



SAP Report Submission for Building Regulations Compliance

Client: C & L Management

Project:

Contact: Tobias Whiting
Abacus Energy (UK) Ltd
tobiaswhiting26@gmail.com

Report Issue Date: 30/01/2019

EXCELLENCE
IN ENERGY
ASSESSMENT

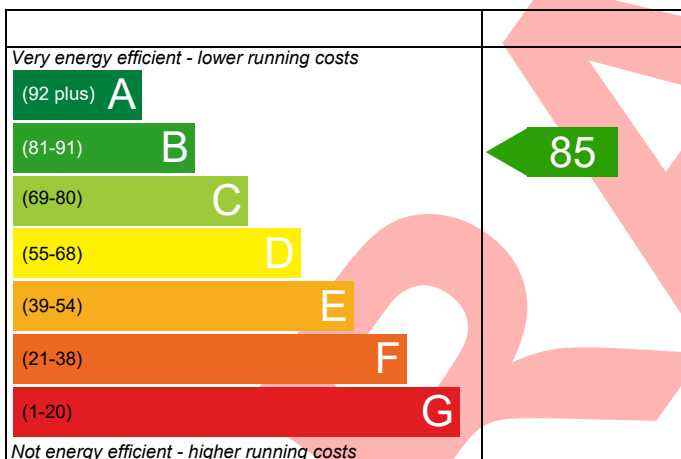
PREDICTED ENERGY ASSESSMENT

Dwelling type: House, Semi-Detached
Date of assessment: 30/01/2019
Produced by: Abacus Energy (UK) Ltd
Total floor area: 65.43 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

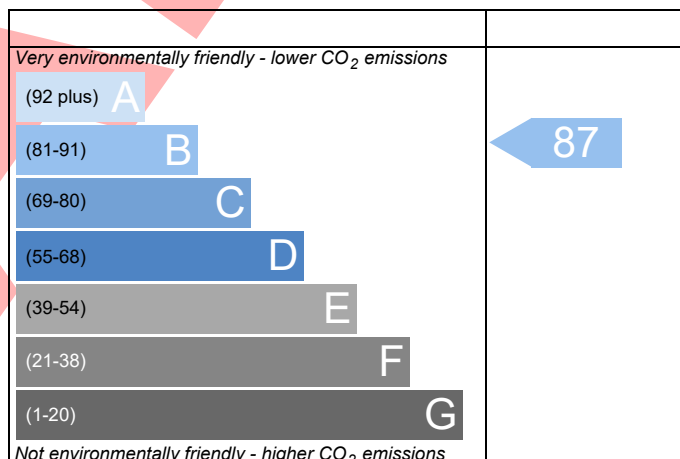


England

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	SAP 0624	Issued on Date	30/01/2019
Assessment Reference	Rev B	Prop Type Ref	
Property			
SAP Rating	85 B	DER	18.76
Environmental	87 B	% DER<TER	3.29
CO ₂ Emissions (t/year)	0.93	DFEE	54.24
General Requirements Compliance	Fail	% DFEE<TFEE	-1.76
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
Client	C & L Management, C&L		

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	19.40	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.76	kgCO ₂ /m ²	Pass
	-0.64 (-3.3%)	kgCO ₂ /m ²	

1b TFE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.30	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	54.24	kWh/m ² /yr	
Excess energy	0.9 (1.7%)	kWh/m ² /yr	Fail

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	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.18 (max. 0.35)	Pass
Openings	1.43 (max. 2.00)	1.60 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

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

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant Ecotec Plus 824
Combi boiler
Efficiency: 88.9% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

5.78 m², No overhang

Windows facing West

6.95 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

m³/(h.m²) @ 50 Pa

Maximum

10.0

m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Floor U-value

0.12

W/m²K

Photovoltaic array

N/A

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

RECOMMENDATIONS

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating	£4,000 - £6,000	£32	B 86	B 89	Recommended
Photovoltaic			0	0	Already installed
Wind turbine			0	0	Not applicable
Totals	£4,000 - £6,000	£32	B 86	B 89	

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

THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	SAP 0624	Issued on Date	30/01/2019
Assessment Reference	Rev B	Prop Type Ref	
Property			

SAP Rating	85 B	DER	18.76	TER	19.40
Environmental	87 B	% DER<TER	3.29		
CO ₂ Emissions (t/year)	0.93	DFEE	54.24	TFEE	53.30
General Requirements Compliance	Fail	% DFEE<TFEE	-1.76		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
------------------	--	-------------	-----------

Client	C & L Management, C&L
--------	-----------------------

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Approved	0.300	10.56	3.17	
External wall	E3 Sill	Table K1 - Approved	0.040	8.10	0.32	
External wall	E4 Jamb	Table K1 - Approved	0.050	24.60	1.23	
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	17.19	2.75	
External wall	E6 Intermediate floor within a dwelling	Table K1 - Approved	0.070	16.26	1.14	
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	9.74	0.58	
External wall	E12 Gable (insulation at ceiling level)	Table K1 - Approved	0.240	6.49	1.56	
External wall	E14 Flat roof	Table K1 - Default	0.080	3.07	0.25	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	11.81	1.06	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	2.33	-0.21	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	9.48	0.57	
Party wall	P1 Party wall - Ground floor	Table K1 - Default	0.160	7.43	1.19	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	6.49	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Table K1 - Default	0.240	6.49	1.56	

Total: **15.17** W/mK:
Y-Value: **0.104** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	SAP 0624			Issued on Date	30/01/2019
Assessment Reference	Rev B	Prop Type Ref			
Property					
SAP Rating	85 B	DER	18.76	TER	19.40
Environmental	87 B	% DER<TER	3.29		
CO ₂ Emissions (t/year)	0.93	DFEE	54.24	TFEE	53.30
General Requirements Compliance	Fail	% DFEE<TFEE	-1.76		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com			Assessor ID	E477-0001
Client	C & L Management, C&L				

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 65 m²

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

1a TER and DER

Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.40 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.76 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 54.2 kWh/m²/yrFail
Excess energy =0.9 kWh/m²/yr (1.7%)

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	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.43 (max. 2.00)	1.60 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant Ecotec Plus 824
Combi boiler
Efficiency: 88.9% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK

Based on:

Overshading: Average
Windows facing East: 5.78 m², No overhang
Windows facing West: 6.95 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Floor U-value 0.12 W/m²K
Photovoltaic array

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.6400 (1b)	x 2.3300 (2b)	= 78.3812 (1b) - (3b)
First floor	31.7900 (1c)	x 2.4100 (2c)	= 76.6139 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 154.9951 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1936 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4436 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.4103 (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	0.5231	0.5129	0.5026	0.4513	0.4411	0.3898	0.3898	0.3795	0.4103	0.4411	0.4616	0.4821 (22b)
Effective ac	0.6368	0.6315	0.6263	0.6018	0.5973	0.5760	0.5760	0.5720	0.5842	0.5973	0.6065	0.6162 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.0200	1.6000	3.2320		(26)
Windows (Uw = 1.40)			12.7300	1.3258	16.8769		(27)
Ground Floor			33.6400	0.1200	4.0368		(28a)
Brick and Block	79.2400	14.7500	64.4900	0.2300	14.8327		(29a)
Pitched Roof	31.7900		31.7900	0.1000	3.1790		(30)
Flat Roof	1.8500		1.8500	0.1800	0.3330		(30)
Total net area of external elements Aum(A, m ²)			146.5200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.4904		(33)
Party Wall 1			32.9500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.1666 (36)
Total fabric heat loss						(33) + (36) =	57.6570 (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	32.5726	32.3009	32.0345	30.7833	30.5492	29.4595	29.4595	29.2577	29.8793	30.5492	31.0228	31.5179 (38)
Heat transfer coeff	90.2296	89.9578	89.6915	88.4403	88.2062	87.1165	87.1165	86.9147	87.5362	88.2062	88.6798	89.1749 (39)
Average = Sum(39)m / 12 =												88.4392 (39)
HLP	1.3790	1.3749	1.3708	1.3517	1.3481	1.3314	1.3314	1.3284	1.3379	1.3481	1.3553	1.3629 (40)
HLP (average)												1.3517 (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												2.1303 (42)
Average daily hot water use (litres/day)												84.7944 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	93.2738	89.8820	86.4902	83.0985	79.7067	76.3149	76.3149	79.7067	83.0985	86.4902	89.8820	93.2738 (44)
Energy conte	138.3223	120.9776	124.8381	108.8368	104.4315	90.1165	83.5062	95.8245	96.9690	113.0080	123.3571	133.9578 (45)
Energy content (annual)										Total = Sum(45)m =		1334.1455 (45)
Distribution loss (46)m = 0.15 x (45)m												
20.7484	18.1466	18.7257	16.3255	15.6647	13.5175	12.5259	14.3737	14.5453	16.9512	18.5036	20.0937 (46)	
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	189.2812	167.0050	175.7970	158.1519	155.3904	139.4315	134.4651	146.7834	146.2841	163.9669	172.6722	184.9167 (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	189.2812	167.0050	175.7970	158.1519	155.3904	139.4315	134.4651	146.7834	146.2841	163.9669	172.6722	184.9167 (64)
Heat gains from water heating, kWh/month	58.7319	51.7319	54.2484	48.5170	47.4632	42.2925	40.5055	44.6014	44.5710	50.3149	53.3450	57.2807 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.7874	14.9104	12.1260	9.1801	6.8623	5.7934	6.2600	8.1370	10.9214	13.8673	16.1851	17.2540	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.4055	188.3398	183.4654	173.0884	159.9893	147.6780	139.4533	137.5190	142.3934	152.7704	165.8695	178.1808	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	(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)	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	(71)
Water heating gains (Table 5)	78.9407	76.9820	72.9145	67.3847	63.7946	58.7396	54.4429	59.9481	61.9041	67.6275	74.0903	76.9902	(72)
Total internal gains	340.0879	338.1865	326.4602	307.6076	288.6005	270.1653	258.1105	263.5584	273.1732	292.2195	314.0992	330.3793	(73)

6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East						5.7800	19.6403	0.6300	0.7000			0.7700			34.6934
West						6.9500	19.6403	0.6300	0.7000			0.7700			41.7161 (76)
Solar gains	76.4095	149.4733	246.1612	359.0114	439.9819	450.3998	428.7990	368.3320	286.2956	177.3626	95.2737			62.8355 (83)	
Total gains	416.4975	487.6598	572.6213	666.6190	728.5825	720.5651	686.9095	631.8904	559.4689	469.5821	409.3729			393.2147 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.3576	50.5098	50.6598	51.3765	51.5128	52.1572	52.1572	52.2783	51.9071	51.5128	51.2377	50.9533	
alpha	4.3572	4.3673	4.3773	4.4251	4.4342	4.4771	4.4771	4.4852	4.4605	4.4342	4.4158	4.3969	
util living area	0.9973	0.9943	0.9844	0.9497	0.8609	0.7002	0.5391	0.6003	0.8467	0.9743	0.9948	0.9979	(86)
MIT	19.4961	19.6715	19.9832	20.3949	20.7325	20.9263	20.9820	20.9715	20.8192	20.3629	19.8580	19.4721	(87)
Th 2	19.7795	19.7827	19.7858	19.8006	19.8033	19.8163	19.8163	19.8187	19.8113	19.8033	19.7977	19.7919	(88)
util rest of house	0.9964	0.9922	0.9786	0.9303	0.8081	0.5985	0.4035	0.4616	0.7682	0.9608	0.9927	0.9972	(89)
MIT 2	18.4268	18.6038	18.9147	19.3244	19.6288	19.7841	19.8121	19.8111	19.7139	19.3037	18.8020	18.4125	(90)
Living area fraction	18.7061	18.8827	19.1938	19.6040	19.9171	20.0824	20.1177	20.1142	20.0026	19.5804	19.0778	18.6892	(92)
Temperature adjustment	18.7061	18.8827	19.1938	19.6040	19.9171	20.0824	20.1177	20.1142	20.0026	19.5804	19.0778	18.6892	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	414.5061	482.8671	558.2113	617.5244	592.9549	449.0646	301.8164	314.8555	438.0474	449.5980	405.6174	391.7490	(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	1299.8541	1257.8510	1138.5266	946.6687	724.7955	477.6117	306.4464	322.8203	516.6909	792.1272	1062.1905	1292.0768	(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	658.6989	520.7891	431.7546	236.9839	98.0894	0.0000	0.0000	0.0000	0.0000	254.8417	472.7327	669.8439	(98)
Space heating												3343.7342	(98)
Space heating per m ²												51.1040	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 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 %)													89.8000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3723.5347 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	658.6989	520.7891	431.7546	236.9839	98.0894	0.0000	0.0000	0.0000	0.0000	254.8417	472.7327	669.8439	(98)
Space heating efficiency (main heating system 1)	89.8000	89.8000	89.8000	89.8000	89.8000	0.0000	0.0000	0.0000	0.0000	89.8000	89.8000	89.8000	(210)
Space heating fuel (main heating system)	733.5177	579.9434	480.7958	263.9019	109.2309	0.0000	0.0000	0.0000	0.0000	283.7881	526.4283	745.9286	(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	189.2812	167.0050	175.7970	158.1519	155.3904	139.4315	134.4651	146.7834	146.2841	163.9669	172.6722	184.9167	(64)
Efficiency of water heater (217)m	87.3297	87.1193	86.6237	85.4651	83.3267	79.7000	79.7000	79.7000	79.7000	85.5553	86.8552	87.4038	(216)
Fuel for water heating, kWh/month	216.7432	191.6969	202.9434	185.0485	186.4835	174.9455	168.7140	184.1699	183.5434	191.6503	198.8045	211.5660	(219)
Water heating fuel used												2296.3091	(219)
Annual totals kWh/year													
Space heating fuel - main system												3723.5347	(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)												296.4711	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.75 * 853 * 1.00) =										-511.8180		-511.8180	(233)
Total delivered energy for all uses												5879.4970	(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	3723.5347	0.2160	804.2835	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2296.3091	0.2160	496.0028	(264)
Space and water heating			1300.2863	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	296.4711	0.5190	153.8685	(268)
Energy saving/generation technologies				
PV Unit	-511.8180	0.5190	-265.6335	(269)
Total CO2, kg/year			1227.4462	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.7600	(273)

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

DER			18.7600	ZC1
Total Floor Area		TFA	65.4300	
Assumed number of occupants		N	2.1303	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.8822	ZC2
CO2 emissions from cooking, equation (L16)			2.6001	ZC3
Total CO2 emissions			38.2423	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			38.2423	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.6400 (1b)	x 2.3300 (2b)	= 78.3812 (1b) - (3b)
First floor	31.7900 (1c)	x 2.4100 (2c)	= 76.6139 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 154.9951 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
Number of chimneys										0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues										0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans																2 * 10 =	20.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000	/ (5) =	0.1290 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.3790 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3506 (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	0.4470	0.4383	0.4295	0.3857	0.3769	0.3331	0.3331	0.3243	0.3506	0.3769	0.3944	0.4120	(22b)				
Effective ac	0.5999	0.5960	0.5922	0.5744	0.5710	0.5555	0.5555	0.5526	0.5615	0.5710	0.5778	0.5849	(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			2.0200	1.0000	2.0200		(26)					
TER Opening Type (Uw = 1.40)			12.7300	1.3258	16.8769		(27)					
Ground Floor			33.6400	0.1300	4.3732		(28a)					
Brick and Block	79.2400	14.7500	64.4900	0.1800	11.6082		(29a)					
Pitched Roof	31.7900		31.7900	0.1300	4.1327		(30)					
Flat Roof	1.8500		1.8500	0.1300	0.2405		(30)					
Total net area of external elements Aum(A, m2)			146.5200				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.2515	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9280 (36)					
Total fabric heat loss						(33) + (36) =	48.1795 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.6847	Feb 30.4863	Mar 30.2918	Apr 29.3781	May 29.2072	Jun 28.4114	Jul 28.4114	Aug 28.2641	Sep 28.7179	Oct 29.2072	Nov 29.5530	Dec 29.9145 (38)
Heat transfer coeff	78.8642	78.6658	78.4713	77.5576	77.3867	76.5909	76.5909	76.4436	76.8974	77.3867	77.7325	78.0940 (39)
Average = Sum(39)m / 12 =												77.5568 (39)
HLP	Jan 1.2053	Feb 1.2023	Mar 1.1993	Apr 1.1854	May 1.1827	Jun 1.1706	Jul 1.1706	Aug 1.1683	Sep 1.1753	Oct 1.1827	Nov 1.1880	Dec 1.1936 (40)
HLP (average)												1.1853 (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												2.1303 (42)
Average daily hot water use (litres/day)												84.7944 (43)
Daily hot water use	Jan 93.2738	Feb 89.8820	Mar 86.4902	Apr 83.0985	May 79.7067	Jun 76.3149	Jul 76.3149	Aug 79.7067	Sep 83.0985	Oct 86.4902	Nov 89.8820	Dec 93.2738 (44)
Energy conte	138.3223	120.9776	124.8381	108.8368	104.4315	90.1165	83.5062	95.8245	96.9690	113.0080	123.3571	133.9578 (45)
Energy content (annual)										Total = Sum(45)m =		1334.1455 (45)
Distribution loss (46)m = 0.15 x (45)m	20.7484	18.1466	18.7257	16.3255	15.6647	13.5175	12.5259	14.3737	14.5453	16.9512	18.5036	20.0937 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	47.5313	41.3704	44.0745	40.9801	40.6177	37.6348	38.8892	40.6177	40.9801	44.0745	44.3254	47.5313	(61)
Total heat required for water heating calculated for each month	185.8536	162.3480	168.9125	149.8169	145.0492	127.7512	122.3954	136.4422	137.9491	157.0825	167.6825	181.4891	(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	185.8536	162.3480	168.9125	149.8169	145.0492	127.7512	122.3954	136.4422	137.9491	157.0825	167.6825	181.4891	(64)
Heat gains from water heating, kWh/month	57.8750	50.5676	52.5273	46.4333	44.8779	39.3724	37.4881	42.0161	42.4872	48.5938	52.0976	56.4238	(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	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.7874	14.9104	12.1260	9.1801	6.8623	5.7934	6.2600	8.1370	10.9214	13.8673	16.1851	17.2540	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.4055	188.3398	183.4654	173.0884	159.9893	147.6780	139.4533	137.5190	142.3934	152.7704	165.8695	178.1808	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	(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)	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	(71)
Water heating gains (Table 5)	77.7890	75.2495	70.6012	64.4906	60.3198	54.6839	50.3872	56.4732	59.0100	65.3142	72.3577	75.8384	(72)
Total internal gains	338.9362	336.4540	324.1469	304.7135	285.1257	266.1097	254.0549	260.0835	270.2791	289.9062	312.3667	329.2275	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W		
East					5.7800	19.6403	0.6300	0.7000	0.7700	34.6934	(76)	
West					6.9500	19.6403	0.6300	0.7000	0.7700	41.7161	(80)	

Solar gains	76.4095	149.4733	246.1612	359.0114	439.9819	450.3998	428.7990	368.3320	286.2956	177.3626	95.2737	62.8355 (83)
Total gains	415.3457	485.9273	570.3080	663.7249	725.1076	716.5094	682.8538	628.4155	556.5748	467.2688	407.6404	392.0630 (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	57.6148	57.7602	57.9034	58.5855	58.7149	59.3249	59.3249	59.4393	59.0885	58.7149	58.4537	58.1831	
alpha	4.8410	4.8507	4.8602	4.9057	4.9143	4.9550	4.9550	4.9626	4.9392	4.9143	4.8969	4.8789	
util living area	0.9974	0.9941	0.9823	0.9385	0.8278	0.6473	0.4858	0.5453	0.8111	0.9698	0.9947	0.9981	(86)
MIT	19.7171	19.8860	20.1783	20.5500	20.8296	20.9623	20.9925	20.9872	20.8869	20.4982	20.0378	19.6889	(87)
Th 2	19.9157	19.9182	19.9205	19.9317	19.9338	19.9436	19.9436	19.9454	19.9398	19.9338	19.9296	19.9252	(88)
util rest of house	0.9966	0.9920	0.9761	0.9169	0.7731	0.5554	0.3732	0.4275	0.7319	0.9551	0.9926	0.9974	(89)
MIT 2	18.2140	18.4618	18.8861	19.4158	19.7738	19.9198	19.9410	19.9404	19.8526	19.3569	18.6922	18.1794	(90)
Living area fraction	18.6066	18.8338	19.2236	19.7120	20.0495	20.1921	20.2157	20.2138	20.1227	19.6550	19.0437	18.5737	(91)
MIT	18.6066	18.8338	19.2236	19.7120	20.0495	20.1921	20.2157	20.2138	20.1227	19.6550	19.0437	18.5737	(92)
Temperature adjustment	18.6066	18.8338	19.2236	19.7120	20.0495	20.1921	20.2157	20.2138	20.1227	19.6550	19.0437	18.5737	(93)
adjusted MIT	18.6066	18.8338	19.2236	19.7120	20.0495	20.1921	20.2157	20.2138	20.1227	19.6550	19.0437	18.5737	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	413.2599	480.6519	553.6000	605.0214	565.3740	414.1902	275.0367	288.0498	415.9140	443.8903	403.5466	390.5535	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1128.2819	1096.1125	998.4397	838.5555	646.1420	428.3065	276.9261	291.5423	463.1330	700.7393	928.4105	1122.4973	(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	531.9764	413.5895	330.9607	168.1445	60.0914	0.0000	0.0000	0.0000	0.0000	191.0957	377.9020	544.5662	(98)
Space heating												2618.3265	(98)
Space heating per m2												40.0172	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2803.3474 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	531.9764	413.5895	330.9607	168.1445	60.0914	0.0000	0.0000	0.0000	0.0000	191.0957	377.9020	544.5662	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	569.5679	442.8153	354.3476	180.0263	64.3377	0.0000	0.0000	0.0000	0.0000	204.5993	404.6060	583.0473	(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	185.8536	162.3480	168.9125	149.8169	145.0492	127.7512	122.3954	136.4422	137.9491	157.0825	167.6825	181.4891	(64)
Efficiency of water heater (217)m	87.5489	87.3046	86.7145	85.3423	83.0169	80.3000	80.3000	80.3000	80.3000	85.5457	87.0354	80.3000	(216)
Fuel for water heating, kWh/month	212.2854	185.9558	194.7916	175.5483	174.7224	159.0924	152.4227	169.9156	171.7921	183.6242	192.6600	207.0743	(219)
Water heating fuel used												2179.8848	(219)
Annual totals kWh/year													
Space heating fuel - main system												2803.3474	(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)												296.4711	(232)
Total delivered energy for all uses												5354.7033	(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	2803.3474	0.2160	605.5230 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2179.8848	0.2160	470.8551 (264)
Space and water heating			1076.3782 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	296.4711	0.5190	153.8685 (268)
Total CO2, kg/m2/year			1269.1716 (272)
Emissions per m2 for space and water heating			16.4508 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3517 (272b)
Emissions per m2 for pumps and fans			0.5949 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.4508 * 1.00) + 2.3517 + 0.5949, rounded to 2 d.p.			19.4000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	SAP 0624	Issued on Date	30/01/2019
Assessment Reference	Rev B	Prop Type Ref	
Property			

SAP Rating	85 B	DER	18.76	TER	19.40
Environmental	87 B	% DER<TER	3.29		
CO ₂ Emissions (t/year)	0.93	DFEE	54.24	TFEE	53.30
General Requirements Compliance	Fail	% DFEE<TFEE	-1.76		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
Client	C & L Management, C&L		

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.6400 (1b)	x 2.3300 (2b)	= 78.3812 (1b) - (3b)
First floor	31.7900 (1c)	x 2.4100 (2c)	= 76.6139 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 154.9951 (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								2 * 10 =	20.0000 (7a)			
Number of passive vents								0 * 10 =	0.0000 (7b)			
Number of flueless gas fires								0 * 40 =	0.0000 (7c)			
									Air changes per hour			
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =								20.0000 / (5) =	0.1290 (8)			
Pressure test								Yes				
Measured/design AP50								5.0000				
Infiltration rate								0.3790 (18)				
Number of sides sheltered								1 (19)				
Shelter factor								(20) = 1 - [0.075 x (19)] =		0.9250 (20)		
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =		0.3506 (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	0.4470	0.4383	0.4295	0.3857	0.3769	0.3331	0.3331	0.3243	0.3506	0.3769	0.3944	0.4120 (22b)
Effective ac	0.5999	0.5960	0.5922	0.5744	0.5710	0.5555	0.5555	0.5526	0.5615	0.5710	0.5778	0.5849 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.0200	1.6000	3.2320			(26)				
Windows (Uw = 1.40)			12.7300	1.3258	16.8769			(27)				
Ground Floor			33.6400	0.1200	4.0368			(28a)				
Brick and Block	79.2400	14.7500	64.4900	0.2300	14.8327			(29a)				
Pitched Roof	31.7900		31.7900	0.1000	3.1790			(30)				
Flat Roof	1.8500		1.8500	0.1800	0.3330			(30)				
Total net area of external elements Aum(A, m2)			146.5200					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.4904			(33)				
Party Wall 1			32.9500	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								15.1666 (36)				
Total fabric heat loss						(33) + (36) =		57.6570 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.6847	Feb 30.4863	Mar 30.2918	Apr 29.3781	May 29.2072	Jun 28.4114	Jul 28.4114	Aug 28.2641	Sep 28.7179	Oct 29.2072	Nov 29.5530	Dec 29.9145 (38)
Heat transfer coeff												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Average =	Sum(39)m / 12 =	88.3417	88.1433	87.9488	87.0351	86.8642	86.0684	86.0684	85.9211	86.3749	86.8642	87.2100	87.5715 (39)
													87.0343 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3502	1.3471	1.3442	1.3302	1.3276	1.3154	1.3154	1.3132	1.3201	1.3276	1.3329	1.3384	(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													2.1303 (42)
Average daily hot water use (litres/day)													84.7944 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	93.2738	89.8820	86.4902	83.0985	79.7067	76.3149	76.3149	79.7067	83.0985	86.4902	89.8820	93.2738	(44)
Energy content (annual)	138.3223	120.9776	124.8381	108.8368	104.4315	90.1165	83.5062	95.8245	96.9690	113.0080	123.3571	133.9578	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	29.3935	25.7077	26.5281	23.1278	22.1917	19.1498	17.7451	20.3627	20.6059	24.0142	26.2134	28.4660	(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	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.7874	14.9104	12.1260	9.1801	6.8623	5.7934	6.2600	8.1370	10.9214	13.8673	16.1851	17.2540	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.4055	188.3398	183.4654	173.0884	159.9893	147.6780	139.4533	137.5190	142.3934	152.7704	165.8695	178.1808	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	(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)	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	(71)
Water heating gains (Table 5)	39.5074	38.2556	35.6560	32.1220	29.8276	26.5969	23.8509	27.3692	28.6193	32.2772	36.4075	38.2608	(72)
Total internal gains	297.6546	296.4601	286.2017	269.3448	251.6334	235.0226	224.5185	227.9795	236.8885	253.8691	273.4164	288.6499	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
East					5.7800	19.6403	0.6300	0.7000			0.7700	34.6934
West					6.9500	19.6403	0.6300	0.7000			0.7700	41.7161 (80)

Solar gains	76.4095	149.4733	246.1612	359.0114	439.9819	450.3998	428.7990	368.3320	286.2956	177.3626	95.2737	62.8355 (83)
Total gains	374.0641	445.9334	532.3629	628.3562	691.6154	685.4224	653.3175	596.3115	523.1841	431.2317	368.6901	351.4854 (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	51.4338	51.5496	51.6636	52.2059	52.3087	52.7923	52.7923	52.8828	52.6050	52.3087	52.1013	51.8862	
alpha	4.4289	4.4366	4.4442	4.4804	4.4872	4.5195	4.5195	4.5255	4.5070	4.4872	4.4734	4.4591	
util living area	0.9983	0.9960	0.9879	0.9576	0.8751	0.7198	0.5579	0.6241	0.8674	0.9807	0.9966	0.9987	(86)
MIT	19.4740	19.6491	19.9612	20.3727	20.7183	20.9199	20.9802	20.9678	20.8020	20.3320	19.8265	19.4455	(87)
Th 2	19.8017	19.8041	19.8064	19.8173	19.8193	19.8288	19.8288	19.8305	19.8251	19.8193	19.8152	19.8109	(88)
util rest of house	0.9977	0.9945	0.9833	0.9408	0.8257	0.6192	0.4202	0.4838	0.7946	0.9703	0.9951	0.9983	(89)
MIT 2	18.4221	18.5983	18.9097	19.3183	19.6326	19.7931	19.8241	19.8218	19.7154	19.2876	18.7845	18.4007	(90)
Living area fraction	18.6968	18.8728	19.1844	19.5937	19.9162	20.0874	20.1260	20.1211	fLA = Living area / (4) =	19.9993	19.5604	19.0567	0.2612 (91)
MIT	18.6968	18.8728	19.1844	19.5937	19.9162	20.0874	20.1260	20.1211	19.9993	19.5604	19.0567	18.6736	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6968	18.8728	19.1844	19.5937	19.9162	20.0874	20.1260	20.1211	19.9993	19.5604	19.0567	18.6736	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.9969	0.9929	0.9801	0.9368	0.8304	0.6434	0.4566	0.5209	0.8074	0.9672	0.9938	0.9976 (94)
Useful gains	372.8937	442.7832	521.7837	588.6268	574.2958	441.0062	298.3239	310.5986	422.4406	417.0879	366.4054	350.6509 (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	1271.8404	1231.6057	1115.5730	930.7238	713.6941	472.2941	303.4792	319.7223	509.5476	778.3364	1042.7395	1267.4718 (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	668.8164	530.0887	441.7792	246.3098	103.7124	0.0000	0.0000	0.0000	0.0000	268.7689	486.9605	682.1148 (98)
Space heating												3428.5506 (98)
Space heating per m2												(98) / (4) = 52.4003 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	809.0431	636.9063	653.0000	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8517	0.9120	0.8819	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	689.0232	580.8715	575.8817	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	880.4544	841.3515	775.9996	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	137.8305	193.7971	148.8877	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												480.5153 (104)
Cooled fraction												FC = cooled area / (4) = 1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	34.4576	48.4493	37.2219	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												120.1288 (107)
Space cooling per m2												1.8360 (108)
Energy for space heating												52.4003 (99)
Energy for space cooling												1.8360 (108)
Total												54.2363 (109)
Dwelling Fabric Energy Efficiency (DFEE)												54.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.6400 (1b)	x 2.3300 (2b)	= 78.3812 (1b) - (3b)
First floor	31.7900 (1c)	x 2.4100 (2c)	= 76.6139 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 154.9951 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (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) =					20.0000 / (5) = 0.1290 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3790 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3506 (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	0.4470	0.4383	0.4295	0.3857	0.3769	0.3331	0.3331	0.3243	0.3506	0.3769	0.3944	0.4120 (22b)
Effective ac	0.5999	0.5960	0.5922	0.5744	0.5710	0.5555	0.5555	0.5526	0.5615	0.5710	0.5778	0.5849 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0200	1.0000	2.0200		(26)
TER Opening Type (Uw = 1.40)			12.7300	1.3258	16.8769		(27)
Ground Floor			33.6400	0.1300	4.3732		(28a)
Brick and Block	79.2400	14.7500	64.4900	0.1800	11.6082		(29a)
Pitched Roof	31.7900		31.7900	0.1300	4.1327		(30)
Flat Roof	1.8500		1.8500	0.1300	0.2405		(31)
Total net area of external elements Aum(A, m ²)			146.5200				(32)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.2515	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9280 (36)
Total fabric heat loss						(33) + (36) =	48.1795 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	30.6847	30.4863	30.2918	29.3781	29.2072	28.4114	28.4114	28.2641	28.7179	29.2072	29.5530	29.9145 (38)
Heat transfer coeff	78.8642	78.6658	78.4713	77.5576	77.3867	76.5909	76.5909	76.4436	76.8974	77.3867	77.7325	78.0940 (39)
Average = Sum(39)m / 12 =												77.5568 (39)
HLP	1.2053	1.2023	1.1993	1.1854	1.1827	1.1706	1.1706	1.1683	1.1753	1.1827	1.1880	1.1936 (40)
HLP (average)												1.1853 (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												2.1303 (42)
Average daily hot water use (litres/day)												84.7944 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	93.2738	89.8820	86.4902	83.0985	79.7067	76.3149	76.3149	79.7067	83.0985	86.4902	89.8820	93.2738 (44)
Energy content (annual)	138.3223	120.9776	124.8381	108.8368	104.4315	90.1165	83.5062	95.8245	96.9690	113.0080	123.3571	133.9578 (45)
Distribution loss (46)m = 0.15 x (45)m												1334.1455 (45)
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	29.3935	25.7077	26.5281	23.1278	22.1917	19.1498	17.7451	20.3627	20.6059	24.0142	26.2134	28.4660 (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	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144	106.5144 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.7874	14.9104	12.1260	9.1801	6.8623	5.7934	6.2600	8.1370	10.9214	13.8673	16.1851	17.2540 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.4055	188.3398	183.4654	173.0884	159.9893	147.6780	139.4533	137.5190	142.3934	152.7704	165.8695	178.1808 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514	33.6514 (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)	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116 (71)
Water heating gains (Table 5)	39.5074	38.2556	35.6560	32.1220	29.8276	26.5969	23.8509	27.3692	28.6193	32.2772	36.4075	38.2608 (72)
Total internal gains	297.6546	296.4601	286.2017	269.3448	251.6334	235.0226	224.5185	227.9795	236.8885	253.8691	273.4164	288.6499 (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		
East	5.7800			19.6403		0.6300		0.7000		0.7700		34.6934 (76)
West	6.9500			19.6403		0.6300		0.7000		0.7700		41.7161 (80)

Solar gains	76.4095	149.4733	246.1612	359.0114	439.9819	450.3998	428.7990	368.3320	286.2956	177.3626	95.2737	62.8355 (83)
Total gains	374.0641	445.9334	532.3629	628.3562	691.6154	685.4224	653.3175	596.3115	523.1841	431.2317	368.6901	351.4854 (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	57.6148	57.7602	57.9034	58.5855	58.7149	59.3249	59.3249	59.4393	59.0885	58.7149	58.4537	58.1831
alpha	4.8410	4.8507	4.8602	4.9057	4.9143	4.9550	4.9550	4.9626	4.9392	4.9143	4.8969	4.8789
util living area	0.9984	0.9959	0.9866	0.9490	0.8470	0.6704	0.5062	0.5713	0.8374	0.9778	0.9966	0.9988 (86)
MIT	19.6591	19.8307	20.1285	20.5121	20.8090	20.9561	20.9910	20.9843	20.8679	20.4533	19.9836	19.6316 (87)
Th 2	19.9157	19.9182	19.9205	19.9317	19.9338	19.9436	19.9436	19.9454	19.9398	19.9338	19.9296	19.9252 (88)
util rest of house	0.9978	0.9945	0.9817	0.9303	0.7951	0.5775	0.3897	0.4495	0.7625	0.9665	0.9952	0.9984 (89)
MIT 2	18.6961	18.8689	19.1659	19.5452	19.8093	19.9244	19.9415	19.9412	19.8682	19.4979	19.0310	18.6761 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.9476	19.1201	19.4173	19.7978	20.0704	20.1939	20.2156	20.2136	20.1293	19.7474	19.2798	18.9257 (92)
Temperature adjustment												
adjusted MIT	18.9476	19.1201	19.4173	19.7978	20.0704	20.1939	20.2156	20.2136	20.1293	19.7474	19.2798	18.9257 (93)

8. Space heating requirement												

Utilisation	0.9971	0.9930	0.9788	0.9275	0.8026	0.6008	0.4204	0.4816	0.7777	0.9639	0.9940	0.9979 (94)
Useful gains	372.9853	442.8220	521.0512	582.7961	555.0843	411.7688	274.6395	287.1923	406.9040	415.6485	366.4597	350.7332 (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	1155.1747	1118.6379	1013.6367	845.2042	647.7600	428.4405	276.9222	291.5272	463.6369	707.8884	946.7666	1149.9860 (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	581.9490	454.1483	366.4836	188.9338	68.9508	0.0000	0.0000	0.0000	0.0000	217.4265	417.8210	594.6441 (98)
Space heating												2890.3570 (98)
Space heating per m2												(98) / (4) = 44.1748 (99)

8c. Space cooling requirement												

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	719.9546	566.7728	580.9710	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9037	0.9491	0.9273	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	650.6227	537.9065	538.7342	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	880.4544	841.3515	775.9996	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	165.4788	225.7631	176.5255	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												567.7674 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction	FC = cooled area / (4) =										1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.3697	56.4408	44.1314	0.0000	0.0000	0.0000 (107)
Space cooling											141.9418 (107)
Space cooling per m2											2.1694 (108)
Energy for space heating											44.1748 (99)
Energy for space cooling											2.1694 (108)
Total											46.3442 (109)
Target Fabric Energy Efficiency (TFEE)											53.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	SAP 0624	Issued on Date	30/01/2019
Assessment Reference	Rev B	Prop Type Ref	
Property			

SAP Rating	85 B	DER	18.76	TER	19.40
Environmental	87 B	% DER<TER	3.29		
CO ₂ Emissions (t/year)	0.93	DFEE	54.24	TFEE	53.30
General Requirements Compliance	Fail	% DFEE<TFEE	-1.76		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
Client	C & L Management, C&L		

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.6400 (1b)	x 2.3300 (2b)	= 78.3812 (1b) - (3b)
First floor	31.7900 (1c)	x 2.4100 (2c)	= 76.6139 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 154.9951 (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)	
												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										30.0000 / (5) =		0.1936 (8)	
Pressure test												Yes	
Measured/design AP50												5.0000	
Infiltration rate												0.4436 (18)	
Number of sides sheltered												1 (19)	
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.9250 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.4103 (21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000	(22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750	(22a)
Adj infilt rate	0.5231	0.4821	0.4718	0.4411	0.4411	0.4103	0.4103	0.4000	0.4103	0.4616	0.4513	0.4821	(22b)
Effective ac	0.6368	0.6162	0.6113	0.5973	0.5973	0.5842	0.5842	0.5800	0.5842	0.6065	0.6018	0.6162	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Front Door			2.0200	1.6000	3.2320			(26)				
Windows (Uw = 1.40)			12.7300	1.3258	16.8769			(27)				
Ground Floor			33.6400	0.1200	4.0368			(28a)				
Brick and Block	79.2400	14.7500	64.4900	0.2300	14.8327			(29a)				
Pitched Roof	31.7900		31.7900	0.1000	3.1790			(30)				
Flat Roof	1.8500		1.8500	0.1800	0.3330			(30)				
Total net area of external elements Aum(A, m2)			146.5200					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	42.4904			(33)				
Party Wall 1			32.9500	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								15.1666 (36)				
Total fabric heat loss						(33) + (36) =	57.6570	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 32.5726	Feb 31.5179	Mar 31.2676	Apr 30.5492	May 30.5492	Jun 29.8793	Jul 29.8793	Aug 29.6667	Sep 29.8793	Oct 31.0228	Nov 30.7833	Dec 31.5179 (38)
Heat transfer coeff												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Average = Sum(39)m / 12 =	90.2296	89.1749	88.9246	88.2062	88.2062	87.5362	87.5362	87.3237	87.5362	88.6798	88.4403	89.1749 (39)
												88.4141 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3790	1.3629	1.3591	1.3481	1.3481	1.3379	1.3379	1.3346	1.3379	1.3553	1.3517	1.3629 (40)
Days in month												1.3513 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1303 (42)
Average daily hot water use (litres/day)												84.7944 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	93.2738	89.8820	86.4902	83.0985	79.7067	76.3149	76.3149	79.7067	83.0985	86.4902	89.8820	93.2738 (44)
Distribution loss (46)m = 0.15 x (45)m	138.3223	120.9776	124.8381	108.8368	104.4315	90.1165	83.5062	95.8245	96.9690	113.0080	123.3571	133.9578 (45)
Total = Sum(45)m =	20.7484	18.1466	18.7257	16.3255	15.6647	13.5175	12.5259	14.3737	14.5453	16.9512	18.5036	20.0937 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	189.2812	167.0050	175.7970	158.1519	155.3904	139.4315	134.4651	146.7834	146.2841	163.9669	172.6722	184.9167 (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)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	189.2812	167.0050	175.7970	158.1519	155.3904	139.4315	134.4651	146.7834	146.2841	163.9669	172.6722	184.9167 (64)
Total per year (kWh/year) = Sum(64)m =												1934.1455 (64)
RHI water heating demand												1934 (64)
Heat gains from water heating, kWh/month	58.7319	51.7319	54.2484	48.5170	47.4632	42.2925	40.5055	44.6014	44.5710	50.3149	53.3450	57.2807 (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	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.9685	37.2761	30.3150	22.9504	17.1557	14.4835	15.6500	20.3424	27.3036	34.6682	40.4629	43.1350 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	278.2171	281.1041	273.8289	258.3409	238.7900	220.4149	208.1392	205.2522	212.5274	228.0155	247.5664	265.9414 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120 (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)	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116 (71)
Water heating gains (Table 5)	78.9407	76.9820	72.9145	67.3847	63.7946	58.7396	54.4429	59.9481	61.9041	67.6275	74.0903	76.9902 (72)
Total internal gains	494.6442	490.8800	472.5762	444.1938	415.2581	389.1558	373.7499	381.0605	397.2529	425.8290	457.6373	481.5844 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East					5.7800	25.9136	0.6300	0.7000			0.7700			45.7750 (76)
West					6.9500	25.9136	0.6300	0.7000			0.7700			55.0409 (80)
Solar gains	100.8158	168.4041	274.8934	406.1423	473.7944	524.2442	487.4030	428.6904	338.2983	211.1224	124.5447	79.1637 (83)		
Total gains	595.4600	659.2841	747.4696	850.3361	889.0525	913.4000	861.1529	809.7509	735.5512	636.9513	582.1820	560.7480 (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	50.3576	50.9533	51.0966	51.5128	51.5128	51.9071	51.9071	52.0334	51.9071	51.2377	51.3765	50.9533
alpha	4.3572	4.3969	4.4064	4.4342	4.4342	4.4605	4.4605	4.4689	4.4605	4.4158	4.4251	4.3969
util living area	0.9863	0.9785	0.9517	0.8773	0.7349	0.5207	0.3731	0.3950	0.6600	0.9005	0.9722	0.9887 (86)
MIT	19.8697	20.0061	20.2991	20.6404	20.8787	20.9797	20.9964	20.9955	20.9448	20.6647	20.2408	19.8561 (87)
Th 2	19.7795	19.7919	19.7948	19.8033	19.8033	19.8113	19.8113	19.8138	19.8113	19.7977	19.8006	19.7919 (88)
util rest of house	0.9815	0.9712	0.9354	0.8384	0.6599	0.4175	0.2548	0.2705	0.5512	0.8563	0.9608	0.9847 (89)
MIT 2	18.7970	18.9403	19.2252	19.5441	19.7358	19.8046	19.8108	19.8132	19.7895	19.5711	19.1791	18.7938 (90)
Living area fraction									fLA = Living area / (4) =			0.2612 (91)
MIT	19.0772	19.2187	19.5057	19.8305	20.0344	20.1115	20.1205	20.1220	20.0913	19.8568	19.4564	19.0713 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0772	19.2187	19.5057	19.8305	20.0344	20.1115	20.1205	20.1220	20.0913	19.8568	19.4564	19.0713 (93)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9779	0.9668	0.9306	0.8394	0.6755	0.4443	0.2859	0.3033	0.5786	0.8589	0.9566	0.9815	(94)
Useful gains	582.3205	637.4119	695.5839	713.7439	600.5750	405.8226	246.2224	245.5840	425.5722	547.0904	556.9222	550.3638	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W													
	1234.0900	1205.5242	1085.3891	902.3902	655.7569	412.4285	246.8925	246.4270	445.6693	714.4719	977.8301	1210.2159	(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													
	484.9165	381.7715	290.0151	135.8253	41.0553	0.0000	0.0000	0.0000	0.0000	124.5318	303.0537	490.9299	(98)
Space heating													
RHI space heating demand												2252.0991	(98)
												2252	(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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.6400 (1b)	x 2.3300 (2b)	= 78.3812 (1b) - (3b)
First floor	31.7900 (1c)	x 2.4100 (2c)	= 76.6139 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 154.9951 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1936 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4436 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.4103 (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	0.5231	0.5129	0.5026	0.4513	0.4411	0.3898	0.3898	0.3795	0.4103	0.4411	0.4616	0.4821 (22b)
Effective ac	0.6368	0.6315	0.6263	0.6018	0.5973	0.5760	0.5760	0.5720	0.5842	0.5973	0.6065	0.6162 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.0200	1.6000	3.2320		(26)
Windows (Uw = 1.40)			12.7300	1.3258	16.8769		(27)
Ground Floor			33.6400	0.1200	4.0368		(28a)
Brick and Block	79.2400	14.7500	64.4900	0.2300	14.8327		(29a)
Pitched Roof	31.7900		31.7900	0.1000	3.1790		(30)
Flat Roof	1.8500		1.8500	0.1800	0.3330		(30)
Total net area of external elements Aum(A, m ²)			146.5200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.4904		(33)
Party Wall 1			32.9500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.1666 (36)
Total fabric heat loss						(33) + (36) =	57.6570 (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	32.5726	32.3009	32.0345	30.7833	30.5492	29.4595	29.4595	29.2577	29.8793	30.5492	31.0228	31.5179 (38)
Heat transfer coeff	90.2296	89.9578	89.6915	88.4403	88.2062	87.1165	87.1165	86.9147	87.5362	88.2062	88.6798	89.1749 (39)
Average = Sum(39)m / 12 =												88.4392 (39)
HLP	1.3790	1.3749	1.3708	1.3517	1.3481	1.3314	1.3314	1.3284	1.3379	1.3481	1.3553	1.3629 (40)
HLP (average)												1.3517 (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												2.1303 (42)
Average daily hot water use (litres/day)												84.7944 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	93.2738	89.8820	86.4902	83.0985	79.7067	76.3149	76.3149	79.7067	83.0985	86.4902	89.8820	93.2738 (44)
Energy conte	138.3223	120.9776	124.8381	108.8368	104.4315	90.1165	83.5062	95.8245	96.9690	113.0080	123.3571	133.9578 (45)
Energy content (annual)												Total = Sum(45)m = 1334.1455 (45)
Distribution loss (46)m = 0.15 x (45)m												
20.7484	18.1466	18.7257	16.3255	15.6647	13.5175	12.5259	14.3737	14.5453	16.9512	18.5036	20.0937 (46)	
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589 (61)
Solar input	189.2812	167.0050	175.7970	158.1519	155.3904	139.4315	134.4651	146.7834	146.2841	163.9669	172.6722	184.9167 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	189.2812	167.0050	175.7970	158.1519	155.3904	139.4315	134.4651	146.7834	146.2841	163.9669	172.6722	184.9167 (64)
	58.7319	51.7319	54.2484	48.5170	47.4632	42.2925	40.5055	44.6014	44.5710	50.3149	53.3450	57.2807 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.9685	37.2761	30.3150	22.9504	17.1557	14.4835	15.6500	20.3424	27.3036	34.6682	40.4629	43.1350	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	278.2171	281.1041	273.8289	258.3409	238.7900	220.4149	208.1392	205.2522	212.5274	228.0155	247.5664	265.9414	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	(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)	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	(71)
Water heating gains (Table 5)	78.9407	76.9820	72.9145	67.3847	63.7946	58.7396	54.4429	59.9481	61.9041	67.6275	74.0903	76.9902	(72)
Total internal gains	494.6442	490.8800	472.5762	444.1938	415.2581	389.1558	373.7499	381.0605	397.2529	425.8290	457.6373	481.5844	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East					5.7800	19.6403	0.6300	0.7000			0.7700			34.6934
West					6.9500	19.6403	0.6300	0.7000			0.7700			41.7161 (76)

Solar gains	76.4095	149.4733	246.1612	359.0114	439.9819	450.3998	428.7990	368.3320	286.2956	177.3626	95.2737			62.8355 (83)
Total gains	571.0537	640.3533	718.7373	803.2052	855.2400	839.5556	802.5489	749.3925	683.5485	603.1916	552.9110			544.4199 (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	50.3576	50.5098	50.6598	51.3765	51.5128	52.1572	52.1572	52.2783	51.9071	51.5128	51.2377	50.9533	
alpha	4.3572	4.3673	4.3773	4.4251	4.4342	4.4771	4.4771	4.4852	4.4605	4.4342	4.4158	4.3969	
util living area	0.9909	0.9840	0.9652	0.9112	0.7986	0.6242	0.4683	0.5182	0.7631	0.9405	0.9838	0.9925	(86)
MIT	19.7034	19.8718	20.1627	20.5317	20.8097	20.9534	20.9896	20.9840	20.8856	20.5151	20.0471	19.6766	(87)
Th 2	19.7795	19.7827	19.7858	19.8006	19.8033	19.8163	19.8163	19.8187	19.8113	19.8033	19.7977	19.7919	(88)
util rest of house	0.9879	0.9788	0.9535	0.8816	0.7363	0.5248	0.3471	0.3927	0.6719	0.9140	0.9775	0.9901	(89)
MIT 2	18.6323	18.8008	19.0872	19.4463	19.6855	19.7971	19.8140	19.8147	19.7549	19.4425	18.9876	18.6155	(90)
Living area fraction	18.9121	19.0805	19.3681	19.7298	19.9791	20.0991	20.1211	20.1201	20.0502	19.7227	19.2643	18.8926	(92)
Temperature adjustment	18.9121	19.0805	19.3681	19.7298	19.9791	20.0991	20.1211	20.1201	20.0502	19.7227	19.2643	18.8926	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9850	0.9748	0.9485	0.8796	0.7464	0.5498	0.3790	0.4258	0.6922	0.9118	0.9738	0.9876	(94)
Ext temp.	562.5075	624.2336	681.7338	706.4959	638.3436	461.5667	304.1743	319.0550	473.1743	550.0046	538.4352	537.6666	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1318.4399	1275.6509	1154.1592	957.7886	730.2715	479.0625	306.7433	323.3345	520.8611	804.6763	1078.7277	1310.2116	(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 per m2	562.4137	437.7524	351.4845	180.9308	68.3943	0.0000	0.0000	0.0000	0.0000	189.4758	389.0106	574.7735	(98)
												2754.2356	(98)
												42.0944	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 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 %)													89.8000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3067.0775 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	562.4137	437.7524	351.4845	180.9308	68.3943	0.0000	0.0000	0.0000	0.0000	189.4758	389.0106	574.7735	(98)
Space heating efficiency (main heating system 1)	89.8000	89.8000	89.8000	89.8000	89.8000	0.0000	0.0000	0.0000	0.0000	89.8000	89.8000	89.8000	(210)
Space heating fuel (main heating system)	626.2959	487.4748	391.4081	201.4820	76.1629	0.0000	0.0000	0.0000	0.0000	210.9976	433.1967	640.0595	(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	189.2812	167.0050	175.7970	158.1519	155.3904	139.4315	134.4651	146.7834	146.2841	163.9669	172.6722	184.9167	(64)
Efficiency of water heater (217)m	87.0231	86.7637	86.1597	84.7885	82.5372	79.7000	79.7000	79.7000	79.7000	84.8138	86.4328	87.1129	(216)
Fuel for water heating, kWh/month	217.5070	192.4826	204.0362	186.5252	188.2672	174.9455	168.7140	184.1699	183.5434	193.3257	199.7763	212.2725	(219)
Water heating fuel used												2305.5655	(219)
Annual totals kWh/year													
Space heating fuel - main system												3067.0775	(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)												296.4711	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.75 * 853 * 1.00) =										-511.8180		-511.8180	(233)
Total delivered energy for all uses												5232.2961	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3067.0775	3.4800	106.7343 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2305.5655	3.4800	80.2337 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	296.4711	13.1900	39.1045 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-511.8180	13.1900	-67.5088 (252)
Total energy cost			288.4562 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.0971 (257)
SAP value		84.6956
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	3067.0775	0.2160	662.4887 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2305.5655	0.2160	498.0021 (264)
Space and water heating			1160.4909 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	296.4711	0.5190	153.8685 (268)
Energy saving/generation technologies			
PV Unit	-511.8180	0.5190	-265.6335 (269)
Total kg/year			1087.6508 (272)
CO2 emissions per m2			16.6200 (273)
EI value			86.8020
EI rating			87 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.8980 = 3.875$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.8980 = 0.2405$, stars = 4
Water heating energy efficiency	$3.48 / 0.8370 = 4.158$, stars = 4
Water heating environmental impact	$0.216 / 0.8370 = 0.2581$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.6400 (1b)	x 2.3300 (2b)	= 78.3812 (1b) - (3b)
First floor	31.7900 (1c)	x 2.4100 (2c)	= 76.6139 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 154.9951 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1936 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4436 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4103 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.5231	0.4821	0.4718	0.4411	0.4411	0.4103	0.4103	0.4000	0.4103	0.4616	0.4513	0.4821 (22b)
Effective ac	0.6368	0.6162	0.6113	0.5973	0.5973	0.5842	0.5842	0.5800	0.5842	0.6065	0.6018	0.6162 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.0200	1.6000	3.2320		(26)
Windows (Uw = 1.40)			12.7300	1.3258	16.8769		(27)
Ground Floor			33.6400	0.1200	4.0368		(28a)
Brick and Block	79.2400	14.7500	64.4900	0.2300	14.8327		(29a)
Pitched Roof	31.7900		31.7900	0.1000	3.1790		(30)
Flat Roof	1.8500		1.8500	0.1800	0.3330		(30)
Total net area of external elements Aum(A, m ²)			146.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.4904		(33)
Party Wall 1			32.9500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.1666 (36)
Total fabric heat loss						(33) + (36) =	57.6570 (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	32.5726	31.5179	31.2676	30.5492	30.5492	29.8793	29.8793	29.6667	29.8793	31.0228	30.7833	31.5179 (38)
Heat transfer coeff	90.2296	89.1749	88.9246	88.2062	88.2062	87.5362	87.5362	87.3237	87.5362	88.6798	88.4403	89.1749 (39)
Average = Sum(39)m / 12 =												88.4141 (39)
HLP	1.3790	1.3629	1.3591	1.3481	1.3481	1.3379	1.3379	1.3346	1.3379	1.3553	1.3517	1.3629 (40)
HLP (average)												1.3513 (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												2.1303 (42)
Average daily hot water use (litres/day)												84.7944 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	93.2738	89.8820	86.4902	83.0985	79.7067	76.3149	76.3149	79.7067	83.0985	86.4902	89.8820	93.2738 (44)
Energy conte	138.3223	120.9776	124.8381	108.8368	104.4315	90.1165	83.5062	95.8245	96.9690	113.0080	123.3571	133.9578 (45)
Energy content (annual)												
Distribution loss	Total = Sum(45)m = 1334.1455 (45)											
	(46)m = 0.15 x (45)m											
	20.7484	18.1466	18.7257	16.3255	15.6647	13.5175	12.5259	14.3737	14.5453	16.9512	18.5036	20.0937 (46)
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Solar input	189.2812	167.0050	175.7970	158.1519	155.3904	139.4315	134.4651	146.7834	146.2841	163.9669	172.6722	184.9167 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	189.2812	167.0050	175.7970	158.1519	155.3904	139.4315	134.4651	146.7834	146.2841	163.9669	172.6722	184.9167 (64)
	58.7319	51.7319	54.2484	48.5170	47.4632	42.2925	40.5055	44.6014	44.5710	50.3149	53.3450	57.2807 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.9685	37.2761	30.3150	22.9504	17.1557	14.4835	15.6500	20.3424	27.3036	34.6682	40.4629	43.1350	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	278.2171	281.1041	273.8289	258.3409	238.7900	220.4149	208.1392	205.2522	212.5274	228.0155	247.5664	265.9414	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	(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)	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	(71)
Water heating gains (Table 5)	78.9407	76.9820	72.9145	67.3847	63.7946	58.7396	54.4429	59.9481	61.9041	67.6275	74.0903	76.9902	(72)
Total internal gains	494.6442	490.8800	472.5762	444.1938	415.2581	389.1558	373.7499	381.0605	397.2529	425.8290	457.6373	481.5844	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East					5.7800	25.9136	0.6300	0.7000			0.7700			45.7750
West					6.9500	25.9136	0.6300	0.7000			0.7700			55.0409 (76)
Solar gains	100.8158	168.4041	274.8934	406.1423	473.7944	524.2442	487.4030	428.6904	338.2983	211.1224	124.5447	79.1637 (83)		
Total gains	595.4600	659.2841	747.4696	850.3361	889.0525	913.4000	861.1529	809.7509	735.5512	636.9513	582.1820	560.7480 (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	50.3576	50.9533	51.0966	51.5128	51.5128	51.9071	51.9071	52.0334	51.9071	51.2377	51.3765	50.9533	
alpha	4.3572	4.3969	4.4064	4.4342	4.4342	4.4605	4.4605	4.4689	4.4605	4.4158	4.4251	4.3969	
util living area	0.9863	0.9785	0.9517	0.8773	0.7349	0.5207	0.3731	0.3950	0.6600	0.9005	0.9722	0.9887	(86)
MIT	19.8697	20.0061	20.2991	20.6404	20.8787	20.9797	20.9964	20.9955	20.9448	20.6647	20.2408	19.8561	(87)
Th 2	19.7795	19.7919	19.7948	19.8033	19.8033	19.8113	19.8113	19.8138	19.8113	19.7977	19.8006	19.7919	(88)
util rest of house	0.9815	0.9712	0.9354	0.8384	0.6599	0.4175	0.2548	0.2705	0.5512	0.8563	0.9608	0.9847	(89)
MIT 2	18.7970	18.9403	19.2252	19.5441	19.7358	19.8046	19.8108	19.8132	19.7895	19.5711	19.1791	18.7938	(90)
Living area fraction	19.0772	19.2187	19.5057	19.8305	20.0344	20.1115	20.1205	20.1220	20.0913	19.8568	19.4564	19.0713	(92)
Temperature adjustment	19.0772	19.2187	19.5057	19.8305	20.0344	20.1115	20.1205	20.1220	20.0913	19.8568	19.4564	19.0713	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	582.3205	637.4119	695.5839	713.7439	600.5750	405.8226	246.2224	245.5840	425.5722	547.0904	556.9222	550.3638	(95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000	(96)
Heat loss rate W	1234.0900	1205.5242	1085.3891	902.3902	655.7569	412.4285	246.8925	246.4270	445.6693	714.4719	977.8301	1210.2159	(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	484.9165	381.7715	290.0151	135.8253	41.0553	0.0000	0.0000	0.0000	0.0000	124.5318	303.0537	490.9299	(98)
Space heating												2252.0991	(98)
Space heating per m2												34.4200	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 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 %)													89.8000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2507.9054 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	484.9165	381.7715	290.0151	135.8253	41.0553	0.0000	0.0000	0.0000	0.0000	124.5318	303.0537	490.9299	(98)
Space heating efficiency (main heating system 1)	89.8000	89.8000	89.8000	89.8000	89.8000	0.0000	0.0000	0.0000	0.0000	89.8000	89.8000	89.8000	(210)
Space heating fuel (main heating system)	539.9961	425.1353	322.9567	151.2531	45.7186	0.0000	0.0000	0.0000	0.0000	138.6768	337.4763	546.6926	(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	189.2812	167.0050	175.7970	158.1519	155.3904	139.4315	134.4651	146.7834	146.2841	163.9669	172.6722	184.9167	(64)
Efficiency of water heater (217)m	86.7148	86.4654	85.7013	84.0686	81.6185	79.7000	79.7000	79.7000	79.7000	83.7668	85.8511	86.7907	(216)
Fuel for water heating, kWh/month	218.2801	193.1466	205.1276	188.1224	190.3863	174.9455	168.7140	184.1699	183.5434	195.7421	201.1298	213.0605	(219)
Water heating fuel used												2316.3682	(219)
Annual totals kWh/year													
Space heating fuel - main system												2507.9054	(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)												296.4711	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.75 * 989 * 1.00) =										-593.1804		-593.1804	(233)
Total delivered energy for all uses												4602.5643	(238)

10a. Fuel costs - using BEDF prices (436)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2507.9054	3.9200	98.3099 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	2316.3682	3.9200	90.8016 (247)
Pumps and fans for heating	75.0000	16.9600	12.7200 (249)
Energy for lighting	296.4711	16.9600	50.2815 (250)
Additional standing charges			88.0000 (251)
Energy saving/generation technologies			
PV Unit	-593.1804	16.9600	-100.6034 (252)
Total energy cost			239.5096 (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	2507.9054	0.2160	541.7076 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2316.3682	0.2160	500.3355 (264)
Space and water heating			1042.0431 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	296.4711	0.5190	153.8685 (268)
Energy saving/generation technologies			
PV Unit	-593.1804	0.5190	-307.8606 (269)
Total kg/year			926.9760 (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	2507.9054	1.2200	3059.6446 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2316.3682	1.2200	2825.9691 (264)
Space and water heating			5885.6137 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	296.4711	3.0700	910.1662 (268)
Energy saving/generation technologies			
PV Unit	-593.1804	3.0700	-1821.0637 (269)
Primary energy kWh/year			5204.9662 (272)
Primary energy kWh/m2/year			79.5501 (273)

SAP 2012 EPC IMPROVEMENTS

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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	Already installed
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.5	-£ 32	-198 kg (21.4%)

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
Solar water heating	£32	3.03 kg/m²	B 86	B 89
Total Savings	£32	3.03 kg/m²		
Potential energy efficiency rating:			B 86	
Potential environmental impact rating:				B 89

Fuel prices for cost data on this page from database revision number 436 TEST (13 Dec 2018)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£63	£71	-£8
Mains gas	£277	£236	£41
Space heating	£199	£199	£0
Water heating	£91	£59	£32
Lighting	£50	£50	£0
Generated (PV)	-£101	-£101	£0
Total cost of fuels	£239	£206	£33
Total cost of uses	£239	£207	£32
Delivered energy	70 kWh/m²	55 kWh/m²	15 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.7 tonnes	0.2 tonnes
CO2 emissions per m²	14 kg/m²	11 kg/m²	3 kg/m²
Primary energy	80 kWh/m²	63 kWh/m²	17 kWh/m²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.6400 (1b)	x 2.3300 (2b)	= 78.3812 (1b) - (3b)
First floor	31.7900 (1c)	x 2.4100 (2c)	= 76.6139 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 154.9951 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1936 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4436 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.4103 (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	0.5231	0.5129	0.5026	0.4513	0.4411	0.3898	0.3898	0.3795	0.4103	0.4411	0.4616	0.4821 (22b)
Effective ac	0.6368	0.6315	0.6263	0.6018	0.5973	0.5760	0.5760	0.5720	0.5842	0.5973	0.6065	0.6162 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.0200	1.6000	3.2320		(26)
Windows (Uw = 1.40)			12.7300	1.3258	16.8769		(27)
Ground Floor			33.6400	0.1200	4.0368		(28a)
Brick and Block	79.2400	14.7500	64.4900	0.2300	14.8327		(29a)
Pitched Roof	31.7900		31.7900	0.1000	3.1790		(30)
Flat Roof	1.8500		1.8500	0.1800	0.3330		(30)
Total net area of external elements Aum(A, m ²)			146.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.4904		(33)
Party Wall 1			32.9500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.1666 (36)
Total fabric heat loss						(33) + (36) =	57.6570 (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	32.5726	32.3009	32.0345	30.7833	30.5492	29.4595	29.4595	29.2577	29.8793	30.5492	31.0228	31.5179 (38)
Heat transfer coeff	90.2296	89.9578	89.6915	88.4403	88.2062	87.1165	87.1165	86.9147	87.5362	88.2062	88.6798	89.1749 (39)
Average = Sum(39)m / 12 =												88.4392 (39)
HLP	1.3790	1.3749	1.3708	1.3517	1.3481	1.3314	1.3314	1.3284	1.3379	1.3481	1.3553	1.3629 (40)
HLP (average)												1.3517 (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												2.1303 (42)
Average daily hot water use (litres/day)												84.7944 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	93.2738	89.8820	86.4902	83.0985	79.7067	76.3149	76.3149	79.7067	83.0985	86.4902	89.8820	93.2738 (44)
Energy conte	138.3223	120.9776	124.8381	108.8368	104.4315	90.1165	83.5062	95.8245	96.9690	113.0080	123.3571	133.9578 (45)
Energy content (annual)										Total = Sum(45)m =		1334.1455 (45)
Distribution loss (46)m = 0.15 x (45)m												
20.7484	18.1466	18.7257	16.3255	15.6647	13.5175	12.5259	14.3737	14.5453	16.9512	18.5036	20.0937 (46)	
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589 (57)
Total heat required for water heating calculated for each month	189.2812	167.0050	175.7970	158.1519	155.3904	139.4315	134.4651	146.7834	146.2841	163.9669	172.6722	184.9167 (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												1.3594 (H8)
Utilisation factor												0.5208 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												84.7944 (H14)
Volume ratio Veff/V												0.8845 (H15)
Solar storage volume factor												0.9755 (H16)
Solar input												-810.1228 (H17)
Solar input	-23.4919	-39.2013	-66.7643	-89.4773	-110.5417	-108.6801	-107.2439	-93.6995	-73.3855	-50.1137	-27.8648	-19.6587 (63)
Solar input (sum of months) = Sum (63)m =												-810.1228 (63)
Output from w/h	165.7893	127.8037	109.0326	68.6746	44.8487	30.7514	27.2212	53.0839	72.8986	113.8533	144.8073	165.2580 (64)
Total per year (kWh/year) = Sum (64)m =												1124.0226 (64)
Heat gains from water heating, kWh/month	58.7319	51.7319	54.2484	48.5170	47.4632	42.2925	40.5055	44.6014	44.5710	50.3149	53.3450	57.2807 (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	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.9685	37.2761	30.3150	22.9504	17.1557	14.4835	15.6500	20.3424	27.3036	34.6682	40.4629	43.1350	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	278.2171	281.1041	273.8289	258.3409	238.7900	220.4149	208.1392	205.2522	212.5274	228.0155	247.5664	265.9414	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	(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)	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	(71)
Water heating gains (Table 5)	78.9407	76.9820	72.9145	67.3847	63.7946	58.7396	54.4429	59.9481	61.9041	67.6275	74.0903	76.9902	(72)
Total internal gains	494.6442	490.8800	472.5762	444.1938	415.2581	389.1558	373.7499	381.0605	397.2529	425.8290	457.6373	481.5844	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East					5.7800	19.6403	0.6300		0.7000	0.7700	34.6934 (76)	
West					6.9500	19.6403	0.6300		0.7000	0.7700	41.7161 (80)	

Solar gains	76.4095	149.4733	246.1612	359.0114	439.9819	450.3998	428.7990	368.3320	286.2956	177.3626	95.2737	62.8355 (83)
Total gains	571.0537	640.3533	718.7373	803.2052	855.2400	839.5556	802.5489	749.3925	683.5485	603.1916	552.9110	544.4199 (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	50.3576	50.5098	50.6598	51.3765	51.5128	52.1572	52.1572	52.2783	51.9071	51.5128	51.2377	50.9533
alpha	4.3572	4.3673	4.3773	4.4251	4.4342	4.4771	4.4771	4.4852	4.4605	4.4342	4.4158	4.3969
util living area	0.9909	0.9840	0.9652	0.9112	0.7986	0.6242	0.4683	0.5182	0.7631	0.9405	0.9838	0.9925 (86)
MIT	19.7034	19.8718	20.1627	20.5317	20.8097	20.9534	20.9896	20.9840	20.8856	20.5151	20.0471	19.6766 (87)
Th 2	19.7795	19.7827	19.7858	19.8006	19.8033	19.8163	19.8163	19.8187	19.8113	19.8033	19.7977	19.7919 (88)
util rest of house	0.9879	0.9788	0.9535	0.8816	0.7363	0.5248	0.3471	0.3927	0.6719	0.9140	0.9775	0.9901 (89)
MIT 2	18.6323	18.8008	19.0872	19.4463	19.6855	19.7971	19.8140	19.8147	19.7549	19.4425	18.9876	18.6155 (90)
Living area fraction									fLA = Living area / (4) =			0.2612 (91)
MIT	18.9121	19.0805	19.3681	19.7298	19.9791	20.0991	20.1211	20.1201	20.0502	19.7227	19.2643	18.8926 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9121	19.0805	19.3681	19.7298	19.9791	20.0991	20.1211	20.1201	20.0502	19.7227	19.2643	18.8926 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9850	0.9748	0.9485	0.8796	0.7464	0.5498	0.3790	0.4258	0.6922	0.9118	0.9738	0.9876 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Useful gains	562.5075	624.2336	681.7338	706.4959	638.3436	461.5667	304.1743	319.0550	473.1743	550.0046	538.4352	537.6666 (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	1318.4399	1275.6509	1154.1592	957.7886	730.2715	479.0625	306.7433	323.3345	520.8611	804.6763	1078.7277	1310.2116 (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	562.4137	437.7524	351.4845	180.9308	68.3943	0.0000	0.0000	0.0000	0.0000	189.4758	389.0106	574.7735 (98)
Space heating												2754.2356 (98)
Space heating per m2											(98) / (4) =	42.0944 (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 %)												89.8000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3067.0775 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	562.4137	437.7524	351.4845	180.9308	68.3943	0.0000	0.0000	0.0000	0.0000	189.4758	389.0106	574.7735 (98)
Space heating efficiency (main heating system 1)	89.8000	89.8000	89.8000	89.8000	89.8000	0.0000	0.0000	0.0000	0.0000	89.8000	89.8000	89.8000 (210)
Space heating fuel (main heating system)	626.2959	487.4748	391.4081	201.4820	76.1629	0.0000	0.0000	0.0000	0.0000	210.9976	433.1967	640.0595 (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	165.7893	127.8037	109.0326	68.6746	44.8487	30.7514	27.2212	53.0839	72.8986	113.8533	144.8073	165.2580 (64)
Efficiency of water heater	87.2818	87.3000	87.1842	86.7745	85.5085	79.7000	79.7000	79.7000	79.7000	85.7225	86.8156	79.7000 (216)
Fuel for water heating, kWh/month	189.9472	146.3960	125.0602	79.1414	52.4495	38.5840	34.1546	66.6047	91.4662	132.8160	166.7987	189.2368 (219)
Water heating fuel used												1312.6553 (219)
Annual totals kWh/year												
Space heating fuel - main system												3067.0775 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
pump for solar water heating												50.0000 (230g)
Total electricity for the above, kWh/year												125.0000 (231)
Electricity for lighting (calculated in Appendix L)												296.4711 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.75 * 853 * 1.00) =									-511.8180			-511.8180 (233)
Total delivered energy for all uses												4289.3859 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	3067.0775	3.4800	106.7343 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1312.6553	3.4800	45.6804 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Pump for solar water heating	50.0000	13.1900	6.5950 (249)
Energy for lighting	296.4711	13.1900	39.1045 (250)
Additional standing charges			120.0000 (251)
Energy saving/generation technologies			
PV Unit	-511.8180	13.1900	-67.5088 (252)
Total energy cost			260.4979 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)		0.9908 (257)
SAP value	[(255) x (256)] / [(4) + 45.0] =	86.1790
SAP rating (Section 12)		86 (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	3067.0775	0.2160	662.4887 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1312.6553	0.2160	283.5335 (264)
Space and water heating			946.0223 (265)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy For lighting	296.4711	0.5190	153.8685 (268)
Energy saving/generation technologies			
PV Unit			
Total kg/year	-511.8180	0.5190	-265.6335 (269)
CO2 emissions per m2			899.1322 (272)
EI value			13.7400 (273)
EI rating			89.0896
EI band			89 (274)
			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	33.6400 (1b)	x 2.3300 (2b)	= 78.3812 (1b) - (3b)
First floor	31.7900 (1c)	x 2.4100 (2c)	= 76.6139 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 154.9951 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1936 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4436 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.4103 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	4.7000	4.6000	4.3000	4.3000	4.0000	4.0000	3.9000	4.0000	4.5000	4.4000	4.7000 (22)
Wind factor	1.2750	1.1750	1.1500	1.0750	1.0750	1.0000	1.0000	0.9750	1.0000	1.1250	1.1000	1.1750 (22a)
Adj infilt rate	0.5231	0.4821	0.4718	0.4411	0.4411	0.4103	0.4103	0.4000	0.4103	0.4616	0.4513	0.4821 (22b)
Effective ac	0.6368	0.6162	0.6113	0.5973	0.5973	0.5842	0.5842	0.5800	0.5842	0.6065	0.6018	0.6162 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Front Door			2.0200	1.6000	3.2320		(26)
Windows (Uw = 1.40)			12.7300	1.3258	16.8769		(27)
Ground Floor			33.6400	0.1200	4.0368		(28a)
Brick and Block	79.2400	14.7500	64.4900	0.2300	14.8327		(29a)
Pitched Roof	31.7900		31.7900	0.1000	3.1790		(30)
Flat Roof	1.8500		1.8500	0.1800	0.3330		(30)
Total net area of external elements Aum(A, m ²)			146.5200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.4904		(33)
Party Wall 1			32.9500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.1666 (36)
Total fabric heat loss						(33) + (36) =	57.6570 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	32.5726	31.5179	31.2676	30.5492	30.5492	29.8793	29.8793	29.6667	29.8793	31.0228	30.7833	31.5179 (38)
Heat transfer coeff	90.2296	89.1749	88.9246	88.2062	88.2062	87.5362	87.5362	87.3237	87.5362	88.6798	88.4403	89.1749 (39)
Average = Sum(39)m / 12 =												88.4141 (39)
HLP	1.3790	1.3629	1.3591	1.3481	1.3481	1.3379	1.3379	1.3346	1.3379	1.3553	1.3517	1.3629 (40)
HLP (average)												1.3513 (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												2.1303 (42)
Average daily hot water use (litres/day)												84.7944 (43)
Daily hot water use	93.2738	89.8820	86.4902	83.0985	79.7067	76.3149	76.3149	79.7067	83.0985	86.4902	89.8820	93.2738 (44)
Energy conte	138.3223	120.9776	124.8381	108.8368	104.4315	90.1165	83.5062	95.8245	96.9690	113.0080	123.3571	133.9578 (45)
Energy content (annual)										Total = Sum(45)m =		1334.1455 (45)
Distribution loss (46)m = 0.15 x (45)m												
20.7484	18.1466	18.7257	16.3255	15.6647	13.5175	12.5259	14.3737	14.5453	16.9512	18.5036	20.0937 (46)	
Water storage loss:												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589 (61)
Total heat required for water heating calculated for each month	189.2812	167.0050	175.7970	158.1519	155.3904	139.4315	134.4651	146.7834	146.2841	163.9669	172.6722	184.9167 (62)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.7000 (H2)
Collector heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0050 (H3a)
Collector effective heat loss coefficient												1.8063 (H3b)
Collector performance ratio												2.5804 (H4)
Annual solar radiation per m2												1234.4649 (H5)
Overshading factor												0.8000 (H6)
Solar energy available												2073.9010 (H7)
Adjustment factor for showers												1.0000 (H7a)
Solar-to-load ratio												1.5545 (H8)
Utilisation factor												0.4744 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												84.7944 (H14)
Volume ratio Veff/V												0.8845 (H15)
Solar storage volume factor												0.9755 (H16)
Solar input												-843.9457 (H17)
Solar input	-27.6955	-39.5362	-67.0072	-91.4354	-107.9138	-114.8407	-110.6008	-98.6705	-78.0919	-53.4694	-32.5616	-22.1226 (63)
Solar input (sum of months) = Sum (63)m =												-843.9457 (63)
Output from w/h	161.5857	127.4688	108.7898	66.7165	47.4766	24.5909	23.8642	48.1129	68.1921	110.4976	140.1105	162.7942 (64)
Total per year (kWh/year) = Sum (64)m =												1090.1998 (64)
Heat gains from water heating, kWh/month	58.7319	51.7319	54.2484	48.5170	47.4632	42.2925	40.5055	44.6014	44.5710	50.3149	53.3450	57.2807 (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	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	127.8173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	41.9685	37.2761	30.3150	22.9504	17.1557	14.4835	15.6500	20.3424	27.3036	34.6682	40.4629	43.1350	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	278.2171	281.1041	273.8289	258.3409	238.7900	220.4149	208.1392	205.2522	212.5274	228.0155	247.5664	265.9414	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	49.9120	(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)	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	-85.2116	(71)
Water heating gains (Table 5)	78.9407	76.9820	72.9145	67.3847	63.7946	58.7396	54.4429	59.9481	61.9041	67.6275	74.0903	76.9902	(72)
Total internal gains	494.6442	490.8800	472.5762	444.1938	415.2581	389.1558	373.7499	381.0605	397.2529	425.8290	457.6373	481.5844	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
East					5.7800	25.9136	0.6300	0.7000			0.7700			45.7750 (76)
West					6.9500	25.9136	0.6300	0.7000			0.7700			55.0409 (80)

Solar gains	100.8158	168.4041	274.8934	406.1423	473.7944	524.2442	487.4030	428.6904	338.2983	211.1224	124.5447			79.1637 (83)
Total gains	595.4600	659.2841	747.4696	850.3361	889.0525	913.4000	861.1529	809.7509	735.5512	636.9513	582.1820			560.7480 (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	50.3576	50.9533	51.0966	51.5128	51.5128	51.9071	51.9071	52.0334	51.9071	51.2377	51.3765	50.9533	
alpha	4.3572	4.3969	4.4064	4.4342	4.4342	4.4605	4.4605	4.4689	4.4605	4.4158	4.4251	4.3969	
util living area	0.9863	0.9785	0.9517	0.8773	0.7349	0.5207	0.3731	0.3950	0.6600	0.9005	0.9722	0.9887	(86)
MIT	19.8697	20.0061	20.2991	20.6404	20.8787	20.9797	20.9964	20.9955	20.9448	20.6647	20.2408	19.8561	(87)
Th 2	19.7795	19.7919	19.7948	19.8033	19.8033	19.8113	19.8113	19.8138	19.8113	19.7977	19.8006	19.7919	(88)
util rest of house	0.9815	0.9712	0.9354	0.8384	0.6599	0.4175	0.2548	0.2705	0.5512	0.8563	0.9608	0.9847	(89)
MIT 2	18.7970	18.9403	19.2252	19.5441	19.7358	19.8046	19.8108	19.8132	19.7895	19.5711	19.1791	18.7938	(90)
Living area fraction									fLA = Living area / (4) =			0.2612	(91)
MIT	19.0772	19.2187	19.5057	19.8305	20.0344	20.1115	20.1205	20.1220	20.0913	19.8568	19.4564	19.0713	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0772	19.2187	19.5057	19.8305	20.0344	20.1115	20.1205	20.1220	20.0913	19.8568	19.4564	19.0713	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9779	0.9668	0.9306	0.8394	0.6755	0.4443	0.2859	0.3033	0.5786	0.8589	0.9566	0.9815	(94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Useful gains	582.3205	637.4119	695.5839	713.7439	600.5750	405.8226	246.2224	245.5840	425.5722	547.0904	556.9222	550.3638 (95)
Ext temp.	5.4000	5.7000	7.3000	9.6000	12.6000	15.4000	17.3000	17.3000	15.0000	11.8000	8.4000	5.5000 (96)
Heat loss rate W	1234.0900	1205.5242	1085.3891	902.3902	655.7569	412.4285	246.8925	246.4270	445.6693	714.4719	977.8301	1210.2159 (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	484.9165	381.7715	290.0151	135.8253	41.0553	0.0000	0.0000	0.0000	0.0000	124.5318	303.0537	490.9299 (98)
Space heating												2252.0991 (98)
Space heating per m2											(98) / (4) =	34.4200 (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 %)												89.8000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2507.9054 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	484.9165	381.7715	290.0151	135.8253	41.0553	0.0000	0.0000	0.0000	0.0000	124.5318	303.0537	490.9299 (98)
Space heating efficiency (main heating system 1)	89.8000	89.8000	89.8000	89.8000	89.8000	0.0000	0.0000	0.0000	0.0000	89.8000	89.8000	89.8000 (210)
Space heating fuel (main heating system)	539.9961	425.1353	322.9567	151.2531	45.7186	0.0000	0.0000	0.0000	0.0000	138.6768	337.4763	546.6926 (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	161.5857	127.4688	108.7898	66.7165	47.4766	24.5909	23.8642	48.1129	68.1921	110.4976	140.1105	162.7942 (64)
Efficiency of water heater	87.0430	87.0391	86.7994	86.2017	84.0857	79.7000	79.7000	79.7000	79.7000	84.7506	86.3407	79.7000 (216)
(217)m	185.6388	146.4501	125.3347	77.3958	56.4622	30.8543	29.9426	60.3676	85.5610	130.3796	162.2763	187.0062 (219)
Fuel for water heating, kWh/month												1277.6692 (219)
Water heating fuel used												
Annual totals kWh/year												
Space heating fuel - main system												2507.9054 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
pump for solar water heating												50.0000 (230g)
Total electricity for the above, kWh/year												125.0000 (231)
Electricity for lighting (calculated in Appendix L)												296.4711 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.75 * 989 * 1.00) =									-593.1804			-593.1804 (233)
Total delivered energy for all uses												3613.8654 (238)

10a. Fuel costs - using BEDF prices (436)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2507.9054	3.9200	98.3099 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1277.6692	3.9200	50.0846 (247)
Pumps and fans for heating	75.0000	16.9600	12.7200 (249)
Pump for solar water heating	50.0000	16.9600	8.4800 (249)
Energy for lighting	296.4711	16.9600	50.2815 (250)
Additional standing charges			88.0000 (251)
Energy saving/generation technologies			
PV Unit	-593.1804	16.9600	-100.6034 (252)
Total energy cost			207.2726 (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	2507.9054	0.2160	541.7076 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1277.6692	0.2160	275.9766 (264)
Space and water heating			817.6841 (265)
Pumps and fans	125.0000	0.5190	64.8750 (267)
Energy for lighting	296.4711	0.5190	153.8685 (268)
Energy saving/generation technologies			
PV Unit	-593.1804	0.5190	-307.8606 (269)
Total kg/year			728.5670 (272)

13a. Primary energy - 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	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2507.9054	1.2200	3059.6446 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1277.6692	1.2200	1558.7565 (264)
Space and water heating			4618.4011 (265)
Pumps and fans	125.0000	3.0700	383.7500 (267)
Energy for lighting	296.4711	3.0700	910.1662 (268)
Energy saving/generation technologies			
PV Unit	-593.1804	3.0700	-1821.0637 (269)
Primary energy kWh/year			4091.2536 (272)
Primary energy kWh/m2/year			62.5287 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	SAP 0624			Issued on Date	30/01/2019
Assessment Reference	Rev B	Prop Type Ref			
Property					
SAP Rating	85 B	DER	18.76	TER	19.40
Environmental	87 B	% DER<TER	3.29		
CO ₂ Emissions (t/year)	0.93	DFEE	54.24	TFEE	53.30
General Requirements Compliance	Fail	% DFEE<TFEE	-1.76		
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com			Assessor ID	E477-0001
Client	C & L Management, C&L				

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0624	Issued on Date	30/01/2019
Assessment Reference	Rev B	Prop Type Ref	
Project			
Calculation Type	New Build (As Designed)		

SAP Rating	85 B	DER	18.76	TER	19.40
Environmental	87 B	% DER<TER	3.29		
CO ₂ Emissions (t/year)	0.93	DFEE	54.24	TFEE	53.30
General Requirements Compliance	Fail	% DFEE<TFEE	-1.76		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
Client	C & L Management, C&L		

Building Elements

Roof 000002 - Mineral Wool between and above

Roof Type: Pitched Roof, insulated flat ceiling

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

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

Unheated space: None

Total thickness: 463 mm

U-value: 0.10 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0624	Issued on Date	30/01/2019
Assessment Reference	Rev B	Prop Type Ref	
Project			
Calculation Type	New Build (As Designed)		
SAP Rating	85 B	DER	18.76
Environmental	87 B	TER	19.40
CO ₂ Emissions (t/year)	0.93	% DER<TER	3.29
General Requirements Compliance	Fail	DFEE	54.24
		TFEE	53.30
		% DFEE<TFEE	-1.76
Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com		Assessor ID
			E477-0001
Client	C & L Management, C&L		

Building Elements

Roof 000003 - Timber Frame

Roof Type: Flat Roof standard (no precipitation)

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Rhepanol single ply membrane				
	Main construction	2	0.0000	0.0000	100.00
Layer 2	Thermarroof TR27 (120mm +)				
	Main construction	120	0.0240	5.0000	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Breather membrane				
	Main construction	1	0.0000	0.0000	100.00
Layer 4	Plywood				
	Main construction	18	0.1300	0.1385	100.00
Layer 5	Firrings				
	Main construction	25	0.1563	0.1600	87.50
	Main construction	25	0.1300	0.1923	12.50
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 6	Joists				
	Main construction	220	0.6485	0.3392	87.50
	Main construction	220	0.1300	1.6923	12.50
	Corrections - Cavity Unventilated, Emissivity: Low Emissivity (BR443)				
Layer 7	Plasterboard, standard				
	Main construction	15	0.2100	0.0714	100.00
Int surface				0.1000	

Total resistance: Upper limit = 5.994 m² K/W Lower limit = 5.890 m² K/W Average = 5.942 m² K/W
Total correction = 0.0071 m² K/W U-value (unrounded) = 0.18 W/m² K

Unheated space: None

Total thickness: 401 mm

U-value: 0.18 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0624	Issued on Date	30/01/2019
Assessment Reference	Rev B	Prop Type Ref	
Project			
Calculation Type	New Build (As Designed)		

SAP Rating	85 B	DER	18.76	TER	19.40
Environmental	87 B	% DER<TER	3.29		
CO ₂ Emissions (t/year)	0.93	DFEE	54.24	TFEE	53.30
General Requirements Compliance	Fail	% DFEE<TFEE	-1.76		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
------------------	--	-------------	-----------

Client	C & L Management, C&L
--------	-----------------------

Building Elements

Wall 000001

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Brick, outer leaf				
	Main construction	102	0.7700	0.1325	82.81
	Main construction	102	0.9407	0.1084	17.19
Layer 2	Earthwool Dritherm 32 Ultimate				
	Main construction	100	0.0320	3.1250	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Toplite GTI 2.9N and 3.6N				
	Main construction	100	0.1100	0.9091	93.43
	Main construction	100	0.8803	0.1136	6.57
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 4	airspace/plaster dabs				
	Main construction	15	0.0882	0.1700	80.00
	Main construction	15	0.0882	0.1700	20.00
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 5	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1300	

Total resistance:	Upper limit = 4.500 m ² K/W	Lower limit = 4.275 m ² K/W	Average = 4.387 m ² K/W
	Total correction = 0.0053 m ² K/W	U-value (unrounded) = 0.23 W/m ² K	

Unheated space: None

Total thickness: 330 mm

U-value: 0.23 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	SAP 0624	Issued on Date	30/01/2019
Assessment Reference	Rev B	Prop Type Ref	
Project			
Calculation Type	New Build (As Designed)		

SAP Rating	85 B	DER	18.76	TER	19.40
Environmental	87 B	% DER<TER	3.29		
CO ₂ Emissions (t/year)	0.93	DFEE	54.24	TFEE	53.30
General Requirements Compliance	Fail	% DFEE<TFEE	-1.76		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
Client	C & L Management, C&L		

Building Elements

Floor 000004 - Block and Beam

Floor Type: Suspended Floor

Area = 33.64 m², Perimeter = 17.19 m, Wall thickness = 275.00 mm, Soil: Unknown

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

Floor height above ground: h = 0.200 m

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

Ventilation openings per perimeter length: e = 0.0015 %

Mean wind speed: v = 5.000 m/s

Resistance on solum: R_g = 0.000 m²K/W

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.1700	
Layer 1	Blockwork, dense				
	Main construction	100	1.5900	0.0629	84.09
	Main construction	100	2.3000	0.0435	15.91
Layer 2	Polythene, 1000 gauge				
	Main construction	1	0.0000	0.0000	100.00
Layer 3	Celotex XR4000				
	Main construction	150	0.0220	6.8182	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 4	Polythene, 500 gauge				
	Main construction	1	0.0000	0.0000	100.00
Layer 5	Screed				
	Main construction	75	1.1500	0.0652	100.00
Int surface				0.1700	

Total resistance:	Upper limit = 7.283 m ² K/W	Lower limit = 7.282 m ² K/W	Average = 7.283 m ² K/W
	Total correction = 0.0088 m ² K/W	U-value (unrounded) = 0.12 W/m ² K	

Unheated space: None

Total thickness: 327 mm

U-value: 0.12 W/m² K

Kappa: n/a

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	SAP 0624	Issued on Date	30/01/2019
Assessment Reference	Rev B	Prop Type Ref	
Property			

SAP Rating	85 B	DER	18.76	TER	19.40
Environmental	87 B	% DER<TER	3.29		
CO ₂ Emissions (t/year)	0.93	DFEE	54.24	TFEE	53.30
General Requirements Compliance	Fail	% DFEE<TFEE	-1.76		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
Client	C & L Management, C&L		

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	19.40	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.76	kgCO ₂ /m ²	Pass
	-0.64 (-3.3%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.30	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	54.24	kWh/m ² /yr	
Excess energy	0.9 (1.7%)	kWh/m ² /yr	Fail

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	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.10 (max. 0.20)	0.18 (max. 0.35)	Pass
Openings	1.43 (max. 2.00)	1.60 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

Limiting System Efficiencies

4 Heating efficiency

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Vaillant Ecotec Plus 824
Combi boiler
Efficiency: 88.9% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing East

5.78 m², No overhang

Windows facing West

6.95 m², No overhang

Air change rate

4.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.10

W/m²K

Floor U-value

0.12

W/m²K

Photovoltaic array

N/A

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	SAP 0624	Issued on Date	30/01/2019
Assessment Reference	Rev B	Prop Type Ref	
Property			

SAP Rating	85 B	DER	18.76	TER	19.40
Environmental	87 B	% DER<TER	3.29		
CO ₂ Emissions (t/year)	0.93	DFEE	54.24	TFEE	53.30
General Requirements Compliance	Fail	% DFEE<TFEE	-1.76		

Assessor Details	Mr. Tobias Whiting, Abacus Energy (UK) Ltd, Tel: 01329 313079, tobiaswhiting26@gmail.com	Assessor ID	E477-0001
Client	C & L Management, C&L		

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

Orientation	East
Property Tenure	Owner-occupied
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2019
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	17.19 m	33.64 m ²	2.33 m
	1st Storey:	16.26 m	31.79 m ²	2.41 m

7.0 Living Area	17.09	m ²
-----------------	-------	----------------

8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m ² K

9.0 External Walls					
Description	Type	Construction	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Brick and Block	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.23	79.24	64.49

9.1 Party Walls				
Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Party Wall 1	Filled Cavity with Edge Sealing	Other	0.00	32.95

10.0 External Roofs					
Description	Type	Construction	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Pitched Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	31.79	31.79
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.18	1.85	1.85

11.0 Heat Loss Floors				
Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Ground Floor	Ground Floor - Solid	Suspended concrete floor, carpeted	0.12	33.64

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front Door	Manufacturer	Solid Door							1.60
Windows	Manufacturer	Window	Double Low-E Soft 0.1			0.63		0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Front Door	Solid Door	[1] Brick and Block	East							2.02	
Front Elevation	Window	[1] Brick and Block	East	None	0.00					5.78	
Rear Elevation	Window	[1] Brick and Block	West	None	0.00					6.95	

14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	10.56	0.300	No
Table K1 - Approved	E3 Sill	8.10	0.040	No
Table K1 - Approved	E4 Jamb	24.60	0.050	No
Table K1 - Approved	E5 Ground floor (normal)	17.19	0.160	No
Table K1 - Approved	E6 Intermediate floor within a dwelling	16.26	0.070	No
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	9.74	0.060	No
Table K1 - Approved	E12 Gable (insulation at ceiling level)	6.49	0.240	No
Table K1 - Default	E14 Flat roof	3.07	0.080	No
Table K1 - Approved	E16 Corner (normal)	11.81	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	2.33	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	9.48	0.060	No
Table K1 - Default	P1 Party wall - Ground floor	7.43	0.160	No
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	6.49	0.000	No
Table K1 - Default	P4 Party wall - Roof (insulation at ceiling level)	6.49	0.240	No

Y-value 0.104 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 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 Windows half open

Cross ventilation possible Yes

Night Ventilation Yes

Air change rate 4.00

Mechanical Ventilation

Mechanical Ventilation System Present No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Number of intermittent fans	3
Number of passive vents	0
Number of flueless gas fires	0

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings	8	
Total number of L.E.L. fittings	8	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

24.0 Main Heating 1

	Database	
Description	Gas Combi	
Percentage of Heat	100	%
Database Ref. No.	10326	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	89.8	
In Summer	79.7	
Controls	CBE Programmer, room thermostat and TRVs	
PCDF Controls	0	
Delayed Start Stat	No	
Sap Code	2106	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	
Combi boiler type	Standard Combi	
Combi keep hot type	Gas/Oil, time clock	

25.0 Main Heating 2

Community Heating

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

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901

29.0 Hot Water Cylinder	None
-------------------------	-----------------------------------

32.0 Photovoltaic Unit	One Dwelling
------------------------	---

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
0.75	West	45°	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£32	B 86	