6000
Assumed number of occupants	N	2.5444
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.0252 ZC2
CO2 emissions from cooking, equation (L16)		2.1284 ZC3
Total CO2 emissions		34.3437 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.3437 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	42.3000 (1b)	2.3900 (2b)	101.0970 (1b) - (3b)
First floor	42.3000 (1c)	2.7100 (2c)	114.6330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 215.7300 (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) =	0.1391 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3891 (18)							
Number of sides sheltered					2 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3307 (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	0.4216	0.4134	0.4051	0.3638	0.3555	0.3142	0.3142	0.3059	0.3307	0.3555	0.3720	0.3886 (22b)
Effective ac	0.5889	0.5854	0.5821	0.5662	0.5632	0.5494	0.5494	0.5468	0.5547	0.5632	0.5692	0.5755 (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			2.1600	1.0000	2.1600		(26)					
TER Opening Type (Uw = 1.40)			14.1400	1.3258	18.7462		(27)					
Heat Loss Floor 1			42.3000	0.1300	5.4990		(28a)					
BRICK TF	93.8400	16.3000	77.5400	0.1800	13.9572		(29a)					
CEILING	42.3000		42.3000	0.1300	5.4990		(30)					
Total net area of external elements Aum(A, m2)			178.4400				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 45.8614		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.8470 (36)					
Total fabric heat loss							(33) + (36) = 55.7084 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.9238	Feb 41.6781	Mar 41.4372	Apr 40.3058	May 40.0942	Jun 39.1088	Jul 39.1088	Aug 38.9263	Sep 39.4883	Oct 40.0942	Nov 40.5224	Dec 40.9701 (38)
Heat transfer coeff	97.6322	97.3865	97.1456	96.0143	95.8026	94.8172	94.8172	94.6347	95.1967	95.8026	96.2308	96.6785 (39)
Average = Sum(39)m / 12 =												96.0132 (39)
HLP	Jan 1.1540	Feb 1.1511	Mar 1.1483	Apr 1.1349	May 1.1324	Jun 1.1208	Jul 1.1208	Aug 1.1186	Sep 1.1253	Oct 1.1324	Nov 1.1375	Dec 1.1428 (40)
HLP (average)												1.1349 (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												2.5444 (42)
Average daily hot water use (litres/day)												94.6289 (43)
Daily hot water use	104.0917	100.3066	96.5214	92.7363	88.9511	85.1660	85.1660	88.9511	92.7363	96.5214	100.3066	104.0917 (44)
Energy conte	154.3650	135.0087	139.3168	121.4598	116.5436	100.5682	93.1913	106.9383	108.2155	126.1147	137.6641	149.4943 (45)
Energy content (annual)												1488.8803 (45)
Distribution loss (46)m = 0.15 x (45)m												
23.1548	20.2513	20.8975	18.2190	17.4815	15.0852	13.9787	16.0407	16.2323	18.9172	20.6496		22.4241 (46)
Water storage loss:												250.0000 (47)
Store volume												1.8903 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												1.0208 (55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month	209.2718	184.6019	194.2236	174.5954	171.4504	153.7038	148.0980	161.8451	161.3511	181.0215	190.7997	204.4011 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	209.2718	184.6019	194.2236	174.5954	171.4504	153.7038	148.0980	161.8451	161.3511	181.0215	190.7997	204.4011 (64)
Heat gains from water heating, kWh/month	95.2518	84.5650	90.2483	82.8939	82.6762	75.9474	74.9115	79.4824	78.4901	85.8586	88.2818	93.6323 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186	127.2186 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.1017	18.7423	15.2423	11.5394	8.6258	7.2823	7.8688	10.2281	13.7282	17.4311	20.3446	21.6882 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	228.7856	231.1596	225.1770	212.4408	196.3636	181.2532	171.1586	168.7845	174.7671	187.5034	203.5806	218.6909 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219	35.7219 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749 (71)
Water heating gains (Table 5)	128.0266	125.8407	121.3015	115.1304	111.1239	105.4825	100.6875	106.8312	109.0141	115.4013	122.6136	125.8498 (72)
Total internal gains	442.0795	439.9083	425.8864	403.2762	380.2789	358.1837	343.8805	350.0095	361.6750	384.5014	410.7045	430.3946 (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					
North	4.9000	10.6334	0.6300	0.7700	0.7700	15.9235 (74)						
East	1.4400	19.6403	0.6300	0.7700	0.7700	8.6433 (76)						
South	7.8000	46.7521	0.6300	0.7700	0.7700	111.4467 (78)						
Solar gains	136.0136	229.8599	312.0540	386.4439	435.4848	434.2488	417.8104	380.4324	337.4296	253.1528	162.5233	116.6827 (83)
Total gains	578.0931	669.7682	737.9404	789.7200	815.7636	792.4324	761.6909	730.4419	699.1046	637.6542	573.2278	547.0773 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (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)	60.1748	60.3266	60.4762	61.1888	61.3240	61.9613	61.9613	62.0808	61.7143	61.3240	61.0511	60.7684
tau	5.0117	5.0218	5.0317	5.0793	5.0883	5.1308	5.1308	5.1387	5.1143	5.0883	5.0701	5.0512
util living area	0.9964	0.9920	0.9812	0.9502	0.8703	0.7091	0.5361	0.5784	0.8093	0.9602	0.9922	0.9973 (86)
MIT	19.8303	19.9972	20.2398	20.5420	20.7984	20.9499	20.9902	20.9857	20.8985	20.5723	20.1445	19.8010 (87)
Th 2	19.9569	19.9593	19.9616	19.9724	19.9744	19.9839	19.9839	19.9857	19.9803	19.9744	19.9703	19.9661 (88)
util rest of house	0.9952	0.9893	0.9747	0.9320	0.8235	0.6185	0.4183	0.4597	0.7318	0.9420	0.9891	0.9964 (89)
MIT 2	18.4081	18.6524	19.0045	19.4392	19.7772	19.9506	19.9803	19.9798	19.9016	19.4893	18.8760	18.3719 (90)
Living area fraction	18.7216	18.9488	19.2768	19.6823	20.0024	20.1709	20.2029	20.2016	20.1213	19.7281	19.1556	18.6870 (92)
MIT	18.7216	18.9488	19.2768	19.6823	20.0024	20.1709	20.2029	20.2016	20.1213	19.7281	19.1556	18.6870 (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	18.7216	18.9488	19.2768	19.6823	20.0024	20.1709	20.2029	20.2016	20.1213	19.7281	19.1556	18.6870 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	574.1400	660.1744	715.0860	731.0520	673.0050	504.2399	338.5171	354.9008	520.0204	597.1080	564.9844	544.1786 (95)
Ext temp.	4.3000	4.9000	6.5000	8.0000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1408.0158	1368.1649	1241.2141	1035.2536	795.3871	528.2135	341.6185	359.7599	573.2116	874.4920	1160.1206	1400.5788 (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	620.4036	475.7696	391.4393	219.0251	91.0523	0.0000	0.0000	0.0000	0.0000	206.3737	428.4980	637.1618 (98)
Space heating												3069.7234 (98)
Space heating per m2												(98) / (4) = 36.2851 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3283.1267 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	620.4036	475.7696	391.4393	219.0251	91.0523	0.0000	0.0000	0.0000	0.0000	206.3737	428.4980	637.1618	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	663.5333	508.8445	418.6517	234.2515	97.3821	0.0000	0.0000	0.0000	0.0000	220.7205	458.2867	681.4564	(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	209.2718	184.6019	194.2236	174.5954	171.4504	153.7038	148.0980	161.8451	161.3511	181.0215	190.7997	204.4011	(64)
Efficiency of water heater (217)m	87.5394	87.2304	86.6471	85.4196	83.2126	79.8000	79.8000	79.8000	79.8000	85.1640	86.9097	79.8000	(216)
Fuel for water heating, kWh/month	239.0603	211.6257	224.1548	204.3972	206.0390	192.6113	185.5865	202.8134	202.1944	212.5563	219.5378	233.2131	(219)
Water heating fuel used													2533.7898 (219)
Annual totals kWh/year													
Space heating fuel - main system													3283.1267 (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)													372.6627 (232)
Total delivered energy for all uses													6264.5792 (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	3283.1267	0.2160	709.1554 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2533.7898	0.2160	547.2986 (264)
Space and water heating			1256.4540 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	372.6627	0.5190	193.4120 (268)
Total CO2, kg/m2/year			1488.7909 (272)
Emissions per m2 for space and water heating			14.8517 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2862 (272b)
Emissions per m2 for pumps and fans			0.4601 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.8517 * 1.55) + 2.2862 + 0.4601, rounded to 2 d.p.			25.7700 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	42.3000 (1b)	2.3900 (2b)	101.0970 (1b) - (3b)
First floor	42.3000 (1c)	2.7100 (2c)	114.6330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 215.7300 (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) =	0.1391 (8)
Pressure test				Yes	4.5000
Measured/design AP50					0.3641 (18)
Infiltration rate					2 (19)
Number of sides sheltered					
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3095 (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	0.3946	0.3868	0.3791	0.3404	0.3327	0.2940	0.2940	0.2862	0.3095	0.3327	0.3481	0.3636 (22b)
Effective ac	0.5778	0.5748	0.5719	0.5579	0.5553	0.5432	0.5432	0.5410	0.5479	0.5553	0.5606	0.5661 (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
upvc window (Uw = 1.40)			10.3400	1.3258	13.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
BRICK TF	93.8400	16.3000	77.5400	0.2300	17.8342		(29a)
CEILING	42.3000		42.3000	0.1400	5.9220		(30)
Total net area of external elements Aum(A, m2)			178.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 51.8624		(33)
Party Wall 1			45.9000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7107 (36)
Total fabric heat loss						(33) + (36) =	62.5732 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	41.1367	40.9215	40.7106	39.7199	39.5346	38.6718	38.6718	38.5120	39.0041	39.5346	39.9095	40.3015 (38)
Heat transfer coeff	103.7098	103.4946	103.2837	102.2931	102.1077	101.2449	101.2449	101.0851	101.5773	102.1077	102.4827	102.8747 (39)
Average = Sum(39)m / 12 =												102.2922 (39)
HLP	1.2259	1.2233	1.2208	1.2091	1.2069	1.1967	1.1967	1.1949	1.2007	1.2069	1.2114	1.2160 (40)
HLP (average)												1.2091 (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												2.5444 (42)
Average daily hot water use (litres/day)												94.6289 (43)
Daily hot water use	104.0917	100.3066	96.5214	92.7363	88.9511	85.1660	85.1660	88.9511	92.7363	96.5214	100.3066	104.0917 (44)
Energy conte	154.3650	135.0087	139.3168	121.4598	116.5436	100.5682	93.1913	106.9383	108.2155	126.1147	137.6641	149.4943 (45)
Energy content (annual)										Total = Sum(45)m =		1488.8803 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	216.9705	270.1147	238.8241	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												725.9094 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	54.2426	67.5287	59.7060	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												181.4773 (107)
Space cooling per m2												2.1451 (108)
Energy for space heating												42.8740 (99)
Energy for space cooling												2.1451 (108)
Total												45.0191 (109)
Dwelling Fabric Energy Efficiency (DFEE)												45.0 (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	42.3000 (1b)	2.3900 (2b)	101.0970 (1b) - (3b)
First floor	42.3000 (1c)	2.7100 (2c)	114.6330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 215.7300 (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) =	0.1391 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3891 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3307 (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	0.4216	0.4134	0.4051	0.3638	0.3555	0.3142	0.3142	0.3059	0.3307	0.3555	0.3720	0.3886 (22b)
Effective ac	0.5889	0.5854	0.5821	0.5662	0.5632	0.5494	0.5494	0.5468	0.5547	0.5632	0.5692	0.5755 (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			2.1600	1.0000	2.1600		(26)					
TER Opening Type (Uw = 1.40)			14.1400	1.3258	18.7462		(27)					
Heat Loss Floor 1			42.3000	0.1300	5.4990		(28a)					
BRICK TF	93.8400	16.3000	77.5400	0.1800	13.9572		(29a)					
CEILING	42.3000		42.3000	0.1300	5.4990		(30)					
Total net area of external elements Aum(A, m2)			178.4400				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 45.8614		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.8470 (36)					
Total fabric heat loss							(33) + (36) = 55.7084 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	41.9238	41.6781	41.4372	40.3058	40.0942	39.1088	39.1088	38.9263	39.4883	40.0942	40.5224	40.9701 (38)
Heat transfer coeff	97.6322	97.3865	97.1456	96.0143	95.8026	94.8172	94.8172	94.6347	95.1967	95.8026	96.2308	96.6785 (39)
Average = Sum(39)m / 12 =												96.0132 (39)
HLP	1.1540	1.1511	1.1483	1.1349	1.1324	1.1208	1.1208	1.1186	1.1253	1.1324	1.1375	1.1428 (40)
HLP (average)												1.1349 (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												2.5444 (42)
Average daily hot water use (litres/day)												94.6289 (43)
Daily hot water use	104.0917	100.3066	96.5214	92.7363	88.9511	85.1660	85.1660	88.9511	92.7363	96.5214	100.3066	104.0917 (44)
Energy conte	154.3650	135.0087	139.3168	121.4598	116.5436	100.5682	93.1913	106.9383	108.2155	126.1147	137.6641	149.4943 (45)
Energy content (annual)										Total = Sum(45)m =		1488.8803 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	30.3321	46.2200	38.8020	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											115.3541 (107)	
Space cooling per m2											1.3635 (108)	
Energy for space heating											42.1619 (99)	
Energy for space cooling											1.3635 (108)	
Total											43.5254 (109)	
Target Fabric Energy Efficiency (TFEE)											50.1 (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	42.3000 (1b)	2.3900 (2b)	101.0970 (1b) - (3b)
First floor	42.3000 (1c)	2.7100 (2c)	114.6330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 215.7300 (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				0 * 10 =	0.0000 (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) =				0.0000 / (5) =	0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.5000
Infiltration rate					0.2250 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1913 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.5000	4.4000	3.9000	3.8000	3.4000	3.3000	3.3000	3.5000	3.8000	3.9000	4.1000 (22)
Wind factor	1.1250	1.1250	1.1000	0.9750	0.9500	0.8500	0.8250	0.8250	0.8750	0.9500	0.9750	1.0250 (22a)
Adj infilt rate	0.2152	0.2152	0.2104	0.1865	0.1817	0.1626	0.1578	0.1578	0.1673	0.1817	0.1865	0.1960 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
upvc window (Uw = 1.40)			10.3400	1.3258	13.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
BRICK TF	93.8400	16.3000	77.5400	0.2300	17.8342		(29a)
CEILING	42.3000		42.3000	0.1400	5.9220		(30)
Total net area of external elements Aum(A, m2)			178.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	51.8624	(33)
Party Wall 1			45.9000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7107 (36)
 Total fabric heat loss (33) + (36) = 62.5732 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955 (38)
Average = Sum(39)m / 12 =	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5444 (42)
 Average daily hot water use (litres/day) 94.6289 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	104.0917	100.3066	96.5214	92.7363	88.9511	85.1660	85.1660	88.9511	92.7363	96.5214	100.3066	104.0917 (44)
Energy content (annual)	154.3650	135.0087	139.3168	121.4598	116.5436	100.5682	93.1913	106.9383	108.2155	126.1147	137.6641	149.4943 (45)
Distribution loss (46)m = 0.15 x (45)m												1488.8803 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Water storage loss:	23.1548	20.2513	20.8975	18.2190	17.4815	15.0852	13.9787	16.0407	16.2323	18.9172	20.6496	22.4241 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0908 (55)
Total storage loss	33.8148	30.5424	33.8148	32.7240	33.8148	32.7240	33.8148	33.8148	32.7240	33.8148	32.7240	33.8148 (56)
If cylinder contains dedicated solar storage	33.8148	30.5424	33.8148	32.7240	33.8148	32.7240	33.8148	33.8148	32.7240	33.8148	32.7240	33.8148 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	211.4422	186.5623	196.3940	176.6958	173.6208	155.8042	150.2685	164.0155	163.4515	183.1919	192.9001	206.5715 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	211.4422	186.5623	196.3940	176.6958	173.6208	155.8042	150.2685	164.0155	163.4515	183.1919	192.9001	206.5715 (64)
RHI water heating demand												2161 (64)
Heat gains from water heating, kWh/month	96.9881	86.1333	91.9846	84.5742	84.4125	77.6277	76.6479	81.2188	80.1705	87.5949	89.9621	95.3686 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7543	46.8559	38.1058	28.8485	21.5646	18.2057	19.6719	25.5703	34.3205	43.5777	50.8616	54.2205 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.4710	345.0144	336.0851	317.0758	293.0800	270.5272	255.4606	251.9172	260.8465	279.8558	303.8517	326.4044 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749 (71)
Water heating gains (Table 5)	130.3604	128.1745	123.6352	117.4641	113.4577	107.8163	103.0213	109.1650	111.3479	117.7351	124.9474	128.1836 (72)
Total internal gains	628.2837	623.7428	601.5242	567.0865	531.8003	500.2473	481.8519	490.3506	510.2129	544.8667	583.3587	612.5065 (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						
North	4.9000	11.3201	0.7200	0.7000	0.7700	19.3736 (74)						
East	1.4400	21.0039	0.7200	0.7000	0.7700	10.5640 (76)						
South	4.0000	49.0238	0.7200	0.7000	0.7700	68.4906 (78)						
South	3.8000	49.0238	0.7200	0.7000	0.7700	65.0660 (78)						
Solar gains	163.4942	280.4612	382.2067	484.4021	515.8274	556.4336	515.9026	478.4527	427.9761	317.2044	219.8927	155.0546 (83)
Total gains	791.7779	904.2041	983.7309	1051.4886	1047.6277	1056.6809	997.7545	968.8033	938.1890	862.0711	803.2515	767.5611 (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	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384
alpha	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959
util living area	0.9157	0.8853	0.8371	0.7616	0.6665	0.5084	0.4035	0.4216	0.6028	0.7829	0.8779	0.9216 (86)
Tweekday	18.8659	18.9586	19.1066	19.2609	19.3814	19.4657	19.4883	19.4866	19.4373	19.2799	19.0581	18.8454
Tweekend	20.4887	20.5311	20.5990	20.6714	20.7300	20.7754	20.7897	20.7884	20.7583	20.6787	20.5755	20.4794
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.2109	20.2747	20.3811	20.4869	20.5833	20.6550	20.6755	20.6734	20.6226	20.5041	20.3371	20.1965 (87)
Th 2	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518 (88)
util rest of house	0.9045	0.8707	0.8160	0.7299	0.6194	0.4390	0.3171	0.3345	0.5388	0.7479	0.8598	0.9111 (89)
Tweekday	18.8659	18.9586	19.1066	19.2609	19.3814	19.4657	19.4883	19.4866	19.4373	19.2799	19.0581	18.8454
Tweekend	18.8659	18.9586	19.1066	19.2609	19.3814	19.4657	19.4883	19.4866	19.4373	19.2799	19.0581	18.8454
MIT 2	18.8659	18.9586	19.1066	19.2609	19.3814	19.4657	19.4883	19.4866	19.4373	19.2799	19.0581	18.8454 (90)
Living area fraction												fLA = Living area / (4) = 0.2204 (91)
MIT	19.1624	19.2487	19.3876	19.5312	19.6463	19.7279	19.7500	19.7483	19.6986	19.5497	19.3400	19.1432 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1624	19.2487	19.3876	19.5312	19.6463	19.7279	19.7500	19.7483	19.6986	19.5497	19.3400	19.1432 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8947	0.8595	0.8032	0.7158	0.6043	0.4231	0.2996	0.3166	0.5218	0.7327	0.8477	0.9017 (94)
Ext temp.	4.3000	4.8000	6.6000	9.0000	11.8000	14.8000	16.6000	16.5000	14.0000	10.5000	7.1000	4.2000 (96)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Heat loss rate W	1459.0241	1418.4074	1255.3371	1033.8342	770.2636	483.7646	309.2303	318.8764	559.4216	888.4003	1201.5858	1466.9571 (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												
Space heating	558.4336	430.9060	346.1091	202.4743	102.0567	0.0000	0.0000	0.0000	0.0000	191.0460	374.9025	576.4876 (98)
RHI space heating demand												2782.4157 (98)
												2782 (98)

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	42.3000 (1b)	2.3900 (2b)	101.0970 (1b) - (3b)
First floor	42.3000 (1c)	2.7100 (2c)	114.6330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 215.7300 (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				0 * 10 =	0.0000 (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) =				0.0000 / (5) =	0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.5000
Infiltration rate					0.2250 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1913 (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	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
upvc window (Uw = 1.40)			10.3400	1.3258	13.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
BRICK TF	93.8400	16.3000	77.5400	0.2300	17.8342		(29a)
CEILING	42.3000		42.3000	0.1400	5.9220		(30)
Total net area of external elements Aum(A, m2)			178.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 51.8624		(33)
Party Wall 1			45.9000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7107 (36)
Total fabric heat loss							(33) + (36) = 62.5732 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955 (38)
Average = Sum(39)m / 12 =	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686 (39)
HLP	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604 (40)
HLP (average)												1.1604 (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												2.5444 (42)
Average daily hot water use (litres/day)												94.6289 (43)
Daily hot water use	104.0917	100.3066	96.5214	92.7363	88.9511	85.1660	85.1660	88.9511	92.7363	96.5214	100.3066	104.0917 (44)
Energy conte	154.3650	135.0087	139.3168	121.4598	116.5436	100.5682	93.1913	106.9383	108.2155	126.1147	137.6641	149.4943 (45)
Energy content (annual)												Total = Sum(45)m = 1488.8803 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Water storage loss:	23.1548	20.2513	20.8975	18.2190	17.4815	15.0852	13.9787	16.0407	16.2323	18.9172	20.6496	22.4241 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0908 (55)
Total storage loss	33.8148	30.5424	33.8148	32.7240	33.8148	32.7240	33.8148	33.8148	32.7240	33.8148	32.7240	33.8148 (56)
If cylinder contains dedicated solar storage	33.8148	30.5424	33.8148	32.7240	33.8148	32.7240	33.8148	33.8148	32.7240	33.8148	32.7240	33.8148 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	211.4422	186.5623	196.3940	176.6958	173.6208	155.8042	150.2685	164.0155	163.4515	183.1919	192.9001	206.5715 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	211.4422	186.5623	196.3940	176.6958	173.6208	155.8042	150.2685	164.0155	163.4515	183.1919	192.9001	206.5715 (64)
Heat gains from water heating, kWh/month	96.9881	86.1333	91.9846	84.5742	84.4125	77.6277	76.6479	81.2188	80.1705	87.5949	89.9621	95.3686 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7543	46.8559	38.1058	28.8485	21.5646	18.2057	19.6719	25.5703	34.3205	43.5777	50.8616	54.2205 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.4710	345.0144	336.0851	317.0758	293.0800	270.5272	255.4606	251.9172	260.8465	279.8558	303.8517	326.4044 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749 (71)
Water heating gains (Table 5)	130.3604	128.1745	123.6352	117.4641	113.4577	107.8163	103.0213	109.1650	111.3479	117.7351	124.9474	128.1836 (72)
Total internal gains	628.2837	623.7428	601.5242	567.0865	531.8003	500.2473	481.8519	490.3506	510.2129	544.8667	583.3587	612.5065 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m ²	Table 6a	Specific data	Specific data	factor	W						
		W/m ²	or Table 6b	or Table 6c	Table 6d							
North	4.9000	10.6334	0.7200	0.7000	0.7700	18.1983 (74)						
East	1.4400	19.6403	0.7200	0.7000	0.7700	9.8781 (76)						
South	4.0000	46.7521	0.7200	0.7000	0.7700	65.3167 (78)						
South	3.8000	46.7521	0.7200	0.7000	0.7700	62.0509 (78)						
Solar gains	155.4441	262.6970	356.6331	441.6501	497.6969	496.2843	477.4976	434.7799	385.6338	289.3175	185.7409	133.3517 (83)
Total gains	783.7278	886.4398	958.1573	1008.7367	1029.4971	996.5316	959.3495	925.1306	895.8467	834.1842	769.0997	745.8582 (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	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384
alpha	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959
util living area	0.9173	0.8881	0.8459	0.7780	0.6773	0.5436	0.4172	0.4461	0.6154	0.7903	0.8871	0.9259 (86)
Tweekday	18.8614	18.9562	19.0901	19.2432	19.3744	19.4576	19.4874	19.4843	19.4352	19.2763	19.0415	18.8329
Tweekend	20.4867	20.5299	20.5912	20.6626	20.7263	20.7702	20.7889	20.7865	20.7568	20.6767	20.5677	20.4737
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.2077	20.2729	20.3691	20.4732	20.5776	20.6471	20.6742	20.6705	20.6203	20.5010	20.3249	20.1877 (87)
Th 2	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518 (88)
util rest of house	0.9063	0.8737	0.8257	0.7477	0.6310	0.4746	0.3287	0.3577	0.5502	0.7555	0.8701	0.9159 (89)
Tweekday	18.8614	18.9562	19.0901	19.2432	19.3744	19.4576	19.4874	19.4843	19.4352	19.2763	19.0415	18.8329
Tweekend	18.8614	18.9562	19.0901	19.2432	19.3744	19.4576	19.4874	19.4843	19.4352	19.2763	19.0415	18.8329
MIT 2	18.8614	18.9562	19.0901	19.2432	19.3744	19.4576	19.4874	19.4843	19.4352	19.2763	19.0415	18.8329 (90)
Living area fraction												fLA = Living area / (4) = 0.2204 (91)
MIT	19.1582	19.2465	19.3720	19.5143	19.6397	19.7199	19.7490	19.7458	19.6964	19.5463	19.3244	19.1316 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1582	19.2465	19.3720	19.5143	19.6397	19.7199	19.7490	19.7458	19.6964	19.5463	19.3244	19.1316 (93)

8. Space heating requirement

Utilisation	0.8967	0.8626	0.8130	0.7335	0.6159	0.4581	0.3105	0.3391	0.5327	0.7402	0.8582	0.9068 (94)
Useful gains	702.7507	764.6270	778.9935	739.9179	634.0327	456.5330	297.8661	313.6881	477.2484	617.4778	660.0564	676.3183 (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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Month fracti	1458.6108	1408.3751	1263.6305	1041.9932	779.4244	502.6089	309.1372	328.4508	549.3940	878.2415	1200.0557	1465.8119	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	562.3599	432.5987	360.5699	217.4942	108.1714	0.0000	0.0000	0.0000	0.0000	194.0082	388.7995	587.3833	(98)
Space heating per m2												2851.3850	(98)
												33.7043	(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 %)														299.0378	(206)	
Efficiency of secondary/supplementary heating system, %														100.0000	(208)	
Space heating requirement														953.5199	(211)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Space heating requirement	562.3599	432.5987	360.5699	217.4942	108.1714	0.0000	0.0000	0.0000	0.0000	194.0082	388.7995	587.3833		(98)		
Space heating efficiency (main heating system 1)	299.0378	299.0378	299.0378	299.0378	299.0378	0.0000	0.0000	0.0000	0.0000	299.0378	299.0378	299.0378		(210)		
Space heating fuel (main heating system)	188.0564	144.6635	120.5767	72.7313	36.1731	0.0000	0.0000	0.0000	0.0000	64.8775	130.0168	196.4244		(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	211.4422	186.5623	196.3940	176.6958	173.6208	155.8042	150.2685	164.0155	163.4515	183.1919	192.9001	206.5715		(64)		
Efficiency of water heater	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400		(216)		
(217)m	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400		(217)		
Fuel for water heating, kWh/month	106.0180	93.5430	98.4727	88.5960	87.0541	78.1209	75.3452	82.2380	81.9552	91.8532	96.7209	103.5758		(219)		
Water heating fuel used												1083.4930		(219)		
Annual totals kWh/year																
Space heating fuel - main system														953.5199	(211)	
Space heating fuel - secondary														0.0000	(215)	
Electricity for pumps and fans:																
(MEVD)decentralised, Database: total watage = 4.8875, total flow = 29.0000, SFP = 0.1685)																
mechanical ventilation fans (SFP = 0.1685)															44.3567	(230a)
Total electricity for the above, kWh/year															44.3567	(231)
Electricity for lighting (calculated in Appendix L)															372.6627	(232)
Total delivered energy for all uses															2454.0323	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	953.5199	13.1900	125.7693	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	1083.4930	13.1900	142.9127	(247)
Mechanical ventilation fans	44.3567	13.1900	5.8506	(249)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Energy for lighting	372.6627	13.1900	49.1542	(250)
Additional standing charges			0.0000	(251)
Total energy cost			323.6869	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200	(256)
Energy cost factor (ECF)		1.0490	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	85.3667	
SAP rating (Section 12)		85	(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	953.5199	0.5190	494.8768	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	1083.4930	0.5190	562.3328	(264)
Space and water heating			1057.2097	(265)
Pumps and fans	44.3567	0.5190	23.0211	(267)
Energy for lighting	372.6627	0.5190	193.4120	(268)
Total kg/year			1273.6427	(272)
CO2 emissions per m2			15.0500	(273)
EI value			86.8312	
EI rating			87	(274)
EI band			B	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.75) / 2.9904 = 5.370$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.75) / 2.9904 = 0.2113$, stars = 5
Water heating energy efficiency	$13.19 / 1.9944 = 6.614$, stars = 3
Water heating environmental impact	$0.519 / 1.9944 = 0.2602$, 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	42.3000 (1b)	2.3900 (2b)	101.0970 (1b) - (3b)
First floor	42.3000 (1c)	2.7100 (2c)	114.6330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 215.7300 (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				0 * 10 =	0.0000 (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) =				0.0000 / (5) =	0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.5000
Infiltration rate					0.2250 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1913 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.5000	4.4000	3.9000	3.8000	3.4000	3.3000	3.3000	3.5000	3.8000	3.9000	4.1000 (22)
Wind factor	1.1250	1.1250	1.1000	0.9750	0.9500	0.8500	0.8250	0.8250	0.8750	0.9500	0.9750	1.0250 (22a)
Adj infilt rate	0.2152	0.2152	0.2104	0.1865	0.1817	0.1626	0.1578	0.1578	0.1673	0.1817	0.1865	0.1960 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
upvc window (Uw = 1.40)			10.3400	1.3258	13.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
BRICK TF	93.8400	16.3000	77.5400	0.2300	17.8342		(29a)
CEILING	42.3000		42.3000	0.1400	5.9220		(30)
Total net area of external elements Aum(A, m2)			178.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 51.8624		(33)
Party Wall 1			45.9000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7107 (36)
Total fabric heat loss						(33) + (36) =	62.5732 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955 (38)
Average = Sum(39)m / 12 =	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686 (39)
HLP	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604 (40)
HLP (average)												1.1604 (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												2.5444 (42)
Average daily hot water use (litres/day)												94.6289 (43)
Daily hot water use	104.0917	100.3066	96.5214	92.7363	88.9511	85.1660	85.1660	88.9511	92.7363	96.5214	100.3066	104.0917 (44)
Energy conte	154.3650	135.0087	139.3168	121.4598	116.5436	100.5682	93.1913	106.9383	108.2155	126.1147	137.6641	149.4943 (45)
Energy content (annual)												Total = Sum(45)m = 1488.8803 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Water storage loss:	23.1548	20.2513	20.8975	18.2190	17.4815	15.0852	13.9787	16.0407	16.2323	18.9172	20.6496	22.4241 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0908 (55)
Total storage loss	33.8148	30.5424	33.8148	32.7240	33.8148	32.7240	33.8148	33.8148	32.7240	33.8148	32.7240	33.8148 (56)
If cylinder contains dedicated solar storage	33.8148	30.5424	33.8148	32.7240	33.8148	32.7240	33.8148	33.8148	32.7240	33.8148	32.7240	33.8148 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	211.4422	186.5623	196.3940	176.6958	173.6208	155.8042	150.2685	164.0155	163.4515	183.1919	192.9001	206.5715 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	211.4422	186.5623	196.3940	176.6958	173.6208	155.8042	150.2685	164.0155	163.4515	183.1919	192.9001	206.5715 (64)
Heat gains from water heating, kWh/month	96.9881	86.1333	91.9846	84.5742	84.4125	77.6277	76.6479	81.2188	80.1705	87.5949	89.9621	95.3686 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7543	46.8559	38.1058	28.8485	21.5646	18.2057	19.6719	25.5703	34.3205	43.5777	50.8616	54.2205 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.4710	345.0144	336.0851	317.0758	293.0800	270.5272	255.4606	251.9172	260.8465	279.8558	303.8517	326.4044 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749 (71)
Water heating gains (Table 5)	130.3604	128.1745	123.6352	117.4641	113.4577	107.8163	103.0213	109.1650	111.3479	117.7351	124.9474	128.1836 (72)
Total internal gains	628.2837	623.7428	601.5242	567.0865	531.8003	500.2473	481.8519	490.3506	510.2129	544.8667	583.3587	612.5065 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	Specific data	FF	Access	Gains				
		m ²	Table 6a	W/m ²	or Table 6b	or Table 6c	factor	W				
							Table 6d					
North		4.9000	11.3201	0.7200		0.7000	0.7700	19.3736 (74)				
East		1.4400	21.0039	0.7200		0.7000	0.7700	10.5640 (76)				
South		4.0000	49.0238	0.7200		0.7000	0.7700	68.4906 (78)				
South		3.8000	49.0238	0.7200		0.7000	0.7700	65.0660 (78)				
Solar gains	163.4942	280.4612	382.2067	484.4021	515.8274	556.4336	515.9026	478.4527	427.9761	317.2044	219.8927	155.0546 (83)
Total gains	791.7779	904.2041	983.7309	1051.4886	1047.6277	1056.6809	997.7545	968.8033	938.1890	862.0711	803.2515	767.5611 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384
alpha	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959
util living area	0.9157	0.8853	0.8371	0.7616	0.6665	0.5084	0.4035	0.4216	0.6028	0.7829	0.8779	0.9216 (86)
Tweekday	18.8659	18.9586	19.1066	19.2609	19.3814	19.4657	19.4883	19.4866	19.4373	19.2799	19.0581	18.8454
Tweekend	20.4887	20.5311	20.5990	20.6714	20.7300	20.7754	20.7897	20.7884	20.7583	20.6787	20.5755	20.4794
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.2109	20.2747	20.3811	20.4869	20.5833	20.6550	20.6755	20.6734	20.6226	20.5041	20.3371	20.1965 (87)
Th 2	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518 (88)
util rest of house	0.9045	0.8707	0.8160	0.7299	0.6194	0.4390	0.3171	0.3345	0.5388	0.7479	0.8598	0.9111 (89)
Tweekday	18.8659	18.9586	19.1066	19.2609	19.3814	19.4657	19.4883	19.4866	19.4373	19.2799	19.0581	18.8454
Tweekend	18.8659	18.9586	19.1066	19.2609	19.3814	19.4657	19.4883	19.4866	19.4373	19.2799	19.0581	18.8454
MIT 2	18.8659	18.9586	19.1066	19.2609	19.3814	19.4657	19.4883	19.4866	19.4373	19.2799	19.0581	18.8454 (90)
Living area fraction									fLA = Living area / (4) =			0.2204 (91)
MIT	19.1624	19.2487	19.3876	19.5312	19.6463	19.7279	19.7500	19.7483	19.6986	19.5497	19.3400	19.1432 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1624	19.2487	19.3876	19.5312	19.6463	19.7279	19.7500	19.7483	19.6986	19.5497	19.3400	19.1432 (93)

8. Space heating requirement

Utilisation	0.8947	0.8595	0.8032	0.7158	0.6043	0.4231	0.2996	0.3166	0.5218	0.7327	0.8477	0.9017 (94)
Useful gains	708.4413	777.1783	790.1367	752.6199	633.0907	447.0404	298.8784	306.7006	489.5244	631.6181	680.8878	692.1082 (95)
Ext temp.	4.3000	4.8000	6.6000	9.0000	11.8000	14.8000	16.6000	16.5000	14.0000	10.5000	7.1000	4.2000 (96)
Heat loss rate W												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Month fracti	1459.0241	1418.4074	1255.3371	1033.8342	770.2636	483.7646	309.2303	318.8764	559.4216	888.4003	1201.5858	1466.9571 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	558.4336	430.9060	346.1091	202.4743	102.0567	0.0000	0.0000	0.0000	0.0000	191.0460	374.9025	576.4876 (98)
Space heating per m2												2782.4157 (98)
												(98) / (4) = 32.8891 (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 %)												299.0378 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												930.4562 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	558.4336	430.9060	346.1091	202.4743	102.0567	0.0000	0.0000	0.0000	0.0000	191.0460	374.9025	576.4876 (98)
Space heating efficiency (main heating system 1)	299.0378	299.0378	299.0378	299.0378	299.0378	0.0000	0.0000	0.0000	0.0000	299.0378	299.0378	299.0378 (210)
Space heating fuel (main heating system)	186.7435	144.0975	115.7409	67.7086	34.1283	0.0000	0.0000	0.0000	0.0000	63.8869	125.3696	192.7808 (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	211.4422	186.5623	196.3940	176.6958	173.6208	155.8042	150.2685	164.0155	163.4515	183.1919	192.9001	206.5715 (64)
Efficiency of water heater (217)m	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400 (217)
Fuel for water heating, kWh/month	106.0180	93.5430	98.4727	88.5960	87.0541	78.1209	75.3452	82.2380	81.9552	91.8532	96.7209	103.5758 (219)
Water heating fuel used												1083.4930 (219)
Annual totals kWh/year												
Space heating fuel - main system												930.4562 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans: (MEVDcentralised, Database: total watage = 4.8875, total flow = 29.0000, SFP = 0.1685)												
mechanical ventilation fans (SFP = 0.1685)												44.3567 (230a)
Total electricity for the above, kWh/year												44.3567 (231)
Electricity for lighting (calculated in Appendix L)												372.6627 (232)
Total delivered energy for all uses												2430.9685 (238)

10a. Fuel costs - using BEDF prices (506)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	930.4562	20.4300	190.0922 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1083.4930	20.4300	221.3576 (247)
Mechanical ventilation fans	44.3567	20.4300	9.0621 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	372.6627	20.4300	76.1350 (250)
Additional standing charges			0.0000 (251)
Total energy cost			496.6469 (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	930.4562	0.5190	482.9067 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1083.4930	0.5190	562.3328 (264)
Space and water heating			1045.2396 (265)
Pumps and fans	44.3567	0.5190	23.0211 (267)
Energy for lighting	372.6627	0.5190	193.4120 (268)
Total kg/year			1261.6727 (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	930.4562	3.0700	2856.5004 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	1083.4930	3.0700	3326.3234 (264)
Space and water heating			6182.8237 (265)
Pumps and fans	44.3567	3.0700	136.1750 (267)
Energy for lighting	372.6627	3.0700	1144.0746 (268)
Primary energy kWh/year			7463.0734 (272)
Primary energy kWh/m2/year			88.2160 (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 85
 Current environmental impact rating: B 87

(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	Recommended
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	+ 2.4	-£ 86	-219 kg (17.4%)
U Solar photovoltaic panels	+ 10.3	-£ 388	-985 kg (94.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£86	2.59 kg/m ²	B 88 B 89
Solar photovoltaic panels	£388	11.64 kg/m ²	A 98 A 98
Total Savings	£474	14.23 kg/m²	

Potential energy efficiency rating: A 98
 Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 506 TEST (30 Sep 2022)
 Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£497	£410	£86
Space heating	£199	£199	-£0
Water heating	£221	£135	£87
Lighting	£76	£76	£0
Generated (PV)	-£0	-£388	£388
Total cost of fuels	£497	£22	£474
Total cost of uses	£496	£22	£475
Delivered energy	29 kWh/m ²	1 kWh/m ²	27 kWh/m ²
Carbon dioxide emissions	1.3 tonnes	0.1 tonnes	1.2 tonnes
CO2 emissions per m ²	15 kg/m ²	1 kg/m ²	14 kg/m ²
Primary energy	88 kWh/m ²	4 kWh/m ²	84 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	42.3000 (1b)	2.3900 (2b)	101.0970 (1b) - (3b)
First floor	42.3000 (1c)	2.7100 (2c)	114.6330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 215.7300 (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				0 * 10 =	0.0000 (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) =				0.0000 / (5) =	0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.5000
Infiltration rate					0.2250 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1913 (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	0.2438	0.2391	0.2343	0.2104	0.2056	0.1817	0.1817	0.1769	0.1913	0.2056	0.2152	0.2247 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
upvc window (Uw = 1.40)			10.3400	1.3258	13.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
BRICK TF	93.8400	16.3000	77.5400	0.2300	17.8342		(29a)
CEILING	42.3000		42.3000	0.1400	5.9220		(30)
Total net area of external elements Aum(A, m2)			178.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	51.8624	(33)
Party Wall 1			45.9000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7107 (36)
 Total fabric heat loss (33) + (36) = 62.5732 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955 (38)
Average = Sum(39)m / 12 =	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686 (39)
HLP	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604 (40)
HLP (average)												1.1604 (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												2.5444 (42)
Average daily hot water use (litres/day)												94.6289 (43)
Daily hot water use	104.0917	100.3066	96.5214	92.7363	88.9511	85.1660	85.1660	88.9511	92.7363	96.5214	100.3066	104.0917 (44)
Energy conte	154.3650	135.0087	139.3168	121.4598	116.5436	100.5682	93.1913	106.9383	108.2155	126.1147	137.6641	149.4943 (45)
Energy content (annual)												Total = Sum(45)m = 1488.8803 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Water storage loss:	23.1548	20.2513	20.8975	18.2190	17.4815	15.0852	13.9787	16.0407	16.2323	18.9172	20.6496	22.4241 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0908 (55)
Total storage loss	33.8148	30.5424	33.8148	32.7240	33.8148	32.7240	33.8148	33.8148	32.7240	33.8148	32.7240	33.8148 (56)
If cylinder contains dedicated solar storage	33.8148	30.5424	33.8148	32.7240	33.8148	32.7240	33.8148	33.8148	32.7240	33.8148	32.7240	33.8148 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	211.4422	186.5623	194.9983	169.9422	160.8264	143.1975	137.2415	151.9191	158.0486	181.7962	192.9001	206.5715 (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												1.2181 (H8)
Utilisation factor												0.5600 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.6289 (H14)
Volume ratio Veff/V												0.7926 (H15)
Solar storage volume factor												0.9535 (H16)
Solar input	-24.6914	-41.2028	-70.1731	-94.0458	-116.1856	-114.2290	-112.7194	-98.4835	-77.1323	-52.6723	-29.2875	-851.4852 (H17)
Solar input (sum of months) = Sum(63)m =												-851.4852 (63)
Output from w/h	186.7509	145.3594	124.8252	75.8964	44.6408	28.9685	24.5221	53.4356	80.9163	129.1239	163.6126	185.9090 (64)
Total per year (kWh/year) = Sum(64)m =												1243.9607 (64)
Heat gains from water heating, kWh/month	96.9881	86.1333	90.8680	79.1713	74.1770	67.5424	66.2263	71.5416	75.8482	86.4783	89.9621	95.3686 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7543	46.8539	38.1058	28.8485	21.5646	18.2057	19.6719	25.5703	34.3205	43.5777	50.8616	54.2205 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.4710	345.0144	336.0851	317.0758	293.0800	270.5272	255.4606	251.9172	260.8465	279.8558	303.8517	326.4044 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749 (71)
Water heating gains (Table 5)	130.3604	128.1745	122.1344	109.9601	99.7003	93.8088	89.0138	96.1581	105.3447	116.2343	124.9474	128.1836 (72)
Total internal gains	628.2837	623.7428	600.0234	559.5825	518.0429	486.2399	467.8445	477.3437	504.2097	543.3659	583.3587	612.5065 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
North	4.9000	10.6334	0.7200	0.7000	0.7700	18.1983 (74)						
East	1.4400	19.6403	0.7200	0.7000	0.7700	9.8781 (76)						
South	4.0000	46.7521	0.7200	0.7000	0.7700	65.3167 (78)						
South	3.8000	46.7521	0.7200	0.7000	0.7700	62.0509 (78)						
Solar gains	155.4441	262.6970	356.6331	441.6501	497.6969	496.2843	477.4976	434.7799	385.6338	289.3175	185.7409	133.3517 (83)
Total gains	783.7278	886.4398	956.6565	1001.2327	1015.7398	982.5242	945.3421	912.1236	889.8435	832.6834	769.0997	745.8582 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384
alpha	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959
util living area	0.9173	0.8881	0.8463	0.7804	0.6824	0.5491	0.4224	0.4513	0.6180	0.7909	0.8871	0.9259 (86)
Tweekday	18.8614	18.9562	19.0894	19.2408	19.3718	19.4565	19.4871	19.4839	19.4345	19.2758	19.0415	18.8329
Tweekend	20.4867	20.5299	20.5909	20.6615	20.7249	20.7695	20.7886	20.7861	20.7564	20.6765	20.5677	20.4737
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.2077	20.2729	20.3687	20.4714	20.5755	20.6460	20.6737	20.6699	20.6196	20.5007	20.3249	20.1877 (87)
Th 2	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518 (88)
util rest of house	0.9063	0.8737	0.8261	0.7502	0.6363	0.4800	0.3331	0.3622	0.5529	0.7562	0.8701	0.9159 (89)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Tweekday	18.8614	18.9562	19.0894	19.2408	19.3718	19.4565	19.4871	19.4839	19.4345	19.2758	19.0415	18.8329
Tweekend	18.8614	18.9562	19.0894	19.2408	19.3718	19.4565	19.4871	19.4839	19.4345	19.2758	19.0415	18.8329
MIT 2	18.8614	18.9562	19.0894	19.2408	19.3718	19.4565	19.4871	19.4839	19.4345	19.2758	19.0415	18.8329 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.1582	19.2465	19.3715	19.5121	19.6372	19.7188	19.7487	19.7453	19.6957	19.5458	19.3244	19.1316 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1582	19.2465	19.3715	19.5121	19.6372	19.7188	19.7487	19.7453	19.6957	19.5458	19.3244	19.1316 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8967	0.8626	0.8135	0.7361	0.6210	0.4633	0.3147	0.3434	0.5353	0.7408	0.8582	0.9068 (94)
Useful gains	702.7507	764.6270	778.1999	736.9840	630.8176	455.1932	297.4666	313.1984	476.3463	616.8772	660.0564	676.3183 (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	1458.6108	1408.3751	1263.5723	1041.7751	779.1812	502.5015	309.1005	328.4069	549.3228	878.1966	1200.0557	1465.8119 (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	562.3599	432.5987	361.1170	219.4496	110.3825	0.0000	0.0000	0.0000	0.0000	194.4216	388.7995	587.3833 (98)
Space heating												
Space heating per m2	(98) / (4) = 33.7649 (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 %)												299.0378 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												955.2344 (211)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	562.3599	432.5987	361.1170	219.4496	110.3825	0.0000	0.0000	0.0000	0.0000	194.4216	388.7995	587.3833 (98)
Space heating efficiency (main heating system 1)	299.0378	299.0378	299.0378	299.0378	299.0378	0.0000	0.0000	0.0000	0.0000	299.0378	299.0378	299.0378 (210)
Space heating fuel (main heating system)	188.0564	144.6635	120.7597	73.3852	36.9126	0.0000	0.0000	0.0000	0.0000	65.0157	130.0168	196.4244 (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	186.7509	145.3594	124.8252	75.8964	44.6408	28.9685	24.5221	53.4356	80.9163	129.1239	163.6126	185.9090 (64)
Efficiency of water heater	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400 (216)
(217)m	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400 (217)
Fuel for water heating, kWh/month	93.6376	72.8838	62.5878	38.0548	22.3831	14.5249	12.2955	26.7928	40.5717	64.7432	82.0360	93.2155 (219)
Water heating fuel used												623.7268 (219)
Annual totals kWh/year												
Space heating fuel - main system												955.2344 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 4.8875, total flow = 29.0000, SFP = 0.1685)												
mechanical ventilation fans (SFP = 0.1685)												44.3567 (230a)
pump for solar water heating												50.0000 (230g)
Total electricity for the above, kWh/year												94.3567 (231)
Electricity for lighting (calculated in Appendix L)												372.6627 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 2.50 * 1080 * 0.80) =												-1727.2394 (233)
Total delivered energy for all uses												318.7412 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	955.2344	13.1900	125.9954 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	623.7268	13.1900	82.2696 (247)
Mechanical ventilation fans	44.3567	13.1900	5.8506 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	50.0000	13.1900	6.5950 (249)
Energy for lighting	372.6627	13.1900	49.1542 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			42.0420 (255)

11a. SAP rating - Individual heating systems

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.1362 (257)
SAP value		98.0994
SAP rating (Section 12)		98 (258)
SAP band		A

 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	955.2344	0.5190	495.7667 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	623.7268	0.5190	323.7142 (264)
Space and water heating			819.4809 (265)
Pumps and fans	94.3567	0.5190	48.9711 (267)
Energy for lighting	372.6627	0.5190	193.4120 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			165.4267 (272)
CO2 emissions per m2			1.9600 (273)
EI value			98.2896
EI rating			98 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	42.3000 (1b)	2.3900 (2b)	101.0970 (1b) - (3b)
First floor	42.3000 (1c)	2.7100 (2c)	114.6330 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	84.6000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 215.7300 (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				0 * 10 =	0.0000 (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) =				0.0000 / (5) =	0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					4.5000							
Infiltration rate					0.2250 (18)							
Number of sides sheltered					2 (19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1913 (21)							
Wind speed	Jan 4.5000	Feb 4.5000	Mar 4.4000	Apr 3.9000	May 3.8000	Jun 3.4000	Jul 3.3000	Aug 3.3000	Sep 3.5000	Oct 3.8000	Nov 3.9000	Dec 4.1000 (22)
Wind factor	1.1250	1.1250	1.1000	0.9750	0.9500	0.8500	0.8250	0.8250	0.8750	0.9500	0.9750	1.0250 (22a)
Adj infilt rate	0.2152	0.2152	0.2104	0.1865	0.1817	0.1626	0.1578	0.1578	0.1673	0.1817	0.1865	0.1960 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation:												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
upvc window (Uw = 1.40)			10.3400	1.3258	13.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
BRICK TF	93.8400	16.3000	77.5400	0.2300	17.8342		(29a)
CEILING	42.3000		42.3000	0.1400	5.9220		(30)
Total net area of external elements Aum(A, m2)			178.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	51.8624	(33)
Party Wall 1			45.9000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.7107 (36)
Total fabric heat loss						(33) + (36) =	62.5732 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955	35.5955 (38)
Average = Sum(39)m / 12 =	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686	98.1686 (39)
HLP	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604	1.1604 (40)
HLP (average)												1.1604 (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												2.5444 (42)
Average daily hot water use (litres/day)												94.6289 (43)
Daily hot water use	104.0917	100.3066	96.5214	92.7363	88.9511	85.1660	85.1660	88.9511	92.7363	96.5214	100.3066	104.0917 (44)
Energy conte	154.3650	135.0087	139.3168	121.4598	116.5436	100.5682	93.1913	106.9383	108.2155	126.1147	137.6641	149.4943 (45)
Energy content (annual)												Total = Sum(45)m = 1488.8803 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Water storage loss:	23.1548	20.2513	20.8975	18.2190	17.4815	15.0852	13.9787	16.0407	16.2323	18.9172	20.6496	22.4241 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0908 (55)
Total storage loss												
	33.8148	30.5424	33.8148	32.7240	33.8148	32.7240	33.8148	33.8148	32.7240	33.8148	32.7240	33.8148 (56)
If cylinder contains dedicated solar storage												
	33.8148	30.5424	33.8148	32.7240	33.8148	32.7240	33.8148	33.8148	32.7240	33.8148	32.7240	33.8148 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	211.4422	186.5623	194.9983	169.9422	160.8264	143.1975	137.2415	151.9191	158.0486	181.7962	192.9001	206.5715 (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												1185.6484 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												1991.8893 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.3378 (H8)
Utilisation factor												0.5264 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												94.6289 (H14)
Volume ratio Veff/V												0.7926 (H15)
Solar storage volume factor												0.9535 (H16)
Solar input												-879.1620 (H17)
Solar input	-24.6567	-41.7847	-71.3905	-97.6638	-113.7031	-120.7820	-114.9129	-102.4927	-81.1913	-54.8537	-32.9258	-22.8047 (63)
Solar input (sum of months) = Sum(63)m =												-879.1620 (63)
Output from w/h												
	186.7855	144.7775	123.6078	72.2784	47.1233	22.4155	22.3286	49.4264	76.8573	126.9425	159.9743	183.7668 (64)
Total per year (kWh/year) = Sum(64)m =												1216.2840 (64)
Heat gains from water heating, kWh/month												
	96.9881	86.1333	90.8680	79.1713	74.1770	67.5424	66.2263	71.5416	75.8482	86.4783	89.9621	95.3686 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624	152.6624 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	52.7543	46.8539	38.1058	28.8485	21.5646	18.2057	19.6719	25.5703	34.3205	43.5777	50.8616	54.2205 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	341.4710	345.0144	336.0851	317.0758	293.0800	270.5272	255.4606	251.9172	260.8465	279.8558	303.8517	326.4044 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106	52.8106 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749	-101.7749 (71)
Water heating gains (Table 5)	130.3604	128.1745	122.1344	109.9601	99.7003	93.8088	89.0138	96.1581	105.3447	116.2343	124.9474	128.1836 (72)
Total internal gains	628.2837	623.7428	600.0234	559.5825	518.0429	486.2399	467.8445	477.3437	504.2097	543.3659	583.3587	612.5065 (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						
North	4.9000	11.3201	0.7200	0.7000	0.7700	19.3736 (74)						
East	1.4400	21.0039	0.7200	0.7000	0.7700	10.5640 (76)						
South	4.0000	49.0238	0.7200	0.7000	0.7700	68.4906 (78)						
South	3.8000	49.0238	0.7200	0.7000	0.7700	65.0660 (78)						
Solar gains	163.4942	280.4612	382.2067	484.4021	515.8274	556.4336	515.9026	478.4527	427.9761	317.2044	219.8927	155.0546 (83)
Total gains	791.7779	904.2041	982.2301	1043.9846	1033.8704	1042.6735	983.7470	955.7964	932.1858	860.5703	803.2515	767.5611 (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)												
tau	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384	23.9384 (85)
alpha	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959	2.5959
util living area	0.9157	0.8853	0.8375	0.7640	0.6716	0.5135	0.4084	0.4264	0.6053	0.7835	0.8779	0.9216 (86)
Tweekday	18.8659	18.9586	19.1060	19.2588	19.3789	19.4649	19.4880	19.4863	19.4366	19.2794	19.0581	18.8454
Tweekend	20.4887	20.5311	20.5987	20.6703	20.7287	20.7748	20.7894	20.7881	20.7579	20.6784	20.5755	20.4794
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.2109	20.2747	20.3807	20.4852	20.5812	20.6541	20.6750	20.6729	20.6220	20.5037	20.3371	20.1965 (87)
Th 2	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518	19.9518 (88)
util rest of house	0.9045	0.8707	0.8164	0.7324	0.6246	0.4438	0.3213	0.3386	0.5413	0.7485	0.8598	0.9111 (89)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Tweekday	18.8659	18.9586	19.1060	19.2588	19.3789	19.4649	19.4880	19.4863	19.4366	19.2794	19.0581	18.8454
Tweekend	18.8659	18.9586	19.1060	19.2588	19.3789	19.4649	19.4880	19.4863	19.4366	19.2794	19.0581	18.8454
MIT 2	18.8659	18.9586	19.1060	19.2588	19.3789	19.4649	19.4880	19.4863	19.4366	19.2794	19.0581	18.8454 (90)
Living area fraction												fLA = Living area / (4) =
MIT	19.1624	19.2487	19.3870	19.5291	19.6440	19.7270	19.7497	19.7479	19.6979	19.5493	19.3400	0.2204 (91)
Temperature adjustment												19.1432 (92)
adjusted MIT	19.1624	19.2487	19.3870	19.5291	19.6440	19.7270	19.7497	19.7479	19.6979	19.5493	19.3400	0.0000
												19.1432 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8947	0.8595	0.8037	0.7183	0.6094	0.4277	0.3035	0.3205	0.5242	0.7333	0.8477	0.9017 (94)
Useful gains	708.4413	777.1783	789.3713	749.8921	630.0532	445.9933	298.5226	306.3070	488.6779	631.0355	680.8878	692.1082 (95)
Ext temp.	4.3000	4.8000	6.6000	9.0000	11.8000	14.8000	16.6000	16.5000	14.0000	10.5000	7.1000	4.2000 (96)
Heat loss rate W												
1459.0241	1418.4074	1255.2808	1033.6313	770.0335	483.6798	309.1975	318.8407	559.3549	888.3568	1201.5858	1466.9571 (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	558.4336	430.9060	346.6367	204.2922	104.1454	0.0000	0.0000	0.0000	0.0000	191.4470	374.9025	576.4876 (98)
Space heating												2787.2509 (98)
Space heating per m2												(98) / (4) =
												32.9462 (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 %)												299.0378 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												932.0731 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	558.4336	430.9060	346.6367	204.2922	104.1454	0.0000	0.0000	0.0000	0.0000	191.4470	374.9025	576.4876 (98)
Space heating efficiency (main heating system 1)	299.0378	299.0378	299.0378	299.0378	299.0378	0.0000	0.0000	0.0000	0.0000	299.0378	299.0378	299.0378 (210)
Space heating fuel (main heating system)	186.7435	144.0975	115.9173	68.3165	34.8268	0.0000	0.0000	0.0000	0.0000	64.0210	125.3696	192.7808 (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	186.7855	144.7775	123.6078	72.2784	47.1233	22.4155	22.3286	49.4264	76.8573	126.9425	159.9743	183.7668 (64)
Efficiency of water heater												199.4400 (216)
(217)m	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400	199.4400 (217)
Fuel for water heating, kWh/month	93.6550	72.5920	61.9775	36.2407	23.6278	11.2392	11.1957	24.7826	38.5365	63.6495	80.2117	92.1414 (219)
Water heating fuel used												609.8496 (219)
Annual totals kWh/year												
Space heating fuel - main system												932.0731 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 4.8875, total flow = 29.0000, SFP = 0.1685)												
mechanical ventilation fans (SFP = 0.1685)												44.3567 (230a)
pump for solar water heating												50.0000 (230g)
Total electricity for the above, kWh/year												94.3567 (231)
Electricity for lighting (calculated in Appendix L)												372.6627 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 2.50 * 1186 * 0.80) =										-1897.0374		-1897.0374 (233)
Total delivered energy for all uses												111.9046 (238)

10a. Fuel costs - using BEDF prices (506)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	932.0731	20.4300	190.4225 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	609.8496	20.4300	124.5923 (247)
Mechanical ventilation fans	44.3567	20.4300	9.0621 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	50.0000	20.4300	10.2150 (249)
Energy for lighting	372.6627	20.4300	76.1350 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-1897.0374	20.4300	-387.5647 (252)
Total energy cost			22.8621 (255)

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

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 kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	932.0731	0.5190	483.7459 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	609.8496	0.5190	316.5119 (264)
Space and water heating			800.2578 (265)
Pumps and fans	94.3567	0.5190	48.9711 (267)
Energy for lighting	372.6627	0.5190	193.4120 (268)
Energy saving/generation technologies			
PV Unit	-1897.0374	0.5190	-984.5624 (269)
Total kg/year			58.0785 (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	932.0731	3.0700	2861.4643 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	609.8496	3.0700	1872.2381 (264)
Space and water heating			4733.7025 (265)
Pumps and fans	94.3567	3.0700	289.6750 (267)
Energy for lighting	372.6627	3.0700	1144.0746 (268)
Energy saving/generation technologies			
PV Unit	-1897.0374	3.0700	-5823.9049 (269)
Primary energy kWh/year			343.5472 (272)
Primary energy kWh/m2/year			4.0608 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	HOUSE TYPE B4	Issued on Date	09/11/2022
Assessment Reference	GRANT ASHP	Prop Type Ref	
Property			

SAP Rating	85 B	DER	16.19	TER	25.77
Environmental	87 B	% DER<TER	37.17		
CO₂ Emissions (t/year)	1.26	DFEE	45.02	TFEE	50.05
General Requirements Compliance	Pass	% DFEE<TFEE	10.06		

Assessor Details	Mr. Neil Jones, S J Roberts Construction Limited, Tel: 01743 891858, neil.jones@sjroberts.com	Assessor ID	K559-0001
-------------------------	---	--------------------	-----------

Client	
---------------	--

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	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	25.77	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.19	kgCO ₂ /m ²	Pass
	-9.58 (-37.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.05	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.02	kWh/m ² /yr	
	-5.1 (-10.2%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.23 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.16 (max. 0.25)	0.16 (max. 0.70)	Pass
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	Pass
Openings	1.37 (max. 2.00)	1.40 (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	4.50 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Heat pump with radiators or underfloor - Electric Grant AERONA3 HPID6R32	
Secondary heating system	None	

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 2.02 kWh/day Permitted by DBSCG 2.56	Pass
Primary pipework insulated	Yes	Pass

6 Controls

Space heating controls	Time and temperature zone control	Pass
Hot water controls	Cylinderstat	Pass
	Independent timer for DHW	Pass

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power	0.1300 0.1600	
Maximum	0.7	Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Midlands)	Not significant	Pass
Based on:		
Overshading	Average	
Windows facing North	4.90 m ² , No overhang	
Windows facing East	1.44 m ² , No overhang	
Windows facing South	7.80 m ² , No overhang	
Air change rate	5.00 ach	
Blinds/curtains	None	

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value	W/m ² K	
Filled Cavity with Edge Sealing	0.00		Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.50 (design value)	
Maximum	10.0	Pass

10 Key features

Party wall U-value	0.00	W/m ² K
--------------------	------	--------------------

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	HOUSE TYPE B4	Issued on Date	09/11/2022
Assessment Reference	GRANT ASHP	Prop Type Ref	
Property			

SAP Rating	85 B	DER	16.19	TER	25.77
Environmental	87 B	% DER<TER	37.17		
CO ₂ Emissions (t/year)	1.26	DFEE	45.02	TFEE	50.05
General Requirements Compliance	Pass	% DFEE<TFEE	10.06		

Assessor Details	Mr. Neil Jones, S J Roberts Construction Limited, Tel: 01743 891858, neil.jones@sjroberts.com	Assessor ID	K559-0001
------------------	---	-------------	-----------

Client	
--------	--

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

Orientation	North
Property Tenure	Rented (social)
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2022
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	18.40 m	42.30 m ²	2.39 m
1st Storey:	18.40 m	42.30 m ²	2.71 m

7.0 Living Area	18.65	m ²
-----------------	-------	----------------

8.0 Thermal Mass Parameter	Simple calculation - Low	
Thermal Mass	100.00	kJ/m ² K

9.0 External Walls

Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
BRICK TF	Timber Frame	0.23	93.84	77.54

9.1 Party Walls

Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Party Wall 1	Filled Cavity with Edge Sealing		0.00	45.90

10.0 External Roofs

Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
CEILING	External Plane Roof	0.14	42.30	42.30

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Heat Loss Floor 1	Ground Floor - Solid		0.16	42.30

12.0 Opening Types

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
upvc window	Manufacturer	Window	Double Low-E Hard	0.15		0.72		0.70	1.40
FRENCH DOOR	Manufacturer	Window	Double Low-E Hard	0.15		0.72		0.70	1.40
external door	Manufacturer	Solid Door							1.20
REAR DOOR	Manufacturer	Half Glazed Door	Double Low-E Hard	0.15		0.72		0.70	1.40

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 WINDOW	Window	[1] BRICK TF	North	None	0.00					4.90	
REAR WINDOW	Window	[1] BRICK TF	South	None	0.00					4.00	
GABLE WINDOW	Window	[1] BRICK TF	East	None	0.00					1.44	
FRONT DOOR	Solid Door	[1] BRICK TF	North							2.16	
FRENCH DOOR	Window	[1] BRICK TF	South	None	0.00					3.80	

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)	11.69	0.141	Yes	TRADA
Independently assessed	E3 Sill	10.67	0.027	Yes	TRADA
Independently assessed	E4 Jamb	27.02	0.038	Yes	TRADA
Independently assessed	E5 Ground floor (normal)	18.40	0.131	Yes	TRADA
Independently assessed	E6 Intermediate floor within a dwelling	18.40	0.094	Yes	TRADA
Independently assessed	E10 Eaves (insulation at ceiling level)	7.40	0.060	No	TRADA
Independently assessed	E12 Gable (insulation at ceiling level)	11.00	0.062	No	TRADA
Independently assessed	E16 Corner (normal)	10.20	0.058	Yes	TRADA
Independently assessed	E18 Party wall between dwellings	10.20	-0.045	Yes	TRADA
Independently assessed	P1 Party wall - Ground floor	9.00	0.119	No	TRADA
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	9.00	0.000	No	
Independently assessed	P4 Party wall - Roof (insulation at ceiling level)	9.00	0.142	No	TRADA

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

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

Approved Installation

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500275
Duct Type	Rigid

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.13	Through Wall Fan Kitchen	1
0.16	Through Wall Fan Other Wet Room	2

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				0
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	20	
Total number of L.E.L. fittings	20	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

Description	Database	
ASHP		
Percentage of Heat	100	%
Database Ref. No.	103763	
Fuel Type	Electricity	
Main Heating	PET	
SAP Code	224	
In Winter	314.8	
In Summer	332.4	
Controls	CHD Time and temperature zone control	
PCDF Controls	0	
Sap Code	2207	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in Concrete	
Flow Temperature	36° - 45°C	

25.0 Main Heating 2

None

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Community Heating	None
28.0 Water Heating	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901
Immersion Only Heating Hot Water	No

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	250.00	L
Loss	2.02	kWh/day
Pipes insulation	Fully insulated primary pipework	

31.0 Thermal Store	None
---------------------------	------

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	£86	B 88	
	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar photovoltaic panels, 2.5 kWp	£3,500 - £5,500	£388	A 98	